

# The **GEO** Quarterly

Group for Earth Observation



Group for Earth Observation

**The Independent Amateur Quarterly Publication for  
Earth Observation and Weather Satellite Enthusiasts**

**Number 23  
September 2009**



## **Inside this issue . . .**

*The image on this page shows Australia's Lake Eyre in March this year at the peak of its most recent flooding event: read more about this rare phenomenon inside ...*

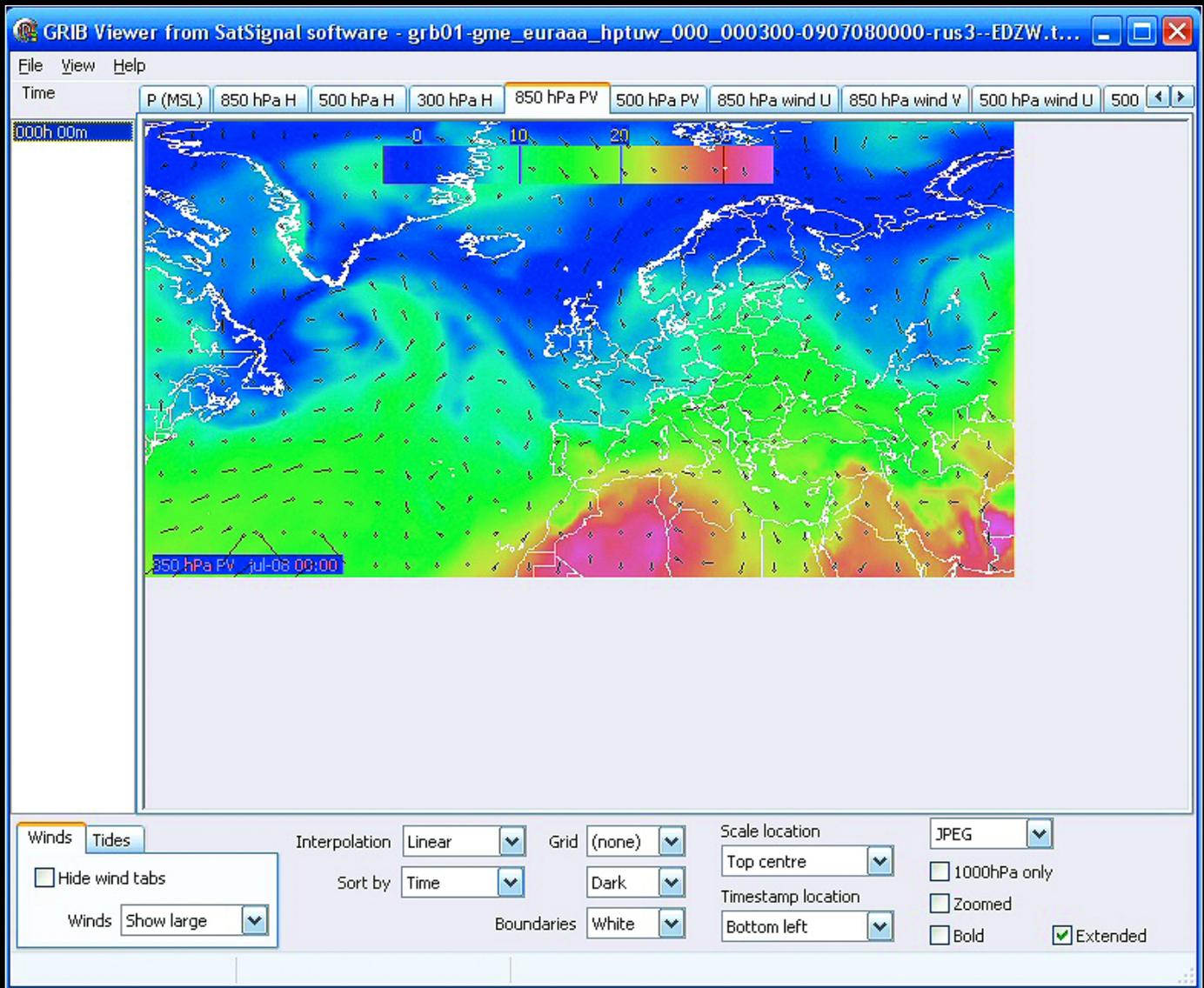
*Luc van der Peer has been constructing EUMETCast systems from inexpensive 'barebones' computers with considerable success*

*The GOES-14 geostationary satellite is now successfully in orbit. Fred Piering provides an eye-witness account of the launch while Ed Murashie gives us an overview of what we can expect from this new orbiter*

*Marciano Righini takes a nostalgic illustrated look back to the era of Soviet radar satellites*

*Two of our readers, Rob Denton and Anders Höök have been experimenting with Double Cross Antennas (DCAs). You can read about their experiences on pages 6 and 7*

*Plus much more ...*



A typical DWDSAT GRIB file displayed in David Taylor's GRIB Viewer  
(See Fred van den Bosch's article on page 15)

## The Royal Meteorological Society



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# The **GEO** Quarterly

## September 2009

Editorial: Les Hamilton

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of text or images, either from the printed  
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source, is forbidden without permission from  
the Editor.

For the second time in three months your *GEO Quarterly* has been published several weeks later than planned. This is a disappointing trend following five years during which members' contributions were always sufficient to complete each issue in good time. During these years, 'overspill' articles were always already making their way into the subsequent issue prior to copy deadline.

Not so this time: *GEO Quarterly 23* had barely crept past the halfway stage when its copy deadline expired. An appeal on *GEO-Subscribers* in early August did bring in further contributions, for which we are most grateful, but as GEO does not have full-time editorial staff, this inevitably delayed all aspects of production by the best part of a month.

With a new editor taking over at the start of 2010 it is important to ease his task by providing articles and images in good time. Please note: the copy deadline is a final date for last-minute news—general articles, particularly major ones containing large numbers of diagrams and images, should be submitted at the earliest opportunity, hopefully at least four weeks prior to deadline.

Perhaps it's time for a change of emphasis. When GEO first formed, APT still reigned as the most popular form of satellite imaging—and the nature of the art meant that everyone was striving to produce better images from more distant horizons than everyone else. Location played a major role: through factors such as the proximity of high ground, pagers, reflecting artefacts, nearby power lines and so on. Constructing and experimenting with hardware provided one of the kingpins of the hobby. But no longer! *EUMETCast* has removed all the uncertainty and mystery from satellite imaging. Everyone now receives identical images, generally of perfect quality, regardless of location. If an image is flawed, then everyone receives it so.

To maintain interest in our hobby, much more thought should be given to the images themselves: identifying images of particular interest, and describing/explaining the features shown in them. Many GEO readers download huge numbers of images every day, covering all corners of the globe (Metop and MSG-FSD). Food for thought indeed.

Copy deadline for Quarterly 24 is October 31. So **now** would be the perfect time to start the ball rolling. Check out your *EUMETCast* data, do a little research, and send us interesting images with a few sentences of description.

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# The GEO Report



Francis Bell

My priority when writing my report for the Quarterly is to welcome new members. This time is no exception so a sincere welcome to those for whom this may be their first GEO Quarterly. I will risk saying, and I know I have said before, that GEO is an organisation covering a broad spectrum of interests and talents. You will read in the Quarterly technical articles which are at the frontiers of experimentation and knowledge relating to weather satellite reception and closely related topics; however, please note that experiences and problems faced by absolute beginners are equally important.

We all start off as beginners at some stage, hence to share and illustrate these experiences is as important as work at the frontiers of knowledge. In other words, please do not hesitate to send a contribution of any description with the potential for publication in our Quarterly, either to myself or to our editor. A note here about the quality of *GEO Quarterly*, which is largely due to the skills and efforts of our editor: so formal thank you editor; plus, in the background, thanks to our printers, who I think produce a quality publication for us.

A slight aside here may be to request materials from schools or other institutions open to the public. I am particularly interested in the perception and experiences of young people when dealing with Earth observation and weather satellites. Please do not hesitate in sending material of any kind to myself or to our editor.

At this point I would usually report on GEO matters relating to our legal status, any tax matters, our membership and financial status. However, these are covered in my report of the symposium and the AGM on page 29 so, with just one exception, I will not repeat them here. This is my usual request not to forget your membership renewal and keep our membership secretary up to date with your personal details: for example, a change of address or subscription payment protocols. It takes much unnecessary effort for our management team to check these details for a failed renewal. Don't renew if your interests have changed or you don't think GEO membership is worthwhile but let that be a positive decision, not just forgetfulness.

It is with pleasure that I bring to your attention three new events which we are anticipating in the next few months.

## EUMETSAT Annual Conference

This year, the EUMETSAT annual conference will be held in the UK. The conference venue moves around member states but this year it is to be held in the UK between September 21-25. The conference will be hosted by the UK Met Office and the venue is the Assembly Rooms, Bath. I am in touch with EUMETSAT and the UK Met Office organisers as I hope we can provide all delegates with a GEO information pack. GEO will not be making a formal presentation at the conference as I did last December at the NOAA conference in Miami but we will make the effort to ensure that delegates are up-to-date with GEO via the information pack, plus a copy of a recent Quarterly. For details of the conference visit EUMETSAT's web site at

[www.eumetsat.int](http://www.eumetsat.int)

## National Hamfest

Members of the RSGB and readers of *RadCom* (August 2009 page 49) may have seen notices relating to a new event which is being planned—a National Hamfest. This is to be a two day event on the October 2-3, 2009. It so happens that I know the location of this new event because I used to live only a few miles from what used to be RAF Swinderby. This was a very active airfield during the Second World War but was vacated by the RAF at some time in the 1970's. The site is now home for several exhibition areas and this is where the National Hamfest is being held. There is easy access via the A46 main road and plenty of parking spaces. GEO will be there and we will endeavour to display live satellite reception together with examples of the hardware and literature we have available for our members. I will ask EUMETSAT and BNSC for their literature as this is always well received by the public at these events. For the latest details visit

[www.nationalhamfest.org.uk](http://www.nationalhamfest.org.uk)

## Royal Meteorological Society Amateur Conference

From copies of correspondence I have received, I understand that the *Royal Meteorological Society* is planning a conference for amateur and educational users of meteorological data. The planning stages will be in the autumn of this year with the event being held at Reading University in the first half of 2010. GEO may well be able to contribute to this conference with our skills and experience of weather satellite reception. Also being considered as contributors to the conference are the Climatological Observers Link (COL) and the UK based Tornado and Storm Research Organisation (TORRO). I can also think of other groups whose contributions may be appropriate. When details are confirmed we will publish them in *GEO Quarterly* and on our website. In the meantime, we look forward in anticipation to this conference.

## QUARTERLY QUESTION

### Quarterly Question 22

The question posed last issue, on how satellite receiving antennas were protected from frost and snow, brought an eclectic postbag of responses. Five readers took the trouble to respond. David Williams' comprehensive letter is reproduced in 'Feedback', on page 44. Other replies came from:

#### Darrell Robertson

Supervisor, Satellite Data Services Team  
NOAA / NESDIS Direct Services Division

The answer to your question is that we use heaters on our dishes. A lot of antennas use de-icers which are heaters that keep the snow and ice from sticking. De-icers have their own issues so we tend to just use fire hoses or liquid de-icers to spray into our dishes if they every get that bad.

However, I did actually see a maintenance guy on the roof knocking the ice and snow out of a dish with the end of a broom handle. Not recommended. They now have dents in that dish.

#### Andreas Lubnow

Having once visited one of the big Usingen-like dishes not far from where I live in Hameln, Germany, I seem to remember they do it by electric heating of the entire dish and that there is a substantial power consumption associated with this heating process. I noted the nuclear power plant nearby but still, the cost of the dish heating must be substantial.

Thank you for your efforts with GEO. I am a little preoccupied at the moment because my wife has just given birth to our first baby daughter and family matters are high on our agenda.

#### Ian Leitch

Despite not having any real first-hand experience of the subject, I have a friend *Google*. Snow cover protection of satellite communication dishes and feeds can be achieved by the employment of covers, coatings or heating: alone or in a sensible combination. Heating can be hot air or electrical heating elements built into covering materials such as domes, fabric face-covers or by components of the dishes/radiating elements themselves.

Surface coatings can be used to make the antenna parts or covers slippery and less likely to retain snow. Coupled with heating, a high degree of protection can be expected. Snow will land, but any build-up of snow is prevented as it either melts or slides off relatively quickly. As always, the balance is between cost on one hand and operational requirement on the other.

#### Andy Eskelson

There will be many ways to protect antennas from snow, and it will depend on the size of the antenna. For very large dishes and domes I would guess that heating is the only way. However, for smaller antennae, the normal method is to use an inflatable bladder. If the dish snows or ices up, the bladder is inflated and deflated. This cracks any ice and snow which then falls off.

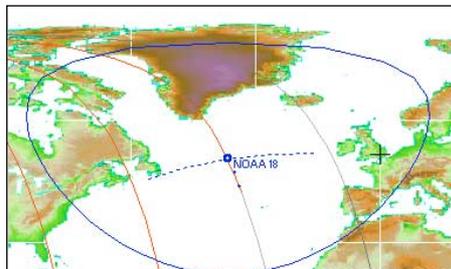
The cover over a dish means that snow and ice cannot collect on the bowl of the dish, so just using a cover solves a lot of problems. I have some photographs of the antennae on the London BT tower showing their covers. Ice bladders are also available for shipboard radar systems, which is where I first encountered them.

## Quarterly Question 23

On July 23 this year, at the *Three Counties Amateur Radio Club's* field day, I set up my laptop and mobile APT station on a hilltop location on the South Downs, in east Hampshire, at a site reputed to be a good take off and receiving location for RF. The most interesting image I received was from NOAA-19, at a maximum elevation of 13° to the west. I judged the reception to be outstanding for that elevation and received an image, mostly of the Atlantic Ocean but more interestingly Greenland and, at the lower left of the image, the island of Newfoundland. I thought this was as good as you can get from Hampshire. The NOAA-18 footprint shown on the WXtrack screen below suggests that a considerable area of Canada should be accessible.



NOAA 18 image acquired from the south of England, showing Greenland and Newfoundland (largely hidden by cloud at lower left).



This screenshot from a NOAA-18 pass at 10°W suggests strongly that a considerable area of eastern Canada should be accessible in APT images, providing the western horizon is good.

Image taken from David Taylor's WXtrack

### The Question

Can any reader, located on mainland Europe, Great Britain or Ireland, submit an APT image clearly showing detail from the eastern seaboard of Canada?

**A selection of the best images submitted to the editor by next copy deadline will appear in the December Quarterly.**

## Forthcoming events

### September 12-13

The Leicester Amateur Radio Show. In the past GEO has attend this show but the changes of dates and venues has left us

## Cover and Full Page Images

### Front Cover

This *Landsat-5* image dating from March 22, 2009 shows Australia's Lake Eyre in flood following record monsoon rains in northern Queensland.

NASA image created by Jesse Allen, using Landsat data provided by the United States Geological Survey

### Inside Front Cover

A typical DWDSAT GRIB file displayed in David Taylor's GRIB Viewer.

Image © EUMETSAT 2009

### Inside Back Cover

The Aral Sea was imaged by the MODIS instrument aboard NASA's *Terra* satellite on July 20, 2009.

Image: MODIS Rapid Response Team at NASA/GSFC

### Back Cover

This superb NOAA-18 AVHRR image of the British Isles was downloaded by David Taylor, via *EUMETCast*, at 12:55 UT on May 30 this year, and processed with HRPT Reader.

Image © EUMETSAT 2009

### Page 26

The light from engine ignition is reflected in the water near Launch Complex-37 at Cape Canaveral, Florida as a Delta IV rocket carries the GOES-O satellite aloft.

Photo: NASA

### Page 31

The first visible image to be received from GOES-14, on July 27, 2009

Image: NASA

### Page 32

Novaya Zemlya, imaged by the MODIS instrument aboard NASA's *Terra* satellite on July 27, 2009.

Image: Jeff Schmaltz, MODIS Rapid Response Team, NASA GSFC

### Page 40

The MODIS instrument aboard NASA's *Terra* satellite imaged these fascinating whorls of sea ice off the southeastern coast of Baffin Island on July 11, 2009.

Image: MODIS Rapid Response Team at NASA/GSFC

with a degree of uncertainty about this event. We will try to be there.

### September 21-25, 2009

EUMETSAT's international conference in Bath, hosted by the UK Met Office. See the EUMETSAT website for details. GEO are preparing information literature for delegates.

### Sunday September 27, 2009

The West London Radio and Electronic show at Kempton.

### October 2-3, 2009

The RSGB National Hamfest to be held near Newark. This is a new event and GEO will do its best to attend.

# Lake Eyre Flooding

## brings life to Australia's heart



Les Hamilton

Almost two years ago <sup>[1]</sup> we carried a feature on the Aral Sea, explaining how Man's activities have resulted in catastrophic water loss over the past half century. Another major inland sea, Australia's Lake Eyre, has suffered a similar fate, albeit through natural causes. Up until around two million years ago, Lake Eyre was well supplied with water and surrounded by forests; but the basin became increasingly arid as Australia drifted closer to the equator. Nowadays, Lake Eyre spends most of its time as a flat desiccated salt pan, famously selected by Donald Campbell as the location for his 1964 land speed record attempt in *Bluebird*. But occasionally it does fill with water, most recently during the austral summer of 2009.

Lake Eyre takes its name from explorer Edward John Eyre who, in 1840, was the first white man to visit it. Lake Eyre, the lowest point on the continent, lies fifteen metres below sea level and usually consists only of salt pans stretching as far as the eye can see. In flood years, though, Lake Eyre undergoes a temporary period of rapid growth and fertility when the waters return, prompting the arrival of enormous flocks of waterfowl and the reappearance of dormant marine creatures.

Australia's Lake Eyre drainage basin embraces over a million square kilometers, stretching from Northern Territory to South Australia. Such rain that falls in this area drains inward, through the Simpson Desert and into Lake Eyre.

Lake Eyre consists of two sections, Lake Eyre North and Lake Eyre South, joined by the narrow Goyder Channel. From 10000 to 5000 years ago, the northern section was a permanent saline lake but during the subsequent 2000 years it dried out, leaving a playa (salt pan). In some parts, the salt crust is up to 460 mm thick but can dissolve completely after major flooding.

Average annual rainfall in the Lake Eyre basin is only 125 millimetres and the bulk of any water reaching it is generally provided by the river systems of inland Queensland, in particular the Georgina and Diamantina. Indeed, until the major flood of 1949—its first recorded filling—it had been thought that Lake Eyre was permanently dry. In the years since its discovery, the lake has filled to its brim only three times though there have been numerous partial floodings. The highest recorded flood occurred in 1974, when 34 km<sup>3</sup> of water entered the lake, filling it to a depth of six metres.

### The 2009 Flooding Event

From the first week of January through to early March 2009, an active monsoon season brought two tropical cyclones, *Charlotte* and *Ellie*, as well as numerous additional low pressure systems to northern Queensland. The result was a period of sustained and exceptionally heavy rainfall throughout January and February, particularly south of the Gulf of Carpentaria. The first flood warnings were issued for moderate to major flooding in the Gulf Rivers and the Georgina and Diamantina Rivers in Western Queensland and as the heavy rains persisted, these remained in force for nine weeks until March 7. By then, the extent and magnitude of the flooding were estimated to have been second only to the record flooding of 1974 during the past century. Many stations in the Gulf recorded record daily and monthly rainfall totals for January and February. The town of Cairns for example experienced some 300 mm of

precipitation in just 24 hours on January 12 and many other stations experienced over 400 mm!

By mid January, major floods were already making their way down the Diamantina and Georgina river systems which feed Lake Eyre but it was not till almost a month later, advancing at a mean velocity of 12.5 km per day, that the first trickles of water finally started entering its parched basin. By March 22, shallow water covered much of the lake bed as illustrated by the Landsat-5 image on the front cover. The water is colourful, tinted green and blue by sediment and algae. The southwestern lobe of the lake is darkest in colour.

The 2009 Lake Eyre flood peaked at a depth of 1.5 m in late May, as illustrated in figure 1 on the facing page. Acquired by NASA's Terra satellite, it provides a wider, natural-colour view of the region, with water from the Diamantina pouring into the lake through one of many channels that drain the desert during the rainy season. The muddy brown water spreads into Lake Eyre via a triangular delta.

Although the recent infill reached only a quarter of the lake's maximum recorded depth of 6m, it represented nine cubic kilometres of water crossing the Queensland - South Australian border, most of it coming from the massive Georgina River floods. Much of this water simply soaked into the desert or evaporated en route and only 10% of the flow, which covered an area of 800 square kilometres, actually reached Lake Eyre.

### Transformation

Normally inhospitable to wildlife, Lake Eyre is transformed into Australia's largest lake when the waters flow. Along with surrounding river channels, lakes, and lagoons it becomes a wildlife oasis brimming with flora and fauna.

The desert becomes transformed. Wildflowers spring up and the lake becomes a breeding ground for thousands of birds. As many as 60,000 waterbirds had arrived in the Lake Eyre region by mid May, flocking to nest on the floodplains of southwest Queensland and take advantage of the best conditions for twenty years. Numerous ducks, spoonbills, egrets, cormorants, pelicans, gulls and terns were all taking advantage of the floodwaters to breed. In years when flooding fills Lake Eyre to 80% of its capacity, it is likely that over 80 different species of birds will descend on the area making it one of the most spectacular places to visit in Australia. Golden perch, which arrive on the floodwaters, quickly start to spawn, providing birds with a feast of fingerlings (young fish).

But it will all be short lived. In the heat of South Australia's north, water evaporates at a prodigious rate. Even on occasions when the lake reaches more than two metres in depth, the water would almost certainly be gone by October. When the waters get deeper than this, the lake can last for approximately 12 months. In 2009 however, the water in Lake Eyre were already well in decline by July, as evaporation exceeded the diminishing flows of the rivers. Figure 2 shows the situation on July 19, 2009.

### Reference

[http://en.wikipedia.org/wiki/Lake\\_Eyre\\_Basin](http://en.wikipedia.org/wiki/Lake_Eyre_Basin)



Figure 1 - A May 22, 2009 Terra MODIS image showing Lake Eyre in flood - Image: NASA/GSFC MODIS Rapid Response



Figure 2 - A July 19, 2009 Aqua MODIS image shows Lake Eyre drying out again - Image: NASA/GSFC MODIS Rapid Response

# DCA v QFH

Rob Denton LZ/G4YRZ - [g4yrz@wxsat.org](mailto:g4yrz@wxsat.org)

After reading so many articles about APT antennas, I decided to put some to the test. I had tried simple verticals and dipoles but knew that, if I wanted a quality image, I must use a dedicated antenna. It's the same as with receivers: you can use a scanner but you need a dedicated weather satellite receiver for the best results.

The antennas I decided to compare were the turnstile, the quadrafilax helix (QFH) and the latest concept, the double cross antenna (DCA).



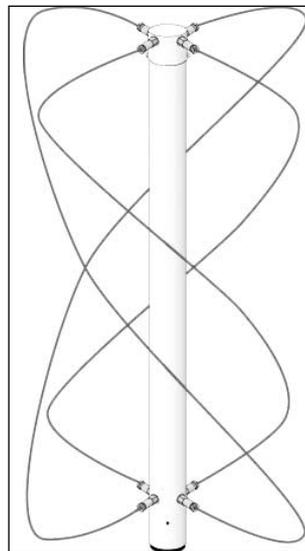
This photograph clearly shows the QFH and DCA on the author's roof

At my previous location in UK I had already been successful using the turnstile. I starting first with a simple run-of-the-mill crossed dipole, then later switched to the *WIMO* design with its sloping elements. It was the *WIMO* antenna on which I received the 'How far east?' images in previous *GEO* Quarterlies.

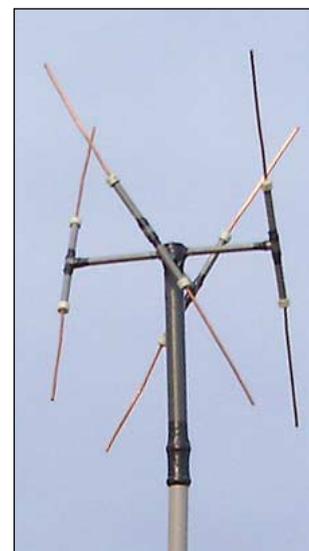
That left me with two more antennas to try, the QFH and the DCA. I received a Dartcom QFH from a fellow *GEO* member, and this seemed to be pulling in the satellite signals very strongly—but there was much interference on the images. Adding a ferrite bead and shortening the coax lead soon cured this problem and I was very pleased with the images. The antenna seemed to work very well. I have read many write-ups about the QFH but wanted to see if what I read was the same as in the real world.

I connected the R2ZX to both my QFH and DCA, enabled its antenna diversity feature and watched. For the main part of the pass, the QFH was chosen more often than the DCA as it produced a much stronger signal. But I was needing a stronger signal at the start and end of the pass, where it counted most.

That's where the Double Cross Antenna came into a league of it's own. The R2ZX chose the DCA for both the start and end of each pass, where I needed it most, long before the QFH had found and lost the signals. I tried each antenna separately and, although the QFH was stronger for the closer, main part of the passes, the DCA out-performed it at low elevations.



The QFH Antenna



The DC Antenna

I don't want to start any 'antenna wars' as I know our Dutch friends, in particular, like the QFH. But many readers have emailed me asking about the results of my tests after building a home-made DCA.

The turnstile type antennas such as the DCA are also less prone to pagers than the QFH. If I were to choose a general single-purpose antenna, it would be the DCA; but for ruggedness and for windy locations, portability, maritime mobile, even car mobile, the QFH is a more robust antenna.

I might also add that what works for me is not necessarily the same for everyone. Antennas perform differently at different locations; there are so many things to take into account: obstructions, pagers, soil types, height of antenna etc. You just have to try it for yourself. Also, there is the cost factor. My home-built antenna cost me around £20, a lot cheaper than a commercial antenna, but saying that, my QFH was a gift. Thank you, I will never part with it. In fact I will use it for portable use.

I hope I haven't stirred up a hornet's nest or offended anyone. I'm just expressing my own personal point of view and honest account of my findings. It's what many of you asked me try out, and I did it for my own peace of mind. You must decide for yourself which antenna is best for you. It will be interesting to run another test next time I move house.

I wrote this in the hope that it will help others. Remember, we are all in the same team here, and all learning through trial and error—so let's help each other. Enjoy the hobby.

## References

A QFH antenna is available from the *GEO* shop

<http://www.geo-web.org.uk/shop.html>

For Jerry Martes Double Cross Antenna, see *GEO* Q20 page13.

You can download the PDF document 'DCA Assembly Hints' from

<http://www.poes-weather.com/media/DCA-Assembly-Hints.pdf>

# Experiences with a Double Cross Antenna

Anders Höök

## Double Cross Antenna

In the first days of June, I was ready with my Double Cross APT Antenna, described in GEO Q20. The crucial point there was what *'was left to the ingenuity of each individual constructor'*. I couldn't find the slim plastic pipes and especially not appropriate T-pieces that the photos seemed to show; so I worked with 32 mm waste pipe and T-pieces that I placed in a 110 mm pipe. The result was the rather crude construction illustrated in figure 1.



Figure 1 - The Double Cross Design

I read somewhere that the really crucial point was the harness. This I happened to prove by mistake as I wrongly made the difference between feeders to the dipole pairs about 300 mm (instead of 360 mm). The result was interesting in the way that usual radio signals, e.g. air communication, were received quite well, but the polarised signal from the satellites were very noisy. After correcting the length everything became better.

The good old QFH antenna (Paul Hayes' design) is still in use and both can be seen here, mounted on my roof. It is very good that both antennas can be used with the help of the diversity reception of the R2FX receiver.



Figure 2 - Twin antennas for diversity reception

## Flooded Russian Rivers

I know that in GEO Q15, a really splendid image of the flooded Russian river Ob was published. I nevertheless cannot resist attaching one that I received recently. It is an APT image, NOAA 18 from 2009-06-26, 08:23 UT, max elevation 13 degrees. I have of course used the DC and QFH antennas in diversity reception. Most of the time the DC antenna has delivered the signal, decoding and processing with Patrik Tast's *APT Decoder* (figure 3).

Besides the rivers Ob and Taz, which flow to the same ice jammed estuary, the river Yenisei can also be seen to have an estuary jammed with ice. This phenomenon with ice jamming of arctic Russian rivers, I already learnt at school, it is very nice to be able to see it in reality, now at old age.

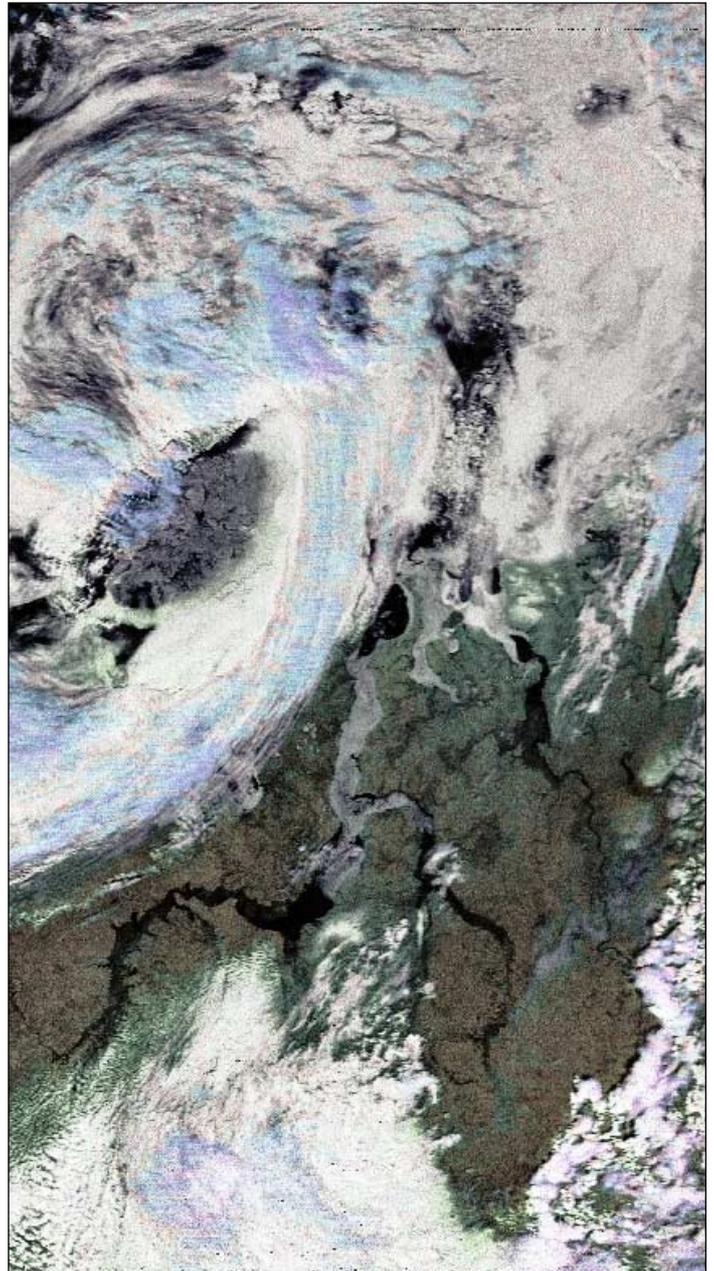
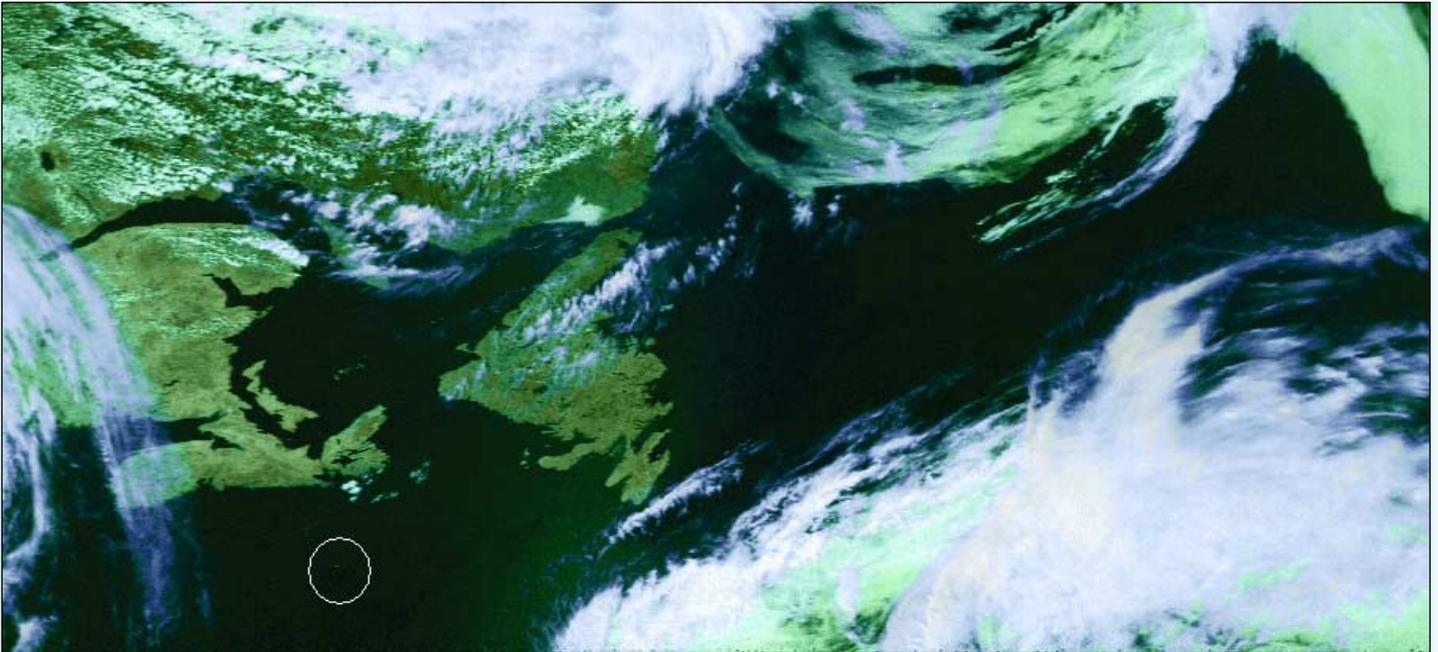
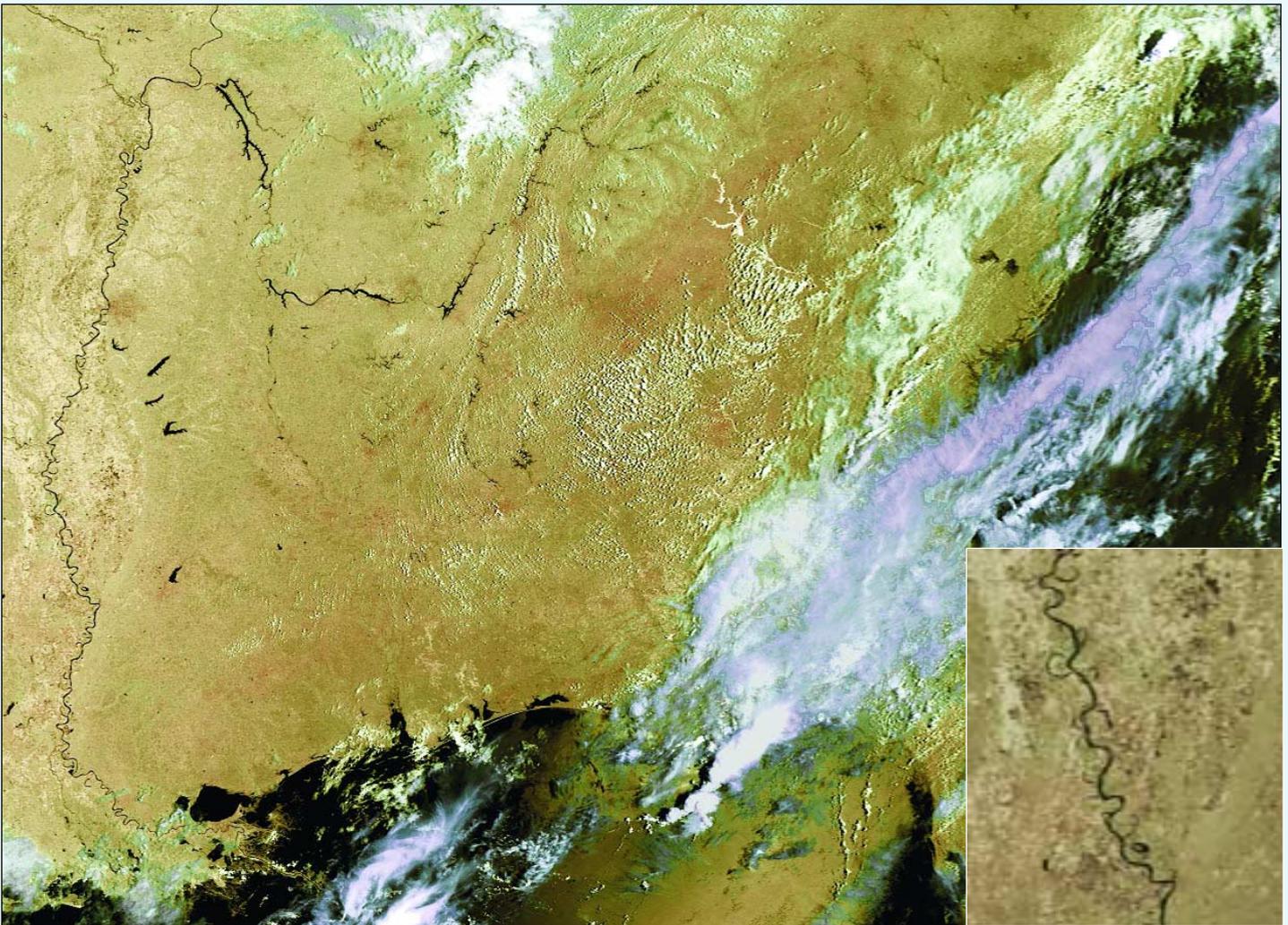


Figure 3 - Ice-jammed Arctic river estuaries



**Keith Fraser** sent in this NOAA-18 APT image dating from 16:30 UT on June 18, 2009. The central feature is the island of Newfoundland. Keith wrote: 'About 200 km southeast of Nova Scotia I saw a pixel that intrigued me and have circled it on image. I looked up the 500 m resolution Aqua/MODIS image

for the same date and identified it as Sable Island—of wild horses renown. This is the first time that I have noticed it, as this area is always under fog or cloud because of Gulf Stream warmth meeting the cold water from the Davis Strait.



**Robert Moore** provided this fascinating image of the Mississippi river. Robert writes: 'Between the Rocky Mountains and the Appalachians, North America drains into the Mississippi River, which discharges into the Gulf of Mexico. On the July 24, 2009, the Metop-A image of the Mississippi was exceptionally clear and cloud free, showing the full

3,730 km length of the river. In the lower reaches, the river runs through flat terrain, creating meanders: loops that become near-circular. Erosion and sedimentation can cut these loops off to form oxbow lakes. These may remain as lakes, or dry out to leave curved depressions in the landscape. The image shows the middle and lower parts of the

Mississippi; the twists and turns are clear to see, as are many oxbows. The inset shows detail from the lower part of the river, and whilst perhaps over-zoomed, nevertheless shows the oxbow lakes very clearly. The flood plain (which regularly floods) may also be seen in both images.'

*Metop-A Image © EUMETSAT 2009*

# SAR on the USSR Weather Spacecraft

Marciano Righini, IAMY

On a satellite carrying SAR (Synthetic Aperture Radar) equipment (figure 1) there is an altimeter to determine the altitude of the spacecraft as it advances along its orbit. At the same time, a radar shoots microwave bursts sideways towards the Earth surface where they suffer reflection. Every echo consists of a great number of reflections from thousands of single structures. The backscattered signal is characterised by the delay (distance) and the Doppler shift (wavelength). Moreover the echo strength depends on the inclination of the structures, on their roughness and on that electromagnetic property of the material known as its dielectric constant. All these elements are combined in order to create a coherent image of the terrain below.

The USSR satellites with SAR downlink on the 137 MHz band were named *Cosmos*, *Okean* and *Sich*.

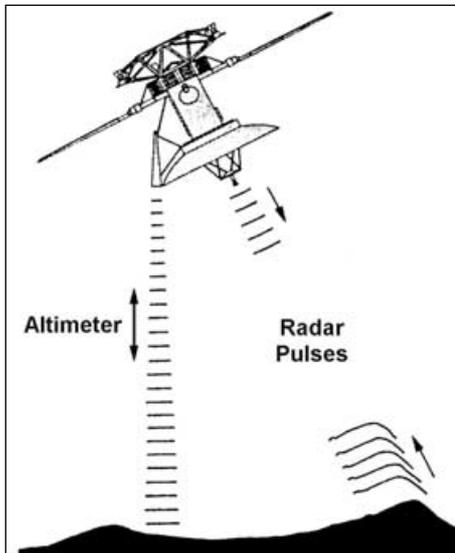


Figure 1 – To create a Synthetic Aperture Radar image, the altimeter determines the altitude above the ground and a microwave train is beamed towards and reflected by the Earth's surface.

### Cosmos

There were four *Cosmos* satellites with a SAR downlink (1500, 1602, 1766 and 1869), which were launched between 1983 and 1987. On the last one, *Cosmos* 1869, a 12 metre long antenna failed to deploy making its SAR unusable. The most interesting satellite was *Cosmos-1500*, from which I was able to acquire a series of

VIS and SAR images taken over Antarctica in 1986. The most legible of the series is shown in figure 2, showing a part of Victoria Land between 160° and 170° east of Greenwich, and from Cape North (71°S) to about 77°S. The SAR sensor emphasises the mountain range running south with peaks up to about 3000 metres high. This range rises abruptly from the sea or from the Ross Shelf Ice.

It is the chain of mountains sighted by the expedition of Capt. J. Clark Ross on

January 10, 1841 and formally claimed for Queen Victoria.

As *Cosmos-1500* could store 6.5 minutes of image and transmit it later when flying over eastern Europe, I received the swath of figure 2 twelve hours after it was taken.

### Okean

The *Cosmos* on the 137 MHz band were part of a system named *Resurs*

*continued on page 11 ...*

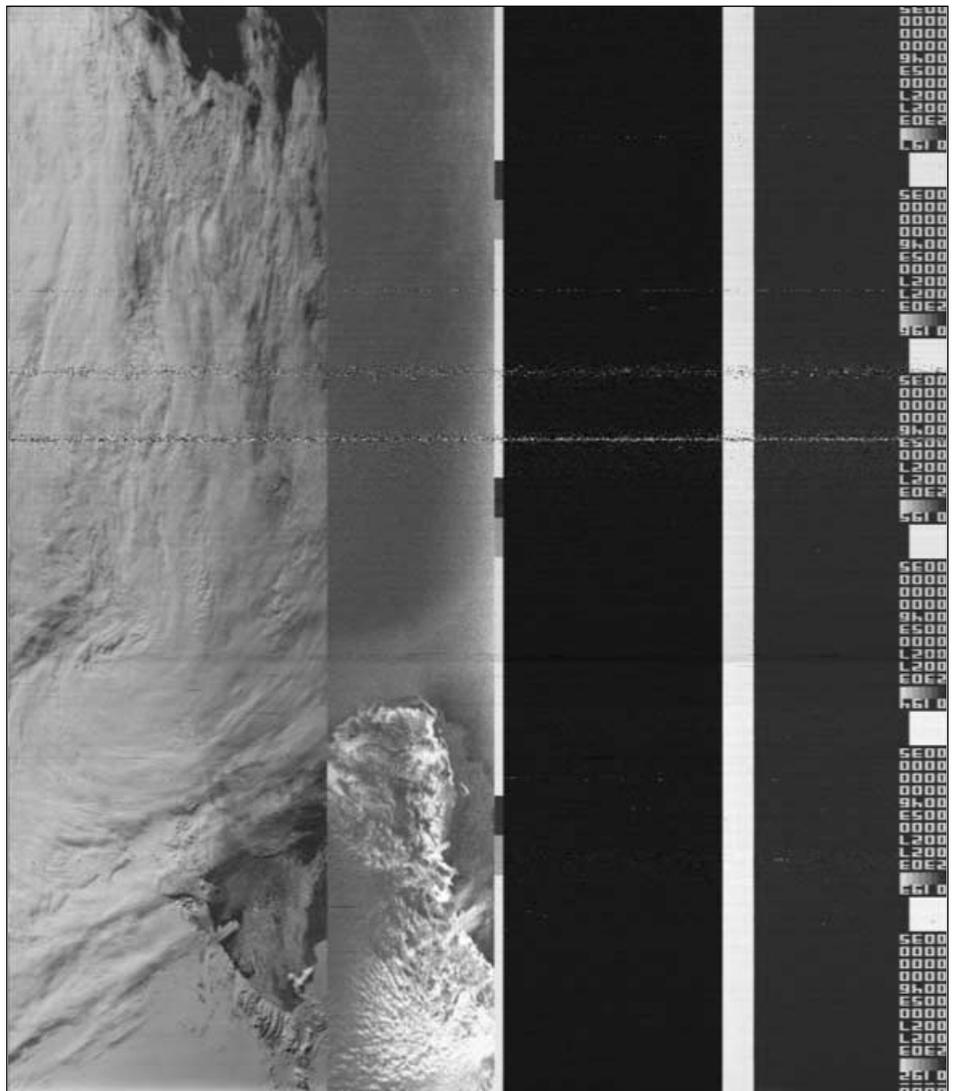


Figure 2 – A *Cosmos-1500* VIS and SAR swath received on March 27, 1986 between 12:10 and 12:16 GMT, about 12 hours after it was taken over Antarctica. The minute count (inverted) says that at 00:12 GMT, *Cosmos-1500* was over latitude -76° and longitude 176°E, and at 00:18 GMT it was over latitude -56° and longitude 196°E. The SAR image (right) shows Victoria Land from Cape North to about -76° with its mountain range rising from the sea. Also the VIS image (left) shows the mountainous coastline of Victoria Land and the Ross Sea.

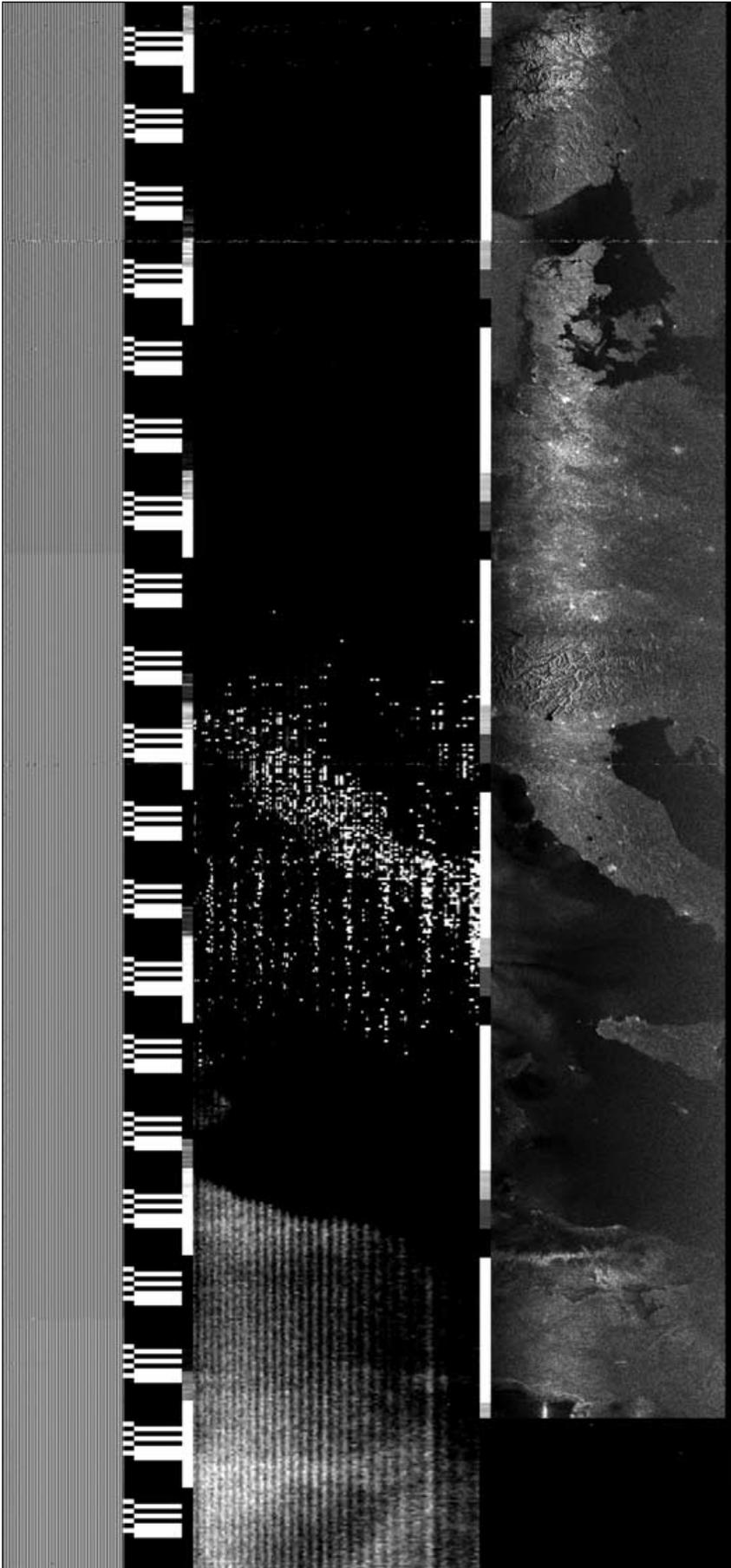


Figure 3 – An Okean-2 descending pass from September 8, 1990 at 13:14 – 13:25 GMT. The 8 mm microwave sounder image is on the left and the 32 mm SAR image on the right. The pass goes from the Norwegian mountains to the Libyan Sahara. As rough surfaces produce a high degree of backscatter, a great number of cities and towns can be identified. Note that the Sahara terrain gives highly varied reflections.

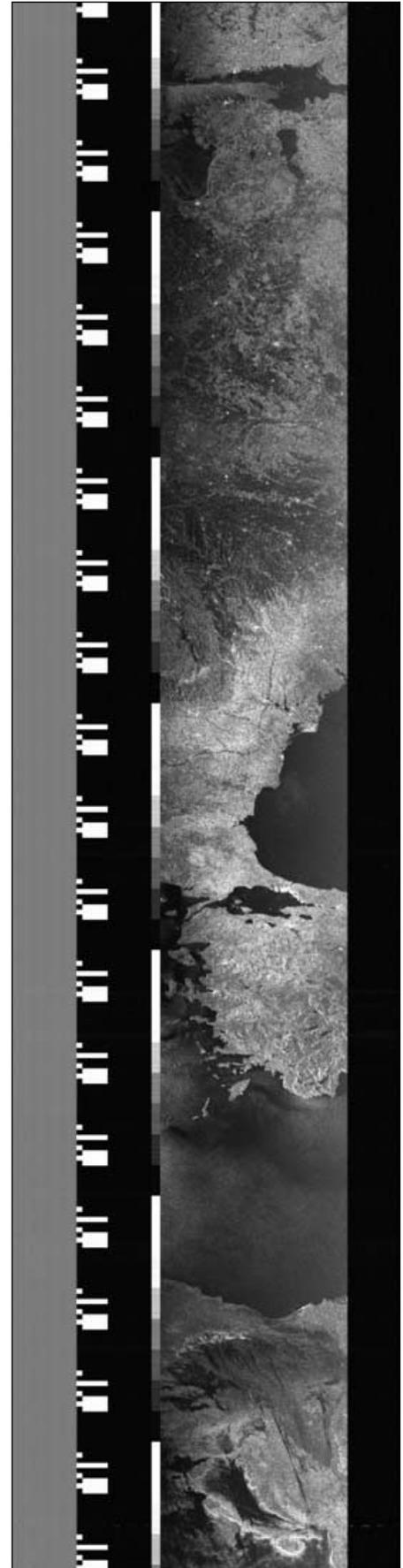


Figure 4 – A SAR swath from Sich 1 transmitted on March 30, 1996 between 15:38–15:48 GMT, descending from southern Finland to western Egypt. This was a single image when Sich-1 sent direct readout data. As usual, the rugged terrain stands out in great relief. The Sahara desert shows threadlike structures which are difficult to interpret.

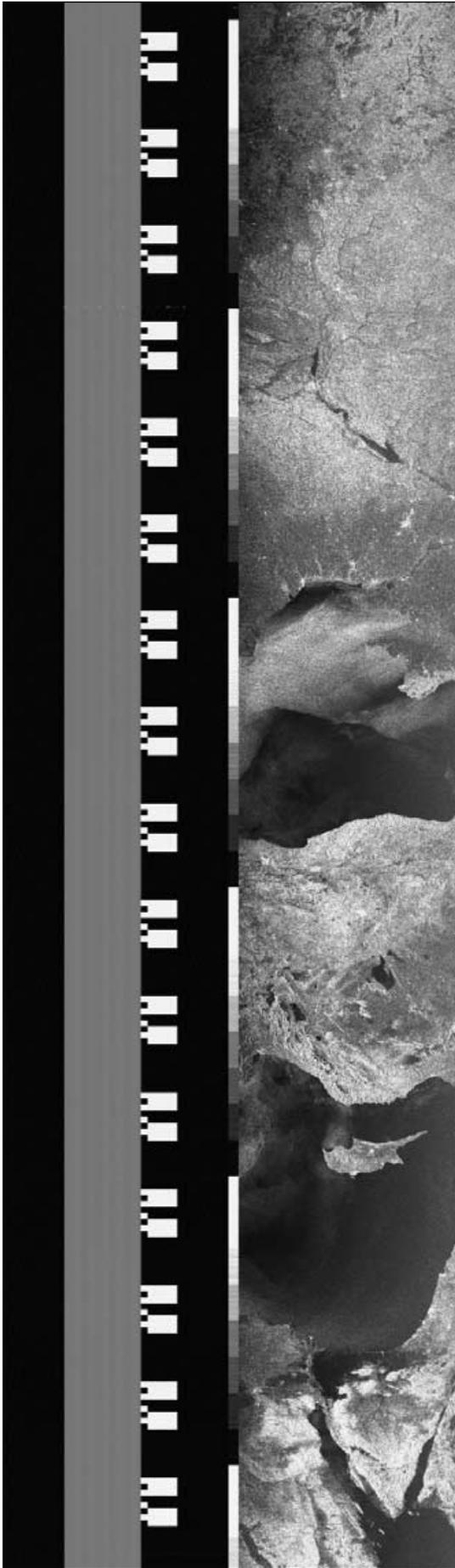


Figure 5 – A SAR descending pass from Sich-1 transmitted on April 4, 1996 between 14:19–14:27 GMT. It shows part of Russia, the Black Sea, Turkey, Cyprus and the Sinai peninsula.

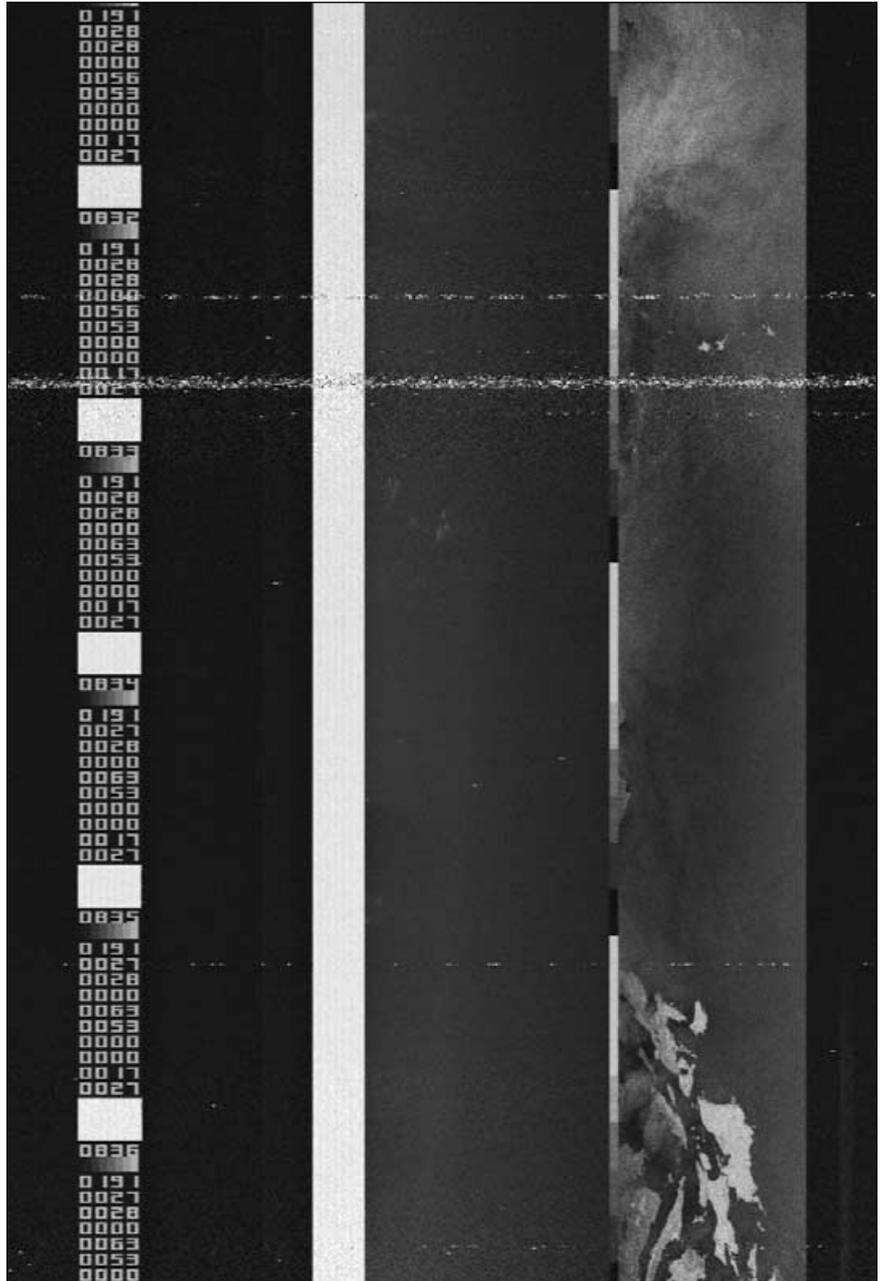


Figure 6 – This Sich-1 image was received in Europe on March 19, 1996 between 15:36 and 15:42 GMT. The first edge number in one of the blocks says that it was taken 836 minutes after Moscow midnight, i.e. at 13:56 MST = 10:56 GMT = 18:56 in the Philippines. In fact the SAR picture shows several islands of the Philippine archipelago: the southern end of Luzon, Samar, Leyte, Cebu, and Bohol.

(Resources), or informally *Okean-O*, where the letter 'O' meant 'optic'. The four Okean satellites launched from 1988 to 1994 continued the *Okean-O* programme.

Besides APT, they carried a 32 mm SAR and an 8 mm microwave sounding unit. In figure 3, the SAR image (right) stretches from North Cape (Norway) to Africa and gives prominence to mountains and cities, as rough surfaces produce a high degree of backscatter. Okean-4, the last of the series, launched in 1994, was built in Ukraine.

**Sich**

In 1995 the Ukrainian Space Agency launched a spacecraft named *Sich* which was said to be another name for *Okean*, but the SAR sensor of *Sich-1* produced images of a different kind. When it transmitted real time data, there was a single picture on the line; on the other hand, when it transmitted stored data (figure 6) the SAR image was similar to that of *Cosmos-1500*: narrow and with a numerical code.

Monitoring the Russian spacecraft was sometimes frustrating because they were seldom active, but now and then beautiful images rewarded the hours spent in front of a dumb receiver.

# HRPT FOR BEGINNERS

Rob Denton LZ/G4YRZ

Since the loss of direct WEFAX reception from Meteosat, things have never been the same for me with this hobby. Although we now have exceptional images from *EUMETCast*, it takes away that satisfaction of direct reception. Whereas I used to really enjoy the hobby, having it on a plate now with *EUMETCast* seems to take away the pleasure I once enjoyed. Don't get me wrong! I'm grateful for what we have with *EUMETCast* and excellent image quality and resolution such as we'd never seen before, but being a radio ham with a curious mind, I prefer the satisfaction of direct reception. As of lately, I seem to have reverted more to APT but, here in Bulgaria, the location is not ideal: there's much interference from pagers and especially overhead power lines, a far cry from my location in the central part of the UK which had trouble free reception.

After much thought, and searching for alternatives to relayed images, I came up with the idea that maybe HRPT was the way to go. And so it was. In this and future articles you will follow my adventures in setting up an HRPT station and receiving images: not just the good points, but the downfalls too, exactly as it is in this real world.

What is HRPT? Well, HRPT stands for High Resolution Picture Transmission. The more familiar APT is a derivative of HRPT but, whereas APT provides 4 km resolution (figure 1), HRPT has a whopping 1.1 km resolution (figure 2). HRPT is received from the same polar orbiting satellites that bring you your APT images, NOAAs 17,18 and 19.

## Equipment

What equipment is needed to receive HRPT? We are looking at a dedicated HRPT receiver. A normal APT receiver will **not** work as the HRPT signal uses a wider bandwidth, so you must have a dedicated receiver. Then you need a decoder, amplifier, downconverter, dish and feed, rotator and controller. It all sounds rather complicated but, taken one step at a time, it's not so difficult as it seems.

## Receivers

The main choice of receivers I liked were available from *Nuova Elettronica*, *Quorum*, and *Dartcom*. There are other suppliers of HRPT Receivers but I favoured these because I had a bad deal with after-sales on one leading brand which only seemed interested in selling me a new system rather than supporting me with my existing one—and who make false claims on their website that no other commercial HRPT receiver is available. The receiver I chose was from *Nuova Elettronica* in Italy, which currently sells at 220 Euro on their website at time of writing this article. The model number is *LX1495* (figure 3). This receiver was once available in kit form but now, at this price, it is only available ready built. I bought my receiver second-hand from another GEO member up in Scotland.

## Decoders

There are several HRPT decoders on the market but I chose the Rob Alblas design (figure 4). This unit can be built as a separate module or included inside the HRPT receiver.

I chose Rob's decoder because it looks like it meets all my requirements and it's simple to build. Yes! I said build. If you want to do this on a shoestring then it involves home construction, although such items can also be bought ready-made. Having a tight budget, I decided I would

construct what I could and save money rather than buying ready-made. It is really not as difficult as you may think. I was a little daunted at first but, step by step, it can be done. I'm not going to go through all the details of this board as it's already available on the internet at the website of Rob Alblas

[http://www.alblas.demon.nl/wsat/hardware/hardware\\_frm.html](http://www.alblas.demon.nl/wsat/hardware/hardware_frm.html)

<http://www.alblas.demon.nl/wsat/hardware/files/hrptpdf.zip>

Rob is a member of *Werkgroep Kunstmanen* (the Dutch equivalent of GEO) who support GEO tremendously. I'm truly grateful for their participation. You may have met some of GEO's Dutch members at an annual GEO Symposium, often held in Leicester. This decoder was the first item I built towards my step of owning and using an HRPT station. The PCB (printed circuit board) was a gift to me from the retailer in USA (Far Circuits)

<http://www.farcircuits.net>

to set me off in my venture. The board normally costs 25 US dollars. The *Xilinx* chips and EPROM plus postage were generously donated from Rob Alblas.

<http://www.alblas.demon.nl/wsat/index.html>

The other components were ordered for me by my friend Tony from *JRW Electronics* in the UK—from *Farnell Electronics*—and some items came from his own stock. The total cost of purchased components was around £5. I might add it would have cost me much more (maybe over £100) were it not for the generosity of my friends.

## Assembling the Rob Alblas Decoder Board

Before you make the same mistake as I did, stop and think before you start assembly. I didn't have any assembly instructions and hastily soldered on the IC holders first, later realising that some wire links had to be soldered underneath them! First lesson learned! This resulted in me having to put PVC coated link wires under the board to get round this problem. So let's start correctly.

First, make sure all the drilled holes in your PCB are unblocked; failure to do this can easily damage a component by bending the pins or breaking them off, rendering it useless. Once the board has been inspected, double check everything; also, if possible, label every part so there are no errors. Now you are ready for soldering. Be sure to ground yourself first by touching earth somewhere or using special earth straps to prevent static build-up. I would recommend starting with all the link wires first, then the pins. This will get you used to soldering before you start with the heat sensitive components.

I would like to add that, if anyone does not feel confident at soldering the components to the board, I will be happy to do it for them for the cost of the return postage. Despite my shaky hands and failing vision, there's life in the old dinosaur yet. However, if you are prepared to wait, I may soon be back in the UK.

Whilst I was assembling the PCB I had an image of the board and components on my computer monitor, so I could see where all the components went. Also, I had the second ready assembled PCB by my side for comparison. Believe me, it was a great feeling of satisfaction when I had soldered the last component in place. What always seems

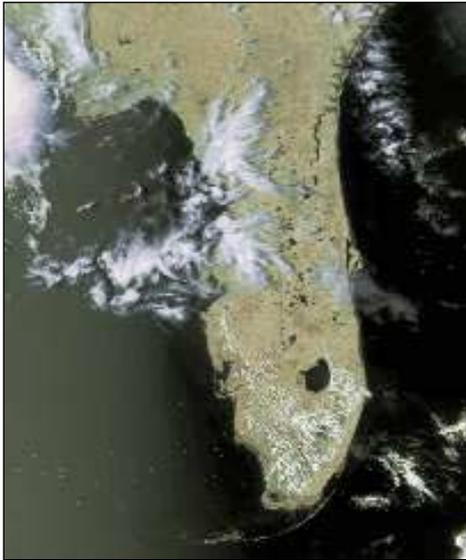


Figure 1 - A APT image (4 km/pixel)

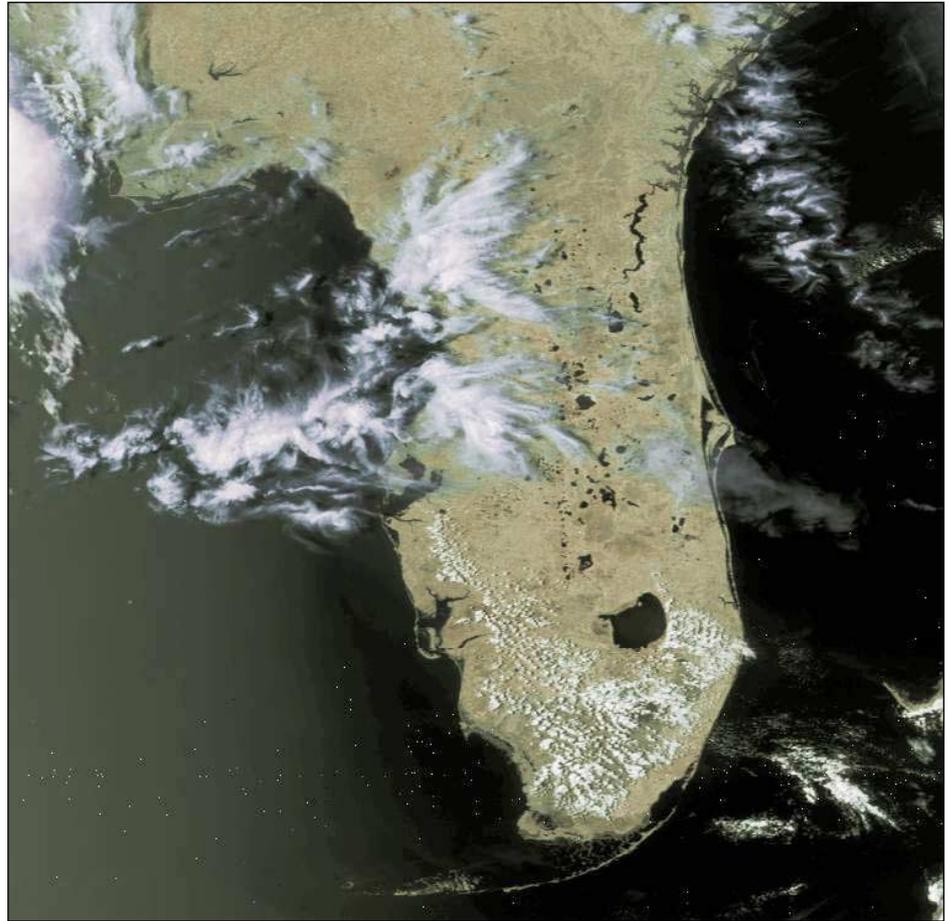


Figure 2 - An HRPT Image (1.1 km/pixel)

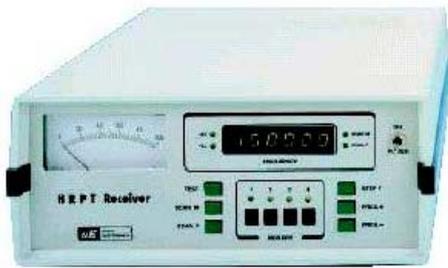


Figure 3 - The Nuova LX1495 Receiver

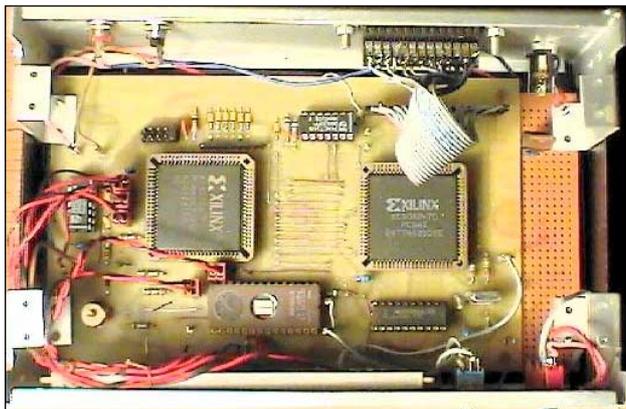


Figure 4 - The Alblas Decoder  
photo: Rob Alblas

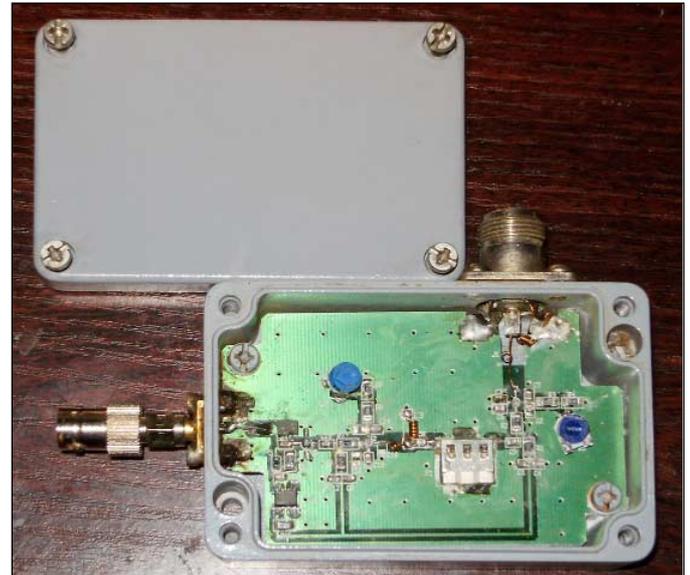


Figure 5 - The 1.7 GHz Amplifier



Figure 6 - A WEFAX Downconverter



Figure 7 - The Downconverter and 1.7 GHz Amplifier

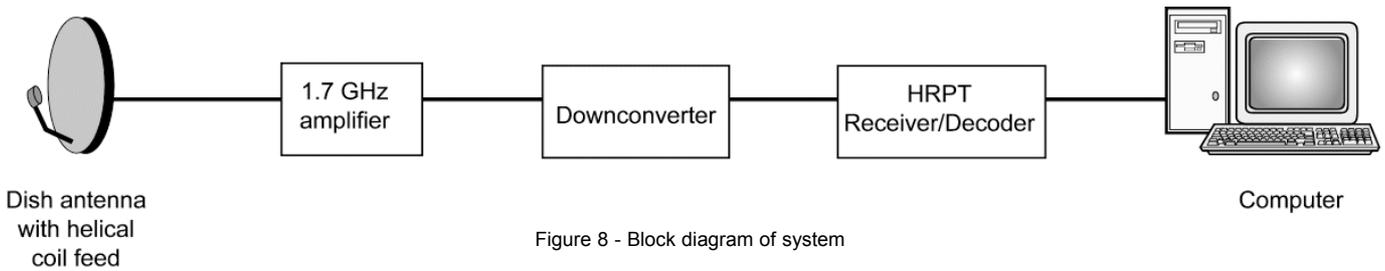


Figure 8 - Block diagram of system

overwhelming at first can be quite simple. I remember the words of one friend when I was sharing a truck journey with him on my way to Bosnia on an aid mission and we were discussing overcoming adversities.

He said: 'How do you eat an elephant?'

'I don't know?', I replied, to which he answered 'One piece at a time'.

I can't begin to tell you how many times these words of advice have helped me in my life when overcome with problems.

### The 1.7GHz Amplifier

My amplifier was a commercial ready-built *Pseudomorphic High Electron Mobility Transistor* (P-Hemt for short) purchased second-hand from a fellow GEO member for the bargain price of £25 (figures 5 and 7). I also received one similar amp designed by Sam Elsdon thrown in for free when I purchased the HRPT receiver: very handy if one amp goes down due to lightning strikes, which are quite common here in Bulgaria. The amplifier is placed directly behind the helical feed in the centre of the satellite dish for maximum signal gain. The P-Hemt field effect transistor tends to give higher gain than the normal FET's due to the way it's made, but for the moment let's keep things simple.

### Downconverter

Remember the days of WEFAX? Remember that old downconverter you had that became obsolete? (figures 6 and 7). Well, it's not any more. You can give it a new lease of life as part of your HRPT system. Used in conjunction with the *NE* receiver it can cover **all** the HRPT frequencies! That's going to save you a lot of money. How can it do the job I hear you ask? Well, let me explain. The downconverter is broadband so it will cover from 1690-1710 MHz and the *NE* receiver covers from 135-155 MHz and that's how it's done! All the frequencies you'll ever need.

The receive frequency on the *Nuova Elettronica* receiver is always 1557 MHz lower than the satellite's HRPT frequency.

For example, an HRPT satellite frequency of 1691.0 MHz downconverts to 134.0 MHz on the *Nuova Receiver*.

1694.5 MHz converts to 137.5 MHz

1698.0 MHz converts to 141.0 MHz

1707.0 MHz converts to 150.0 MHz and so on.

This took a bit of thought and an email to Gerald before I finally grasped it.

### Dish Antenna

The most common and suitable antenna for HRPT seems to be a prime focus dish. You don't want anything too heavy for fear of overloading the rotator but yet you need something large enough to capture the signal. I decided to try and find something midway and settled on a 1.5 metre prime focus dish made from aluminium to reduce the weight and stop rust, although offset dishes have been used for such purposes, see

<http://members.inode.at/576265/index.html>

which is the homepage of Gerald Ihninger and which I find very informative (well done Gerald) I know there are many

mesh dishes about but I read that they are not as efficient as solid ones. I can't confirm this as I haven't done any tests. Maybe that's a chance for some GEO member to study and write about the results to enlighten us all.

### Dish Feed

The dish feed of course must match the HRPT receiving frequency of around 1.7 GHz. The signal is circularly polarised so we need an antenna to receive such signals, which usually involves a helical feed. This again can be home made. Gerald Ihninger's website includes antenna feed specifications. I am not yet experienced enough in this subject but by reading this article along with the web pages of Rob Alblas and Gerald Ihninger you will have a pretty good idea of what is involved. I myself can only relate my own experiences.

### Rotator/Controller

Believe it or not, this is the most expensive part of the set-up—if purchased new anyway. You can of course build your own and save money but I felt this was a bit out of my league. It seems to me that the most common antenna controller/rotator is the *Yaesu 5500* which retails about £450-£500 although I have had no experience whatsoever in using one. At the moment my antenna is still turned by hand! Remember, you need an *Az/El* rotator to keep the antenna pointing at the satellite, moving the dish both left/right and up/down in order to track the moving polar satellite.

There is a way round this expensive problem. I was recently in communication with Ed Murashie from the USA and he has found a perfect solution at a lot less cost. Instead of using the ham radio rotator, why not use a CCTV one? And so it was. I decided to follow Ed's advice and settle on the *Pelco* brand, which is very much cheaper (starting around £100 second-hand) and also much quieter. Ed wrote an article on this in the June 2009 issue of *GEO Quarterly*.

I'm still in the process of setting up my HRPT station but, due to ill health, and rather than wait until all this information is out of date, I thought I would send it in now. It's not nearly as informative as I wanted it to be but I hope to follow up this article with the results of my final installation once I obtain all the equipment; so watch out for this in a future edition of *GEO Quarterly*.

To sum up: if you were to ask me the way to go, I would definitely recommend asking in the GEO group for second-hand equipment. And don't be afraid of having a go at making some of it yourself: there are always people around willing to help. Of course, if you have the money, there are new commercial systems available but at a cost. I'm afraid that path is out for me!

Thanks to Rob Alblas for the donation of IC's and postage, and his help, inspiration, expertise which got me started in this; to Far Circuits USA for the donated PCB board; Tim Holdsworth for the amplifier; Brian Sheriff for the HRPT receiver, down-converter, and donated amplifier with decoder board; JRW Electronics UK for supplying the components via Farnell Electronics UK and anyone else I forgot. Thanks to David Taylor for supplying figures 1 and 2.

# DWDSAT and GRIB Viewer Automation

Fred van den Bosch

Robert Moore came up with the question of whether it was possible to automatically convert the grb-files that collect in the DWDSAT folder [1] into images. This seemed to me to be a nice challenge so I set about doing some testing. Eventually it proved to be not all that difficult.

On initially reading in a file with GribViewer [2] it is evident that each file consists in fact of 13 different images. An example is illustrated on the inside front cover of this issue. Each of these is shown in a separate tab. I will explain how you can build a command line so that making and storing all images can be started up as a batch. All lines are made with *Notepad*. The eventual file is saved as a text-file and stored with the extension '.bat'. See [2] for an example.

The syntax of a line for processing a file with GribViewer looks like this [3]:

Program Param-1 Param-2 Param-3 Param-4 Param-5

## Program

This is the complete path, including the file name, of the program 'GribViewer.exe'. This must be placed between quotes if the path contain space characters. The line can include up to five parameters.

## Param-1

This is the name of the file to be processed. Wild-card characters such as '\*' may be used. But **please note** that you must be careful to ensure that the part of the filename between the '\*' characters is unique. Otherwise, only the first file that contains these characters will be opened! In a particular example, '000' gave me the wrong file and I had to change it to '\_000\_'.

## Param-2

This must be - SAVE<folder> or - SAVE<filename>. Here you can make use of %YY, %MM etc. to include the year, month etc. in the filename. This last one is particularly significantly if using my *POVIM Presentation Manager* [4] as it provides an automatic link. See all other options in the GribViewer guide. It is recommended for this application to save images from each tab in a separate folder. This way, simple animations can be made.

## Param-3, -4 and -5

For these parameters there is a choice from the following options:

-MIN	Starts the program minimised
-ZOOM or -NOZOOM	Determines whether the program starts zoomed in or not
-BOUND(none   dark   light>	Produces borderless images or images with dark/light borders
-Select: 0,2,3	Make images from the tabs 0, 2 and 3. The first tab is 0. If all tabs must be processed, this parameter is omitted.

At least 3 parameters must be present. If fewer are actually needed for a certain application, dummy parameters 'xx' should be substituted.

Finally, the file can be written as a single line, as illustrated below.

```
"C:\Program Files\David J Taylor\GribViewer\Gribviewer.exe"
Y:\DATA\DWDSAT\*_000_*.tar
-Save:C:\temp\ %YY%%MM%%DD%%HH00-.jpg
-MIN -SELECT:0 -BOUND:LIGHT
```

**Note:** this is one continuous line with a space character between each of the separate parts. This line reads all the files by filling the appropriate times into '\*\_000\_\*'. For hour = +6 the program changes the expression to '\*\_006\_\*' etc.

It goes without saying that each file name is dependent on your folder structure. Save the batch file under a significant name.

The batch file can be run automatically by incorporating it in the System Scheduler [2]. Because data is received for 00:00 and 12:00 each day, the batch file must be started up twice daily. I myself do that at 06:00 and 18:00 hour. The files are then pretty well always completely received.

In this article I have treated only those parameters, which were necessary. The GribViewer guide describes still more parameters and how to use them [3].

## References

- 1 DWDSAT, GEO Quarterly No 20, December 2008, page 6
- 2 System Scheduler, GEO Quarterly No 22, June 2009, page 8
- 3 GribViewer, David Taylor, www.satsignal.eu
- 4 POVIM PM, GEO Quarterly No 21, April 2009, page 19



## News in Brief



### NOAA Frequency Change

On 23 June 2009, the APT transmission frequencies of the NOAA-18 and NOAA-19 satellites were switched. NOAA-19's operational frequency is now 137.1 MHz while that of NOAA-18 is now 137.9125 MHz. If you missed the announcement on GEO-Subscribers and have been wondering what's happened, now you know.

### LARS

Since the publication of GEO Quarterly 22, the Leicester Amateur Radio Rally (LARS) has been relocated from Donington to Loughborough University. This has necessitated a change in dates; the rally now takes place on Saturday and Sunday run from September 12-13.

### The Aral Sea - Latest News

The December 2007 issue of *GEO Quarterly* carried a MODIS image of the Aral Sea on its front cover, showing clearly how it had separated into two regions, the *North Aral* and the *South Aral*.

In the intervening two years, the North Aral Sea has maintained its area, thanks to water conservation measures on the Syr Darya river and the Kokaral dam across its southern outflow. The South Aral, however, has continued to dwindle and split into distinct western and eastern seas.

At the present time, the eastern Aral basin has all but dried up, as the MODIS image on our inside back cover, acquired on July 20 this, year starkly reveals.

### Reference

Aral Sea - GEO Quarterly No 16, December 2007 - page25

# Photographing Space Shuttle and ISS Trails

*Francis Breame - email: vf0123@btinternet.com*

Although viewing passes of the International Space Station, as well as the Space Shuttle, is routine these days, I've recently achieved a long-standing ambition and caught a Space Shuttle pass immediately after launch. I realise that many people have done this before, but orbit, timing and especially weather have always conspired against me in the past. The particular feature of this view is of course that the external tank has not yet re-entered the atmosphere and can be seen trailing the orbiter. Being located in Hampshire puts me just about at the northern extremity of the orbit—I don't know how successful things would be further north.

This opportunity occurred during the STS127 flight to the ISS, which had already been postponed twice due to weather in Florida. Funnily enough, if it hadn't been postponed, the launch would have been about an hour later, thus making it invisible in England due to the sun being lower. The tank was noticeably reddish and slowly



The track of the space shuttle over Hampshire at 23:21 BST, 18 minutes following its launch on July 15.



The track of STS119 about two hours prior to docking with the ISS, at 19:10 GMT on March 17, 2009.

faded out and in due to its tumble, unlike the orbiter itself which was the usual star-like object.

The upper photograph, which I took from northeast Hampshire, was taken on July 15 using a Canon 400D camera with an 18 mm wide-angle lens, the exposure being about 20 seconds at f4 and ISO 1600. This was about 18 minutes after launch. The pass wasn't very long as it was some time after sunset and probably reached about 25 degrees elevation before going into eclipse.



Photography of these passes is very easy providing you have a camera which can be set to manual ('bulb' or B) exposure, manual focus, and will take or can be zoomed to a wide-angle lens. It will of course need to be tripod mounted. A remote shutter release is also really needed to avoid disturbing the exposure.

So how to go about it? (These notes equally apply to ISS passes, or indeed to any other reasonably bright satellites, e.g. Iridium flares).

Set the lens to maximum aperture and focus on infinity (remembering to set it to manual focus). Set the camera to its maximum speed rating—ISO 1600 in my case. Using a wide-angle lens means that that the camera doesn't have to be pointed too accurately. Using the viewfinder isn't really possible—just point roughly in the expected direction and elevation for the start of the pass (using predictions from *Heavens Above* or whatever site you prefer). As soon as you see the object by eye, hold the shutter open. If it is a long pass, take a guess at when it will move out of the lens view and quickly realign the camera for another shot. This sounds very inaccurate but in fact works remarkably well because of the wide-angle setting.

A light sky can be an issue if the pass is too soon after sunset. Even if the sky looks quite dark it will soon saturate the picture at these long, fast exposures. The best timing is probably between 1 hour (a dark enough sky) and 2 hours (the pass becomes too short because the shuttle eclipses) after sunset, but earlier passes can be photographed as long as you keep the exposure to less than 30 seconds or so (the speed setting can't be reduced, otherwise the shuttle won't be captured). Even then the contrast will be low, so some image manipulation may be needed afterwards to improve things. To assess the maximum exposure possible, just take some test pictures before the shuttle arrives to see how long an exposure you can make before the sky becomes too bright (one of the great advantages of digital photography).

An example of this is found in the lower photo, taken on March 17, using the same setup, again a 20 second exposure. The sky and house didn't look anywhere near this bright! It shows STS119 when shuttle was about two hours from docking with the ISS. The objects are moving from right to left: the brighter one is the ISS, followed closely by the the shuttle, just below it. Again, far from unique, but I was pleased to capture it!

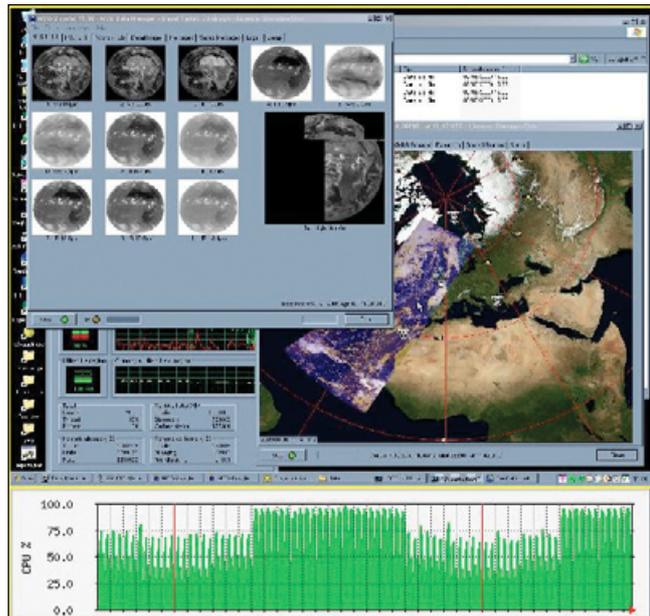
## Remote Management of EUMETCast PCs

by means of email messages

Giuseppe Cico

I have two EUMETCast receiving systems running unattended for most of the day while I am at work or away for holidays. One issue I have now solved is how to manage them remotely. Both systems have VNC installed, and one is connected to the web just for software updates. But because of a security policy, VNC is not enabled from outside, nor permitted from inside my company's network; so I studied another solution.

I cannot act directly using VNC, as I explained, so I had an idea: to write an email with instructions about 'what to do'. Crude but effective. Briefly, the PC has Outlook running and looking at a dedicated email address. I have a personal domain, so have no problem setting one up. Anyway any free account could be useful. Rules are set in Outlook <Tools → Message rules ... → Mail> to manage only some particular emails, controlling



I have MRTG running, so I created a protected page on my website showing certain parameters (CPU load, memory usage, and some EUMETCast related data). Some of the graphics are similar to those shown on David Taylor's 'EUMETCast Europe' page.

One additional item is this screenshot, uploaded every 15 minutes with MRTG data, so I can take a look at 'what's happening there'. This task is done with IrfanView ([www.irfanview.com](http://www.irfanview.com)), used in a scheduled batch file containing a command like

```
<irfanview path>|_view32.exe
/capture=0 /convert=<screenshot
path>|eumetcast1_screen.jpg
```

This image is uploaded with MRTG graphics in the same way as I described in GEO Q16 about my 'Auto-FTP: Upload Images...'. Now I have a remote view on the system—but what happens if I see any misbehaviour?

sender, syntax etc for security and deleting anything useless; for example something like

### Rule 1

if sender is ME and object is BATCH-1 then execute

```
<path>BATCH-1.bat
```

then delete the email

### Rule 2

if sender is ME and object is BATCH-2 then execute

```
<path>BATCH-2.bat
```

then delete email

### Rule 3

delete email

For example, I have a batch file set to kill hung ftp sessions

```
taskkill /im FTPVoyager.exe /f
```

and another one to do a remote reboot (for fatal errors)

```
SHUTDOWN -r -f -t 5
```

and of course, you can set up others.

# Mobile APT

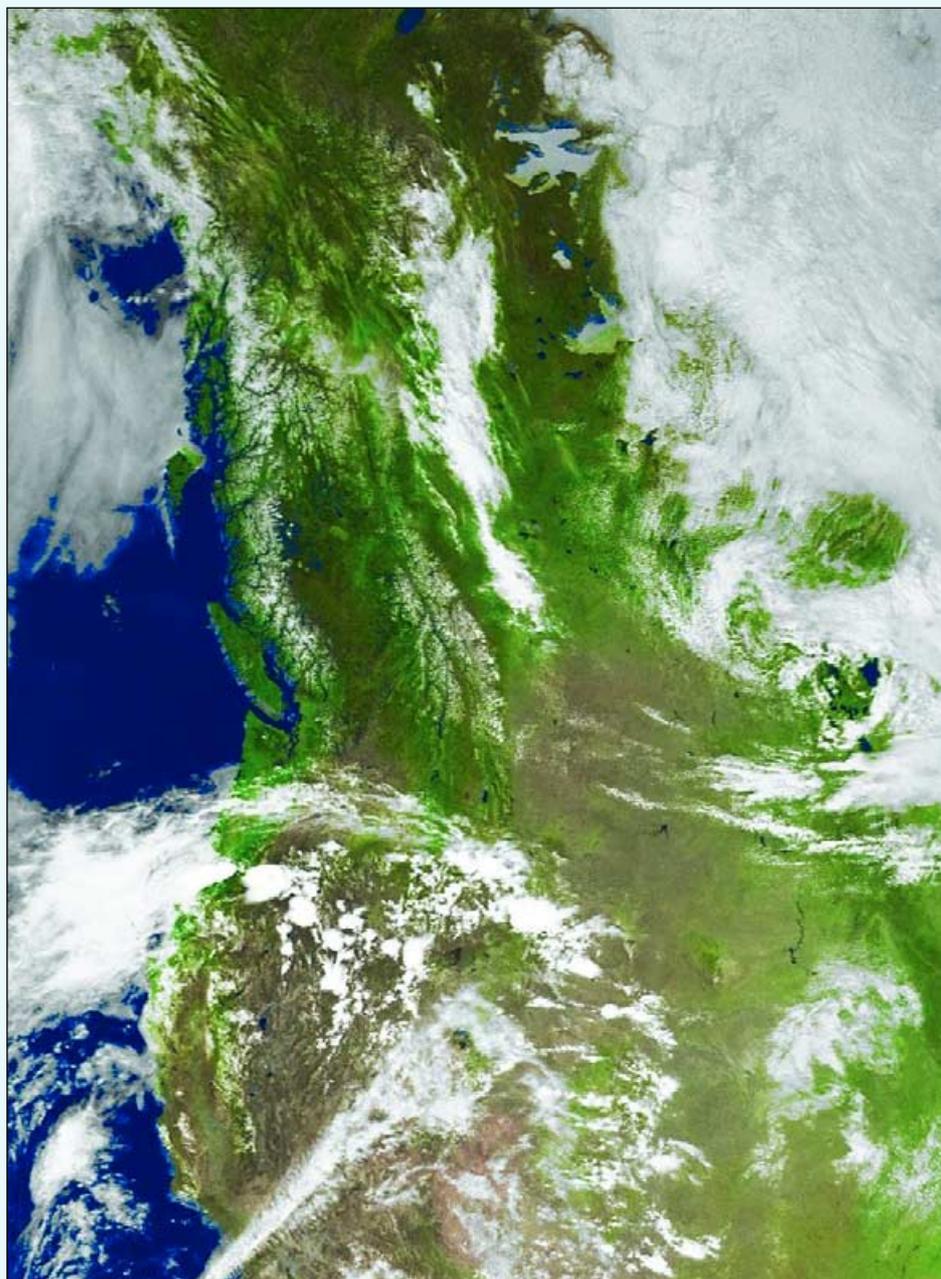
or "Why can't you take normal holiday photos like anyone else?"

*Terry Mullen*

I first became involved with weather satellite imaging more than twenty years ago at the school where I worked as a physics teacher. This was when NOAA 11 was newly launched and long before the days of the Internet, when a mouse was only a small rodent and a website somewhere you might find spiders! Finding out what I needed to know was tough going but with practical and financial help from a local company we eventually set up a very worthwhile ground station. We used a steerable antenna for NOAA APT, to help avoid problems with interfering signals from a nearby mast, and also had animated Meteosat images on permanent display in the school science corridor. This became known as the 'weather telly' and was particularly of interest towards the weekend for some amateur forecasting. The physics courses, especially at A-level, were greatly enhanced by access to up-to-date images, with some captured 'live' during a lesson.

After retiring a year ago, I became interested in revisiting satellite imaging and wanted to be able to collect images while away from home. My wife and I had plans to travel around Europe as well as the UK using our caravan, and to spend time in North America and New Zealand. I settled on a home-made QFH antenna of Chris van Lint's design <sup>[1]</sup>, an R2ZX receiver and a *Samsung NC10* netbook computer as the basic system. I had to add an external soundcard since the audio output would not give satisfactory results straight into the microphone input, although this approach had worked perfectly well for a *Toshiba* laptop. The only additions to the QFH design were to add some insulating tape to the cable loops so that they were not chafed when they were pushed into the support arm notches, and to extend the vertical pole with push-fit connectors which allow the use of extra lengths of plastic pipe. The software I used was *WXtoImg*.

This was all tested in the back garden and then packed to go to Canada at the beginning of June in a cloth bag made by my long-suffering wife. I had been enjoying views of western Europe but couldn't wait to see North America instead. I took the documentation for the receiver and the article describing

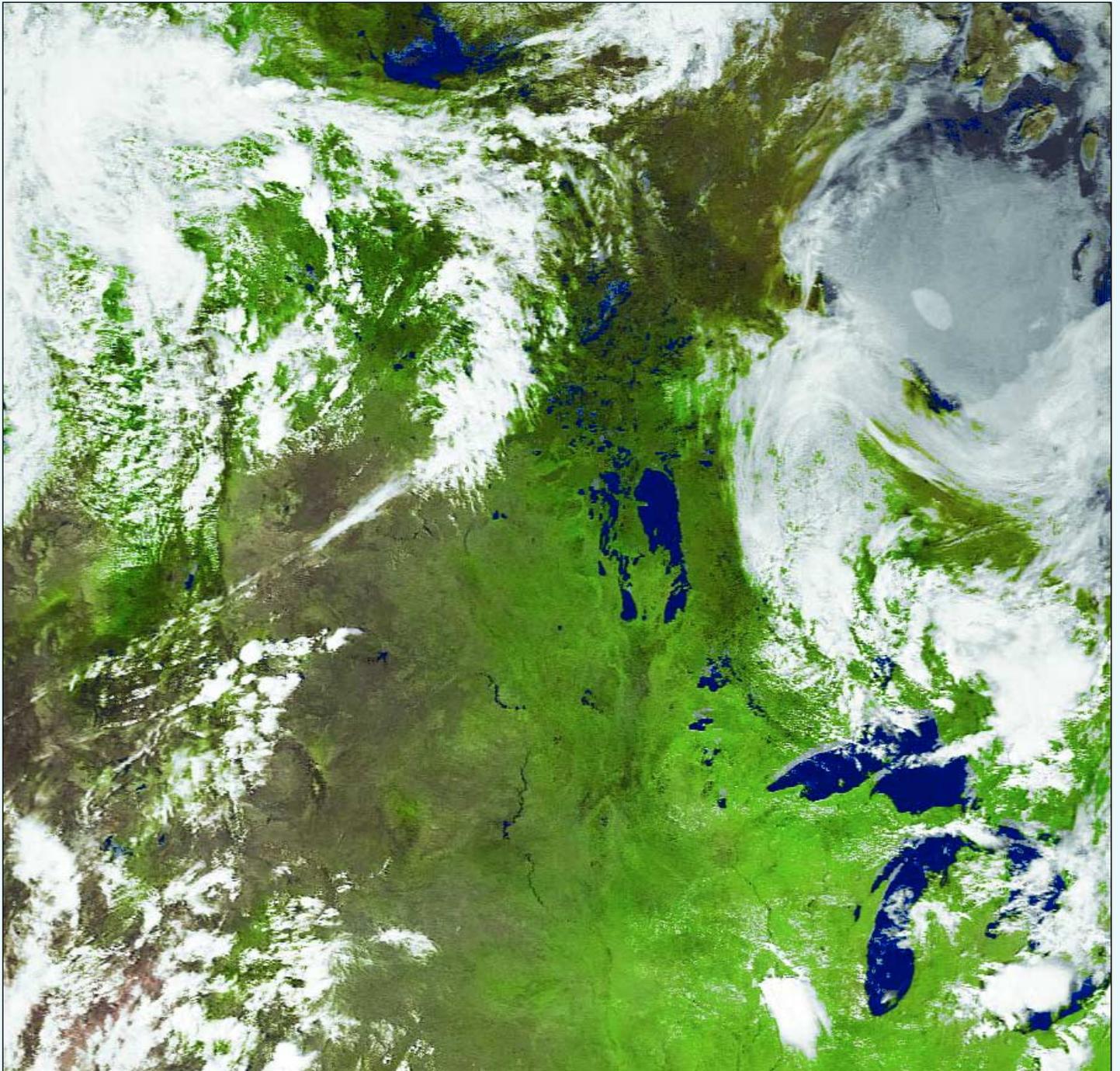


June 4: NOAA 18 from Banff, Alberta, my first effort!

the QFH in case there were awkward questions at international borders, but this did not prove to be a problem. We flew to Calgary and collected a rented motorhome to tour the Rockies. I downloaded my first image (above) from Banff in Alberta, on a hot afternoon, and was soon looking at a superb view, reasonably cloud-free, of British Columbia and Alberta with the snow-covered Coast Ranges and Rockies

clearly visible. The scan extended from the Mexican border to Alaska and showed frozen lakes in the North West Territories. We were soon to appreciate the changeability of Alberta weather when, two days later, we awoke to snow!

This first image made the whole project worthwhile but there were many more to come. We travelled as far as Jasper



June 25: NOAA 19 from Banff, Alberta, showing the Great Lakes and a still-frozen Hudson Bay.



A camping chair props up the QFH at Bow Lake, Banff National Park



Local wildlife inspects the antenna at a camp site

and explored four national parks, spreading the trip over four weeks. We saw the most spectacular scenery we have ever encountered anywhere, enjoyed watching the wildlife—including bears—and went canoeing, horse-riding and walking. Whenever practical, we would stop in the early afternoon and I would set up the equipment and collect a pass or two, usually from NOAA 18 and NOAA 19, conveniently keeping me away from lunch preparations! I soon built up a set of images showing the continent from the west coast to the Great Lakes and Hudson Bay. I was interested to see that Hudson Bay was still

... continued on page 20

# Signal Plotter Plus

Fred Piering

Patrik Tast and Jerry Martes created a very helpful tool that was added into Patrik's free *APT Decoder* program. The operation of the new tool was covered last December in GEO Quarterly No 20. If you were fortunate enough to have an R2FX or any of the ICOM PCR series of receivers, you could automatically capture and plot the performance of any antenna that you had attached to the receiver.

For my station, I use a receiver that is of my own design and fabrication. I had talked to Patrik some time ago about providing an alternate method for those of us that do not have computer controlled radios including a Received Signal Strength Indicator (RSSI). We took a short try, but did not complete it. Recently there had been a flurry of inquiries about using the signal plotter with non computer-controlled receivers, either home built or commercial such as the R139.

Patrik once again took on the task and has provided a new and functional feature that I have also evaluated. For ingest of the RSSI, the program has a new receiver option: Custom. In addition, the program has been changed so that it will read data from a *DATAQ Instruments DI-194RS* 4-Channel Data Acquisition Module. This module is available at <http://www.dataq.com> for \$24.95 plus shipping. It is a four-channel unit and the price includes a serial cable, software and screwdriver as well as the module.

In order to use the signal plotter with a non computer-controlled receiver, the *DI-194RS* should be attached to the RSSI or signal level point in your receiver. The input impedance of the DATAQ is only 200k so care must be taken to not load down your RSSI measurement point. For my receiver, the RSSI signal is developed across a 51k resistor, so I used a LMC7111 Single Supply Operational Amplifier to buffer the signal. I had earlier characterised the RSSI volts per dB and wanted to maintain that accuracy. To use this feature, you can set up the program in accordance with the instructions in the December 2008 GEO article, except, you should chose the 'Custom' receiver (below)



Figure 1 - The 'Custom' recording screen

Once you have made this selection, click on the yellow dot to the right of 'Start Recording' to start recording. You will be asked if you want to record all passes in a small text box. After the pass or passes have been made, opening the signal plotter and selecting the file will provide operation as discussed in the GEO article.

I plotted passes using a home made double cross antenna (DCA) and a commercial turnstile. These were attached to the same mast and used the same coax and receiver (I just swapped out antennas). A comparison of the two antennas is shown in Figures 2 and 3. As you can see, the DCA antenna performs better at the lower elevations while the turnstile appears better overhead—but not as well at the lower elevations. The variability in the DCA is either due to my construction or the nearby interferences such as houses, trees, etc. In both cases, the antenna is approximately 8 meters above ground level at an elevation of 25 meters above sea level. There is no high ground in Florida.

I have found this a very interesting tool and plan on using it to evaluate antennas for Amateur Satellite reception also.

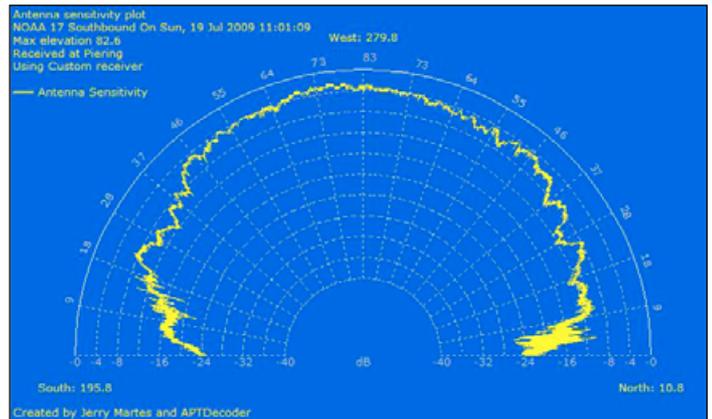


Figure 2 - Radiation plot for the commercial turnstile antenna

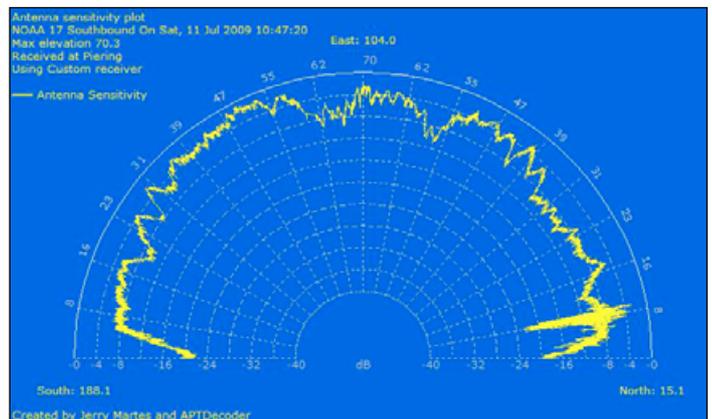


Figure 3 - Radiation plot for the home-built DCA

**Note**

You will need to update your *APTDecoder* software to version 2.0.5.88-alpha 9.

**Mobile APT**

(continued from page 19)

mainly frozen but, as June progressed, it was possible to see clear water appearing at the Bay's western edge. I could also see weather systems coming in off the Pacific, much like our familiar ones in the UK.

I only encountered minor difficulties, like a plug falling off a cable and *WXtoImg* changing its mind about a suitable signal level. My horizons were often limited by the height of surrounding mountains—the signal would be suddenly cut off as the satellite disappeared behind a wall of solid rock, but this was only to be expected. I would certainly encourage anyone who has considered taking equipment away from home to give it a try—it definitely adds to the interest of a trip and gives an extra dimension to the usual viewing of holiday photos.

I would be happy to hear any comments or questions and can be contacted at

[terrymullen@yahoo.com](mailto:terrymullen@yahoo.com)

Next trip is New Zealand, early 2010!

**Reference**

- 1 Portable/Collapsible Quadrifilar Helix Antenna  
Chris van Lint—GEOQ Launch issue

# Communications from the International Space Station

David Simmons

The *Three Counties Amateur Radio Club* (TCARC) is a small but active radio club which meets in Liphook. Liphook is close to the county boundaries of Surrey, Hampshire and West Sussex, hence its name. Several of the club members are also members of GEO. However, a longer established interest by club members is the support of local youth organisations, particularly the Brownies, Girl Guides and Scouts, by trying to bring to these groups first hand experience of radio communication and, more recently, Internet skills.

There are, by international agreement within the Scout, Guides and Brownie movement, two dates identified each year for direct international communication. One is called *Jamboree on the Air*, which traditionally takes place in October each year. During this event young people can speak to each other across the world by radio using amateur radio frequency allocations, supplemented in recent years by use of the Internet. There is a second rather similar day in February each year for Brownie and Guides called *Thinking Day*.

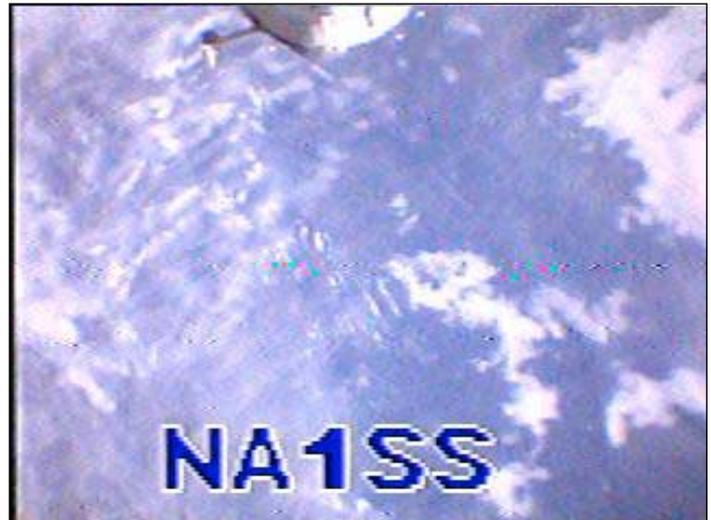
TCARC has supported these events with a Brownies group in Alton, Hampshire. Of course, the use of amateur radio frequencies means not only having available the necessary equipment capable of transmitting and receiving but also a licensed amateur to supervise all transmissions. TCARC covers both of these requirements for the Alton Brownie group.

The building where the Brownies meet is purpose built and quite modern, with a meeting hall, a kitchen area and side rooms adaptable for particular use. TCARC are usually established in one of the side rooms. Twice a year, to correspond with *Thinking Day* and *Jamboree on the Air*, and with tight security, the Brownies will 'sleep over' for one or more nights. A delightful experience for them.



Enthusiastic Brownies gathered around the receiving station

It just so happened that *Jamboree on the Air* in 2008 overlapped with the visit of Richard Garriott to the International Space Station (ISS) as a self-funding tourist. Richard was born in England but currently resides in the



An SSTV image taken through the space station's window and showing cloud about 100 miles west of Ireland



An SSTV image showing the interior of the ISS

USA. Richard is an enthusiastic radio amateur operator with his own call sign and during his stay on the ISS there were planned scheduled voice contacts between Richard and schools in the UK plus the transmissions of Slow Scan Television (SSTV) from the ISS showing views inside the space station and views through a window.

The details of the scheduled contacts between the ISS and UK schools was unknown to us but at least one special event station had been arranged via the RSGB, Carlos Eavis coordinator of GB4FUN and assisted by other dedicated members of AMSAT-UK to schedule a contact with the ISS. I'm not 100% sure, but I expect the RSGB's mobile demonstration station GB4FUN was used by the school for the contact. The uplink frequency was not known but the

down link was expected on 145.80 MHz narrow band FM; so at least we could listen to the ISS's transmissions, either voice or SSTV, whenever the station was in the sky over southern England. The times of the high elevation passes were determined using the web site *Heavens-Above.com*. Their prediction showed that the ISS would pass over southern England on both the Friday and the Saturday of the Brownies' weekend. This was just too good an opportunity to miss with Richard Garriott on board and promising radio contacts and SSTV.

With an appropriate antenna in position and using my *Yaesu FT 847* receiver and the program *MIXW32* running on my computer to display the SSTV images, the first expected signals from the ISS were received on time: firstly voice contacts and then SSTV. During the passes, the girls were clustered around the main indoor receiver, listening intently. We could not monitor the uplink because the frequency was unknown but from the clear downlink from Richard on the ISS there was a very successful contact with about six or more girls from a school which I believe was in Rochdale. During this pass, some of the Brownies were given my handheld *Yaesu FT817* receiver to go outside and listen to the radio contact.

The following orbit coincided with the Brownies' lunch but there was a unanimous decision to postpone it and listen to the next pass. During this pass only SSTV was received. The following day, the ISS again took precedence over the normal routines of food and chores. Again only SSTV images were received but everybody seemed happy with the views from inside and outside the space station: they provoked interest and discussion.

Francis Bell often brings his *EUMETCast* receiving equipment to the Brownies weekends and this occasion was particularly appropriate because, at about the same time as the ISS sent a SSTV image of the clouds and weather below the space station, Francis' images using the high resolution visible channel from MSG2 gave a reference position for the space station's image. Without a reference image it would have been difficult to identify the areas covered by the SSTV image. It turned out that the cloud patterns shown on the ISS image were over the Atlantic Ocean, about a hundred miles west of Ireland. In fact that is just where predictions indicated but it was great to have the correlation with a reference from MSG2.

We did try direct voice contact with the ISS but without success. The standard uplink frequency of 145.200 MHz was used but no contact was made by our station although, from time to time, other stations were acknowledged by the ISS—so some people were successful. However, the images of men floating in space did stimulate the Brownies into all sorts of activities trying to demonstrate the properties of weightlessness and questions about space and the purpose of the ISS. Thanks must go to Richard Garriott for stimulating interest in these bright young girls.

On a previous occasion with the Brownies, the ISS passed overhead at twilight and was clearly visible for some of its pass but then, even though it was at quite a high elevation, it suddenly disappeared. When asked why this had happened the Brownies quickly said: 'Its gone into the Earth's shadow'. Well, I think for youngsters aged 7,8,9 years old you have to be pretty smart to work that out correctly.

I haven't listened recently for SSTV from the ISS but it's worth trying. Obtain the orbital prediction times from *Heavens-Above.com* and listen on 145.800 MHz. The SSTV signals sound like rapid bleeps or tones at a rate of several per second. Software to decode these signal is freely available via the Internet, for example *MIXW32*. Each single SSTV frame takes about 30 seconds to receive.

There is another dimension to GEO's relationship with Richard Garriott. Richard was visiting the UK and attended the BROHP space conference at Charterhouse this year. He visited the GEO display stand and met Francis Bell. Richard expressed genuine interest in our group and said he would like to join GEO [1].

Richard is now a GEO member and hopefully will write some articles for *GEO Quarterly* in the future. I'm sure Francis will remind him in due course.

#### Reference

GEO Quarterly No 22, pages 10-11.

## APT Test Recordings

Fred van den Bosch

### Background

In the last issue of *De Kunstmaan*, Ben Schellekens posed the question: 'could something be developed to store APT signals directly to an SD-card?' As far as I know one of our members is currently working on this possibility. A problem here is that the chosen micro-controller cannot go higher than 12 bits and Craig Anderson, the author of *WXtoImg* (our favoured APT software) recommends 16-bits for recording satellite WAV files.

However, *WXtoImg* [1] does offer the choice of saving WAV files as either 8-bit or 16-bit recordings. The advantage of 8-bit recording is the smaller file size while 16-bits gives better quality. And 8-bit recordings would be compatible with the aforementioned microcontroller. Therefore, I set out to perform a test to compare the 8-bit and 16-bit signals from the same satellite pass.

### The Test

To examine the difference in quality between recorder 8-bit and 16-bit WAV files, I had to record WAV files using both options. And to make a fair comparison, I did so on the **same** PC and during the **same** satellite pass. My reception installation consisted of the *PADAT* antenna, *R2FX* receiver and an *Acer* laptop. The signals were received and decoded with *WXtoImg*.

Here's a short step-by-step plan of what to do

1. Make a second copy of your *WXtoImg* folder, but under a different name (e.g. *WXtoImg2*).
2. Start your original version and select the 16-bit option, under **<Options → Recording options → Sample bits>**.
3. Choose **<File → Record → Autorecord>**.
4. Next, start the copied version of *WXtoImg*.
5. This time, make sure that 'sample bits' is set to '8'. If necessary, place *WXtoImg* into Expert Mode. (**<Options → GUI options → Enable expert mode>**).
6. Go to **<Options → File names and locations>** and set all file locations to point to a different folder from the original version.
7. Do not use **<Options → Save options>**!  
This will make the saved options for both the original and copied versions of *WXtoImg* the same. Also, do not shut down the program otherwise steps 4-7 will have to be repeated.
8. Choose **<File → Record → Autorecord>**.
9. As soon as a satellite appears, both versions of the program will record the pass at the same time.

If everything goes to plan the 16-bit wav-file will be approximately twice as large as the 8-bit version.

I have placed both files on my Internet site [2]. And the difference in quality? Well, download the files, decode them and judge for yourself.

### References

- 1 *WXtoImg*, <http://www.wxtoimg.com/>
- 2 [http://www.fredvandenbosch.nl/satellites\\_polar.html](http://www.fredvandenbosch.nl/satellites_polar.html)

# GEO Shop

Manager: Clive Finnis  
 email: [tech@geo-web.org.uk](mailto:tech@geo-web.org.uk)  
 FAX: +44 (0) 1202 893 323



## The 'Pager-Hardened' R2ZX APT Weather Satellite Receiver

This upgraded version of the German-built R2FX receiver has been developed specially for the UK market and is available solely from the GEO Shop. If you are in an area suffering from pager interference on the NOAA-18 frequency of 137.91 MHz, this receiver should be the answer to your problems - see the R2ZX review in GEO Quarterly No 14.

UK member's price - 210.00 UK non-member's price - £224.00

We still stock the original R2FX receiver which has proved itself to be a top-quality receiver throughout Europe and the world at large. Members in the UK find that the R2FX gives perfect reception of NOAAs 12-17, and in favourable locations (pager-free) of NOAA-18 also.

UK member's price - £180.00 UK non-member's price - £194.00

### R2FX Accessory Pack

This contains everything required to implement a complete APT receiving system when used with either the R2FX or R2ZX receiver. It comprises:

- 137 MHz Turnstile Antenna
- UK plug-in power supply
- PC audio lead + PC Serial 'computer control' lead
- Aerial lead (20 m with fitted connector)
- CD of PC shareware starter software
- Instructions

We do not normally ship outside the UK as these items should be available elsewhere more cheaply from the manufacturers. But contact the GEO Shop if you wish a quote.

UK member's price - £59.00 UK non-member's price - £69.00



The Bias-Tee allows a mast head preamplifier to be used with the 'Antenna 2' input of an R2FX or R2ZX. Only the 'Antenna 1' input normally feeds power to a preamp. The Bias-Tee now allows you to power twin preamps and maintain the receiver's Antenna Diversity feature.

UK members price - £20.00  
 UK non-members price - £24.00



John Silver's APT preamplifier was featured as a constructors' kit in GEO Quarterly No 12 (December 2006). Now we are able to offer this high-linearity LNA to GEO readers, ready built.

UK members price - £35.00  
 UK non-members price - £40.00

### Universal Ku-band Satellite TV LNB 0.2 dB (or equivalent)

This is a quality high specification Universal LNB for use with the SkyStar 2 PCI card, Dexatek and DVBWorld USB receivers and digital satellite TV receivers.



UK members price - £11.00  
 UK non-members price - £17.50

### GEO PIC 1.0 for the RX2

Programmed with the new channel frequencies required for NOAA-18.



UK - £7.00  
 UK non-members price - £7.00



## CURRENT PRICE LIST

	Members Prices			Non Members		
	UK	EU	RoW	UK	EU	RoW
<b>APT Equipment</b>						
R2ZX APT Receiver (no PSU) . . . . .	210.00	214.00	222.00	224.00	228.00	236.00
R2FX APT Receiver (no PSU) . . . . .	180.00	184.00	192.00	194.00	198.00	206.00
R2FX Accessory Pack . . . . .	59.00	-	-	69.00	-	-
BNC Lead (0.25 metre) . . . . .	4.50	5.25	5.75	6.50	7.25	7.75
UK Power Supply Unit (12 volt) . . . . .	8.50	-	-	11.00	-	-
Dartcom High Quality QFH Antenna . . . . .	269.00	POA	-	289.00	POA	-
Turnstile APT antenna . . . . .	43.50	-	-	48.50	-	-
John Silver Preamplifier (built) . . . . .	35.00	36.00	37.50	40.00	41.00	42.50
Bias Tee . . . . .	20.00	20.50	21.00	24.00	24.50	25.00
GEO-PIC 1.0 . . . . .	7.00	7.80	8.40	7.00	7.80	8.40
Martelec MSR40 EPROM . . . . .	10.00	10.75	11.25	10.00	10.75	11.25
<b>EUMETCast Equipment</b>						
DVB-S USB2102 Receiver . . . . .	59.00	62.00	-	69.00	72.00	-
TechniSat SkyStar 2 PCI Card . . . . .	59.50	61.00	-	65.50	67.00	-
Telesat 80 cm dish with LNB . . . . .	67.00	-	-	74.00	-	-
Telesat Ku band universal LNB . . . . .	11.00	12.50	-	17.50	19.00	-
Technisat Satfinder Alignment Meter . . . . .	23.50	26.50	-	26.50	29.50	-
<b>Miscellaneous</b>						
GEO Quarterly Back Issues . . . . .	3.50	4.20	5.10	n/a	n/a	n/a
(subject to availability)						
GEO Quarterly (PDF issues on CD)						
Annual compilations 2004-2008						
(state years required) . . . . .	8.00	8.80	9.30	n/a	n/a	n/a
GEO Membership . . . . .	20.00	24.00	28.00	20.00	24.00	28.00
(4 x GEO Quarterly)						

All prices are in £ sterling and include postage and packaging

### ORDERING AND SHIPPING

We will ship by post, so please allow a few days for items to arrive in Europe and perhaps a few weeks for the Rest of the World.

Orders should be sent to:

GEO Shop,  
 44 Disraeli Road  
 Christchurch BH23 3NB  
 Dorset, England

If you are paying by credit card, you can FAX us your order to:

+44 (0) 1202 893 323

And remember, you can now order through the GEO Website using

**PayPal.**

### NOT A GEO MEMBER?

GEO can provide most of the items advertised—with the exception of GEO Quarterly back-issues and CDs—to both members and non members. However, non-members cannot benefit from the discounted prices available to members.

**Why not join GEO and take advantage of the discounted prices we can offer you as a member?**

Subscription Rates (12 months/4 issues of GEO Quarterly) are just £20 (UK), £24 (EU) and £28 (rest of world).



### TechniSat SatFinder Antenna Alignment Meter

This sensitive meter is a great help in setting up and aligning the dish for maximum signal. The meter comes with full instructions.

UK members price - £23.50  
 UK non-member's price - £26.50



### Telestar 80 cm dish and Universal 0.2 dB LNB (or equivalent)

This quality solid steel offset dish, designed for digital and analogue reception, is coated with electrostatic polymer. The bracket has been heat dipped and zinc treated for maximum corrosion protection. Complete with LNB.

UK members price - £67.00  
 UK non-members price - £74.00

# NOAA Satellite Predictions

(Based on Latitude 52°N, Longitude 2°W, UT/GMT)

NOAA 15 137.50 MHz				NOAA 17 137.62 MHz				NOAA 18 137.9125 MHz				NOAA 19 137.10 MHz																					
Sep 01	04:46	06:26	14:34	16:13	09:27	11:07	19:16	20:55	01:40	03:21	11:34	13:14	01:34	03:15	11:29	13:08	Nov 01	05:23	07:04	15:11	16:51	09:07	10:47	18:56	20:34	02:39	04:20	12:33	14:14	01:10	02:51	12:44	14:26
Sep 02	04:22	06:02	15:49	17:30	09:04	10:44	18:53	20:32	01:29	03:10	11:24	13:03	01:24	03:05	11:19	12:58	Nov 02	04:59	06:40	14:48	16:27	08:44	10:23	20:11	21:52	02:29	04:10	12:22	14:03	02:41	04:22	12:34	14:16
Sep 03	05:38	07:18	15:25	17:06	08:41	10:21	20:09	21:49	01:19	02:59	12:52	14:35	01:14	02:55	12:48	14:30	Nov 03	04:36	06:16	14:24	16:03	10:00	11:40	19:48	21:28	02:18	03:59	12:12	13:52	02:30	04:12	12:24	14:05
Sep 04	05:14	06:54	15:02	16:41	09:57	11:38	19:46	21:26	01:08	02:49	12:42	14:24	02:44	04:26	12:38	14:19	Nov 04	04:12	05:52	15:39	17:20	09:37	11:17	19:25	21:05	02:07	03:49	12:01	13:42	02:20	04:01	12:14	13:54
Sep 05	04:50	06:30	14:38	16:17	09:34	11:14	19:23	21:02	02:38	04:19	12:31	14:13	02:34	04:15	12:27	14:09	Nov 05	05:28	07:08	15:15	16:56	09:14	10:54	19:03	20:41	01:57	03:38	11:51	13:31	02:10	03:51	12:03	13:44
Sep 06	04:26	06:06	15:53	17:35	09:11	10:51	19:00	20:39	02:28	04:09	12:21	14:02	02:24	04:05	12:17	13:58	Nov 06	05:04	06:44	14:52	16:31	08:50	10:30	20:18	21:59	01:46	03:27	11:40	13:20	01:59	03:40	11:53	13:34
Sep 07	04:02	05:42	15:29	17:10	08:48	10:28	20:15	21:56	02:17	03:58	12:10	13:51	02:13	03:54	12:07	13:48	Nov 07	04:40	06:20	14:28	16:07	10:07	11:47	19:55	21:35	01:36	03:17	11:30	13:10	01:49	03:30	11:43	13:23
Sep 08	05:18	06:58	15:06	16:46	10:04	11:45	19:52	21:33	02:06	03:48	12:00	13:41	02:03	03:44	11:57	13:37	Nov 08	04:16	05:56	15:43	17:24	09:44	11:24	19:32	21:12	01:25	03:06	11:20	12:59	01:39	03:20	11:33	13:13
Sep 09	04:54	06:34	14:42	16:21	09:41	11:21	19:30	21:09	01:56	03:37	11:50	13:30	01:53	03:34	11:47	13:27	Nov 09	05:32	07:12	15:19	17:00	09:20	11:00	19:09	20:48	01:15	02:55	12:48	14:31	01:28	03:09	11:23	13:02
Sep 10	04:30	06:10	14:19	15:57	09:18	10:58	19:07	20:46	01:45	03:26	11:39	13:19	01:43	03:23	11:37	13:17	Nov 10	05:08	06:48	14:56	16:35	08:57	10:37	18:47	20:25	02:45	04:26	12:38	14:20	01:18	02:59	12:12	13:54
Sep 11	04:06	05:46	15:34	17:14	08:55	10:35	20:22	22:04	01:35	03:16	11:29	13:09	01:32	03:13	11:27	13:06	Nov 11	04:44	06:24	14:32	16:11	08:34	10:14	20:02	21:42	02:34	04:15	12:27	14:09	01:08	02:49	12:42	14:24
Sep 12	05:22	07:02	15:10	16:50	10:11	11:52	19:59	21:40	01:24	03:05	11:19	12:58	01:22	03:03	12:56	14:38	Nov 12	04:20	06:00	15:47	17:29	09:50	11:31	19:39	21:19	02:23	04:05	12:17	13:58	02:38	04:19	12:31	14:13
Sep 13	04:58	06:38	14:46	16:26	09:48	11:28	19:36	21:16	01:14	02:54	12:47	14:30	01:12	02:52	12:46	14:28	Nov 13	05:36	07:16	15:23	17:04	09:27	11:07	19:16	20:55	02:13	03:54	12:06	13:47	02:28	04:09	12:21	14:02
Sep 14	04:34	06:14	14:23	16:01	09:25	11:05	19:13	20:52	02:44	04:25	12:37	14:19	02:42	04:23	12:36	14:17	Nov 14	05:12	06:52	15:00	16:40	09:04	10:44	18:53	20:32	02:02	03:43	11:56	13:36	02:18	03:59	12:11	13:52
Sep 15	04:10	05:50	15:38	17:19	09:01	10:41	18:51	20:29	02:33	04:14	12:26	14:08	02:32	04:13	12:25	14:07	Nov 15	04:48	06:28	14:36	16:15	08:41	10:20	20:08	21:49	01:52	03:33	11:46	13:26	02:07	03:48	12:01	13:41
Sep 16	05:26	07:06	15:14	16:54	08:38	10:18	20:06	21:47	02:23	04:04	12:16	13:57	02:22	04:03	12:15	13:56	Nov 16	04:24	06:04	15:51	17:33	09:57	11:37	19:45	21:25	01:41	03:22	11:35	13:15	01:57	03:38	11:51	13:31
Sep 17	05:02	06:42	14:50	16:30	09:55	11:35	19:43	21:23	02:12	03:53	12:06	13:46	02:11	03:52	12:05	13:46	Nov 17	04:00	05:40	15:28	17:08	09:34	11:14	19:22	21:02	01:31	03:11	11:25	13:04	01:47	03:27	11:41	13:20
Sep 18	04:38	06:18	14:27	16:06	09:32	11:12	19:20	20:59	02:01	03:42	11:55	13:36	02:01	03:42	11:55	13:35	Nov 18	05:16	06:56	15:04	16:44	09:11	10:51	19:00	20:38	01:20	03:01	12:54	14:36	01:36	03:17	11:31	13:10
Sep 19	04:14	05:54	15:42	17:23	09:08	10:48	18:58	20:36	01:51	03:32	11:45	13:25	01:51	03:32	11:45	13:25	Nov 19	04:52	06:32	14:40	16:19	08:47	10:27	20:15	21:56	01:10	02:50	12:43	14:25	01:26	03:07	11:20	13:00
Sep 20	05:30	07:11	15:18	16:58	08:45	10:25	20:13	21:54	01:40	03:21	11:34	13:14	01:40	03:21	11:35	13:14	Nov 20	04:28	06:08	14:17	15:55	10:04	11:44	19:52	21:32	02:40	04:21	12:33	14:14	01:16	02:56	12:49	14:32
Sep 21	05:06	06:46	14:54	16:34	10:02	11:42	19:50	21:30	01:30	03:11	11:24	13:04	01:30	03:11	11:25	13:04	Nov 21	04:04	05:44	15:32	17:12	09:41	11:21	19:29	21:09	02:29	04:10	12:22	14:03	01:05	02:46	12:39	14:21
Sep 22	04:42	06:22	14:31	16:10	09:38	11:19	19:27	21:06	01:19	03:00	11:14	12:53	01:20	03:01	12:54	14:36	Nov 22	05:20	07:00	15:08	16:48	09:17	10:57	19:06	20:45	02:18	03:59	12:12	13:53	02:36	04:17	12:29	14:10
Sep 23	04:19	05:58	15:46	17:27	09:15	10:55	19:04	20:43	01:09	02:49	12:42	14:24	01:10	02:50	12:44	14:25	Nov 23	04:56	06:36	14:44	16:24	08:54	10:34	20:22	22:03	02:08	03:49	12:01	13:42	02:25	04:06	12:19	14:00
Sep 24	05:34	07:15	15:22	17:02	08:52	10:32	20:20	22:01	02:39	04:20	12:32	14:14	02:40	04:21	12:33	14:15	Nov 24	04:32	06:12	14:21	16:00	08:31	10:11	19:59	21:39	01:57	03:38	11:51	13:31	02:15	03:56	12:08	13:49
Sep 25	05:10	06:51	14:59	16:38	10:09	11:49	19:56	21:37	02:28	04:09	12:21	14:03	02:30	04:11	12:23	14:04	Nov 25	04:08	05:48	15:36	17:17	09:47	11:28	19:36	21:15	01:47	03:27	11:41	13:20	02:05	03:46	11:58	13:39
Sep 26	04:46	06:27	14:35	16:14	09:45	11:25	19:34	21:13	02:18	03:59	12:11	13:52	02:19	04:00	12:13	13:54	Nov 26	05:24	07:04	15:12	16:52	09:24	11:04	19:13	20:52	01:36	03:17	11:30	13:10	01:54	03:35	11:48	13:28
Sep 27	04:23	06:02	15:50	17:31	09:22	11:02	19:11	20:50	02:07	03:48	12:01	13:41	02:09	03:50	12:03	13:43	Nov 27	05:00	06:40	14:48	16:28	09:01	10:41	18:50	20:29	01:25	03:06	11:20	12:59	01:44	03:25	11:38	13:18
Sep 28	05:38	07:19	15:26	17:07	08:59	10:39	20:26	22:08	01:56	03:37	11:50	13:30	01:59	03:40	11:53	13:33	Nov 28	04:36	06:16	14:25	16:04	08:38	10:17	20:05	21:46	01:15	02:56	12:49	14:31	01:34	03:14	11:28	13:07
Sep 29	05:15	06:55	15:03	16:42	08:36	10:15	20:03	21:44	01:46	03:27	11:40	13:20	01:48	03:29	11:43	13:22	Nov 29	04:12	05:52	15:40	17:21	09:54	11:34	19:42	21:22	02:45	04:26	12:38	14:20	01:23	03:04	11:18	12:57
Sep 30	04:51	06:31	14:39	16:18	09:52	11:32	19:40	21:20	01:35	03:16	11:30	13:09	01:38	03:19	11:33	13:12	Nov 30	05:28	07:08	15:16	16:56	09:31	11:11	19:19	20:59	02:34	04:15	12:27	14:09	01:13	02:54	12:47	14:29
Oct 01	04:27	06:07	14:16	15:54	09:29	11:09	19:18	20:57	01:25	03:05	11:19	12:58	01:28	03:09	11:23	13:02	Dec 01	05:04	06:44	14:52	16:32	09:08	10:48	18:57	20:35	02:24	04:05	12:17	13:58	01:03	02:43	12:36	14:18
Oct 02	04:03	05:43	15:30	17:11	09:06	10:46	18:55	20:33	01:14	02:55	12:48	14:30	01:18	02:58	12:51	14:34	Dec 02	04:40	06:20	14:29	16:08	08:44	10:24	20:12	21:53	02:13	03:54	12:07	13:47	02:33	04:14	12:26	14:08
Oct 03	05:19	06:59	15:07	16:46	08:42	10:22	20:10	21:51	02:44	04:25	12:37	14:19	01:07	02:48	12:41	14:23	Dec 03	04:17	05:56	15:44	17:25	10:01	11:41	19:49	21:29	02:02	03:43	11:56	13:36	02:22	04:04	12:16	13:57
Oct 04	04:55	06:35	14:43	16:22	09:59	11:39	19:47	21:27	02:34	04:15	12:27	14:08	02:38	04:19	12:31	14:12	Dec 04	05:32	07:13	15:20	17:00	09:38	11:18	19:26	21:06	01:52	03:33	11:46	13:26	02:12	03:53	12:06	13:46
Oct 05	04:31	06:11	14:20	15:58	09:36	11:16	19:24	21:04	02:23	04:04	12:16	13:57	02:27	04:08	12:21	14:02	Dec 05	05:08	06:49	14:56	16:36	09:14	10:54	19:03	20:42	01:41	03:22	11:35	13:15	02:02	03:43	11:56	13:36
Oct																																	

## GEO Helplines

### Douglas Deans

*Dunblane, Perthshire, SCOTLAND*

All aspects of weather satellites from APT, HRPT to Meteosat-8 DVB/EUMETCast systems.

- telephone: (01786) 82 28 28
- e-mail: dsdeans@tiscali.co.uk

### John Tellick

*Surbiton, Surrey, ENGLAND*

Meteosat-8 advice - registering for the various MSG services, hardware and software installation and troubleshooting. John will also field general queries about any aspect of receiving weather satellite transmissions.

- telephone: (0208) 390 3315
- e-mail: info@geo-web.org.uk

### Geoff Morris GW3ATZ

*Shotton, Flintshire, NE WALES*

Geoff has lots of experience with aerial, co-ax, connectors, mounting hardware etc. and has also done a lot of work with the orbiting satellites. Geoff has been a EUMETCast Meteosat-8 user for some time and is familiar with David Taylor's MSG software; he should be able to share his experiences with newcomers to this branch of the hobby.

- Tel: (01244) 818252
- e-mail: gw3atz@btopenworld.com

### Mike Stevens

*Portland, Dorset, England.*

Advice offered on EUMETCast (MSG and Metop) and APT.

- email: mikeg4cfz@mypostoffice.co.uk

### Guy Martin G8NFU

*Biggin Hill NW Kent, ENGLAND*

Guy is prepared to advise anyone who wishing to receive MSG/Metop using Windows 2000 or XP. Can also help with networking and ADSL router setup..

- gmartin@electroweb.co.uk

### Hector Cintron

*San Juan, Puerto Rico, USA*

Hector is prepared to field enquiries on HRPT, APT, EMWIN and NOAAPORT

- Phone: 787-774-8657
- e-mail: n1tkk@hwc.net

Email contact can of course be made at any time, but we would ask you to respect privacy by restricting telephone contact to the period 7.00-9.00 pm in the evenings.

## Internet News/Discussion Groups

There are a numerous Internet-based discussion groups available to weather satellite enthusiasts. You can join any of these by sending an e-mail to the appropriate address, with a request to subscribe. Indeed, a blank e-mail containing the word 'subscribe' in its Subject line is all that is required. Some of the more useful groups and their contact addresses are listed below.

### APT Decoder

This is a group where users of Patrik Tast's APTDecoder can share information and problems.

<http://tech.groups.yahoo.com/group/APTDecoder/>

### GEO-Subscribers

This is a group where GEO members can exchange information relating to either GEO itself or Earth observation satellites and related matters.

<http://tech.groups.yahoo.com/group/GEO-Subscribers/>

### Satsignal

An end-user self help group for users of David Taylor's Satellite Software Tools (SatSignal, WXtrack, GeoSatSignal, HRPT Reader, GroundMap, MSG Data Manager, AVHRR Manager and the ATOVS Reader).

<http://tech.groups.yahoo.com/group/SatSignal/>

### MSG-1

A forum dedicated to Meteosat Second Generation (MSG), where members share information about the EUMETCast reception hardware and software.

<http://tech.groups.yahoo.com/group/MSG-1/>

### METOP

A forum for users of high-resolution AHRPT data from the MetOp satellite, available via EUMETCast.

<http://tech.groups.yahoo.com/group/METOP/>

### AVHRR

A forum for users who download high-resolution EARS-AVHRR data from the NOAA polar orbiting weather satellites via EUMETCast.

<http://tech.groups.yahoo.com/group/AVHRR/>

### ATOVS

A Group for discussions about using ATOVS data. Data from the whole world is available from CLASS ([www.class.noaa.gov](http://www.class.noaa.gov)) and for an extended Europe, via EUMETCast.

<http://tech.groups.yahoo.com/group/ATOVS/>

### Weather Satellite Reports

This group provides weekly reports, updates and news on operational aspects of weather satellites.

<http://tech.groups.yahoo.com/group/weather-satellite-reports/>

### WXtoImg

Users of the WXtoImg software package for capturing and imaging NOAA APT can air their problems, discuss its features and ask questions about it.

<http://groups.yahoo.com/group/wxtoimg-1/>

## Useful Websites

### EUMETSAT brochure 'MSG: in orbit - in use'

An up to date overview of the MSG system

[http://www.eumetsat.int/groups/cps/documents/document/pdf\\_br\\_msg02\\_en.pdf](http://www.eumetsat.int/groups/cps/documents/document/pdf_br_msg02_en.pdf)

### Arctic Sea Ice News and Analysis

Monthly reports on the state of Arctic Ocean sea-ice and the influences of wind and temperature including comparisons with previous years.

<http://nsidc.org/arcticseaicenews/>

### ESA Earth Observation Handbook

This website explores the increasing need for information about our planet and explains the role of Earth observation satellites in achieving this end. The capabilities of satellites in many fields are discussed and a number of illustrated case studies are presented.

<http://www.eohandbook.com/>

### MODIS 'Image of the Day'

MODIS Web maintains a rolling 7-day page featuring high-resolution colour images of noteworthy features acquired by NASA's *Terra* and *Aqua* satellites at

<http://modis.gsfc.nasa.gov/gallery/showall.php>

## The Copy Deadline for GEO Quarterly No 24 is Saturday, October 31

The Editor is always delighted to receive articles and images for inclusion in *GEO Quarterly*. These can relate to any aspect of Earth Imaging, especially

- Technical articles concerning relevant hardware and software
- Construction projects
- Weather satellite images
- Reports on weather phenomena
- Descriptions of readers' satellite imaging stations
- Activities from overseas readers
- Letters to the Editor
- Problems and Queries for our experts to answer

Contributions should of course be original and, where possible, should be submitted to the editor in electronic format (floppy disc, e-mail attachment, CD, DVD). But of course we will also accept handwritten and typed copy should the need arise.

Please note, however, that **major articles** which contain large numbers of satellite images, photographs or other illustrations should be submitted **as early as possible**, so that they can be prepared and made up into pages in time for publication.

### Images and Diagrams

Images can be accepted in any of the major bitmap formats: **JPG, BMP, GIF, TIFF** etc. Images in both monochrome and colour are welcomed. Line drawings and diagrams are preferred in *Windows* metafile and *postscript* formats. We can also scan original photographs, negatives and slides.

### Gridding, Overlays and Captions

Please note that readers' satellite images should be provided **without** added grid lines, country outlines or captions **unless** these are considered essential for illustrative purposes within an article.

If your article submission contains embedded images and diagrams, please note that you must **also submit the individual, original images**, in one of the formats described above: these are essential for page make-up purposes.

### Submission of Copy

All materials for publication should be sent to the editor,

**Les Hamilton**  
**8 Deeside Place**  
**Aberdeen, AB15 7PW**  
**Scotland.**

The most efficient way to do this is as **email attachments** to the following address

[geoeditor@geo-web.org.uk](mailto:geoeditor@geo-web.org.uk)

### And finally . . .

if you do have material ready for the next issue of *GEO Quarterly*, please submit it **as soon as it is ready**—do not wait till the deadline above: this will simply create an editorial log-jam and delay publication.

# Group for Earth Observation

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3. UK residents may also pay by **personal cheque** or **Postal Order** made payable to  Group for Earth Observation

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**Please send your completed form to:**

David Anderson (GEO subs),  
35 Sycamore Road,  
East Leake  
Loughborough LE12 6PP, UK

If paying by credit card, you may FAX a copy of this form to +44 (0) 1509 277 220

GEO Subscriptions  
35 Sycamore Road,  
East Leake,  
Loughborough LE12 6PP  
England, UK.

If you prefer, a photocopy or scan of this form is acceptable.

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# THE GOES-O LAUNCH



## ... being there

*Fred Piering*

In the previous issue of GEO Quarterly, Ed Murashie described the preparations for the latest GOES satellite launch. With the satellite now safely in orbit as GOES-14, Fred Piering provides us with an eye-witness account of the actual launch, while Ed enlightens us about further details of the satellite and its capabilities.

Thanks to NOAA, NASA and especially to Cynthia O'Carroll, Public Affairs Officer for NASA/Goddard Space Flight Center, and the Boeing Corporation, I was an 'invited guest' for the GOES-O launch. The launch, originally scheduled for April 2009 was finally rescheduled for June 26, 2009 on launch Pad 37 at Cape Canaveral Air Force Station, Florida.

I was travelling that week, but cut the job short to arrive at the Cocoa Beach Hilton Hotel on Thursday night. The main operations, led by Boeing, were headquartered in the Hilton. The first order of business was to get registered, easy enough, and was further enhanced by the receipt of a 'goody bag' which included the latest press release, the schedule for Friday's launch day and a few gratuities, such as a pen, small flash light, various decals, etc.

There was a considerable list of planned activities for Launch Day, beginning with a bus tour of Cape Canaveral Air Force Station along with a short tour of the Kennedy Space Center. Since the tour only had one stop where we were allowed to get off of the bus, the rest of the tour required shooting photos through the bus windows. The tour included the Delta II Operations building, the Range Operations Control Center, Industrial Area and ICBM Road. We toured many space launch complexes known as SLCs, included Mercury's Complex-14, Titan and Gemini's Complex-19, Saturn 1 and 1B's SLC-34, Delta IV's SLC-37, where GOES-O was located, SLC-40 and 41 as well as 39A, which had the shuttle in place ready for launch and SLC 17A and B. The tour also included the tall Vertical Assembly Building, the Air Force Space and Missile Museum

<http://www.patrick.af.mil/library/factsheets/factsheet.asp?id=4496>

plus a few other spots of interest. We were permitted to get off the bus at SLC-34, where the Apollo-1 fire occurred. Since SLC-34 is just south of SLC-37, I took the opportunity to have my picture taken with the GOES-O and Delta IV in the background. This being launch day, most of the roads were cordoned off; this was as close to the launch pad as we could get. Our hosts provided chilled bottled water and encouraged us to drink up so as to not become dehydrated. Since the tour was four hours long, and no pit stops made, strong bladders were required!

The bus tour returned us to the hotel around noon. From 2pm until 3pm, a guest briefing was held. Representatives of Boeing, United Launch Alliance, NASA and NOAA each presented their participation and perspective on the system and launch. We were then reloaded on the buses at 4pm to go to the observation site and witness the launch.

The observation building was quite pleasant. As I remember, after the Space Shuttle Challenger disaster, it was determined to not have the family of the astronauts'

intermixed with the press in the standard viewing site. I believe this building is where the family and relatives observe the shuttle launches. The observation deck is on the fifth floor, directly across from the Vehicle Assembly Building (VAB) as seen in the picture. Looking in the opposite direction you can see launch pad 37, where the GOES-O satellite is mounted on the Delta IV, well off in the safe distance. I only had a cheap 'point and shoot' camera; sadly no telephoto shots are to be had. Inside the observation deck was a waiting room which had large screens broadcasting views of the launch vehicle, the current weather radar, satellite weather pictures, plus video and audio feeds from the launch control center, with the obligatory timed check-ins to ensure everyone was ready when we were a 'go' for launch.

The launch window was from 6:14 pm until 7:14 pm, Eastern Daylight Savings time, although the mission clock was on GMT. This was fine with us, the radio amateurs. The weather was on continual watch, as that was the only potential 'fly in the ointment'. There were thunderstorms in the area and, if they encroached within 10 miles, the launch would be scrubbed. Shortly after the launch window opened, the storm entered the area. We waited hopefully until 7:01 pm at which time the launch was scrubbed. With disappointment, we returned to the hotel where an evening meal was waiting. The reception was formally renamed from the 'Post Launch Reception' to the 'Pre-Launch Reception'. We all thought it was quite ironic that the launch of a weather satellite was scrubbed on account of the weather.

The launch attempt was rescheduled for the same time on Saturday. Once again we loaded onto the buses at 4 pm and headed to the observation deck. The crowd was much smaller this time as many had other obligations and returned home. Fortunately for me, I live about an hour's drive from Cape Canaveral, so I made a round trip home on Saturday morning and returned for the bus pickup that afternoon. Once again, weather was a concern and the obligatory Florida afternoon thunderstorm was present and accounted for. This created a launch delay, but fortunately the storm was moving rapidly and away from the launch site. Great day, we launched at 6:51pm! The launch is shown in three of the photographs on pages 26 and 27.

The satellite reached orbit several hours after launch and additional circularisation burns were performed. Twenty four days after launch, Boeing turned the satellite over to NASA, who will play with it for four months and ultimately turn it over to NOAA in December. The satellite nomenclature was changed from GOES-O to GOES-14 on July 8. GOES-14 will be placed in a parking orbit along with GOES-13 for use on the eventual failure of GOES-11 or -12.

I had a great time and want to thank those who made the trip possible. Most of my observations have been at the shuttle launches, from as close as the Indian River or as far away as my front yard. Being on official property at an observation post that was five stories high was great! Plus, I got to meet a lot of folk in NASA, NOAA and Boeing, all really first class people!

# The Best is Yet to Come

## A forward look into the capabilities of the new GOES-N series

Ed Murashie

Earlier this year, on June 27, we saw the launch of *GOES-O*, now designated *GOES-14* following a successful orbital insertion. It is the second in the 'next generation' *GOES-N* geostationary weather satellite series. Its on-orbit twin, *GOES-13* launched May 24, 2006, is in storage until an operational need arises (should either operational satellite—*GOES-11*, stationed over the western part of the United States, or *GOES-12*, stationed over the east—fail).

*GOES-11* was launched May 3, 2000 and became operational on June 21, 2006, close to the end of its designed life. *GOES-12* was launched July 23, 2001, becoming operational on April 1, 2003. Because the *GOES-NOP* satellite lifespan and fuel requirements have been improved by adding solids to the rocket and changing the required operational lifetime, the *GOES-Q* satellite contract option was dropped. There exist a spare imager and sounder that could be used for a fourth replacement satellite should *GOES-P* fail to achieve orbit, or fail prematurely prior to acceptance. The current status of the *GOES* satellites can always be found at

<http://www.oso.noaa.gov/goesstatus/>

<http://homepage.ntlworld.com/phqfh1/status.htm>

Each generation of *GOES* satellites demonstrates new improvements. *GOES I-M*, redesignated *GOES 8-12* in orbit, were the first to be 3-axis body stabilised instead of the prior spin stabilised design. With a body stabilised platform, the imager and sounder can spend more time pointed at the Earth, performing small area scans such as those studying the development of thunderstorms. This type of flexible scan helped improve short-term local severe storm forecasts. Another improvement on *GOES I-M* was allowing simultaneous scanning with the imager and sounder instruments to provide data for improved forecasts.

*GOES I-M*, built by *Space Systems Loral*, are equipped with a 5-channel imager, 19-channel sounder, space environment monitor, data collection system and search and rescue capability. The transmissions include the following:

Description	Source	Uplink (MHz)	Downlink (MHz)	Destination
Command	CDA/DSN	2034.2		Spacecraft
Telemetry	Spacecraft		1694/2209.086	CDA, DSN
WEFAX/LRIT	CDA	2033.0	1691.0	Users
Data Collection Platform Interrogation	CDA	2034.9	468.825	Data
Data Collection Platform Report	Data collection platform	401.9	1694.5	CDA, Users
Search and Rescue	Emergency Locator Transmitter	406.025	1544.5	Rescue Coordinator Center
MDL diagnostic data	Spacecraft		1681.5	Satellite Operation Control Center
Processed Data Relay (GVAR)	CDA	2027.7	1685.7	Users

The imager that produces the fine images we enjoy watching has the following characteristics:

Chan	Wavelength (µm)	Measurement Range	Nadir Field of View	Use
1	0.55-0.75	1.6-100% albedo	1 km	Cloud Cover
2	3.8-4.0	4-320K (GOES I-K) 4-335K (GOES L/M)	4 km	Night-time Clouds
3	6.5-7.0 (GOES I-K,L)	4-320 K	8 km	Water Vapour
	13.0-13.7 (GOES M)	4-320 K	8 km	Cloud Cover and Height
4	10.2-11.2	4-320 K	4 km	Sea Surface Temp
5	11.5-12.5 (GOES I-K,L)	4-320 K	4 km	Sea Surface Temp
	5.8-7.3 (GOES M)	4-320 K	4 km	Water Vapour

Image navigation specified accuracy at nadir at noon  $\pm 8$  hr is 4 km and at midnight  $\pm 4$  hr is 6 km. Image registration within a 25 minute image is specified as 50 microradians, where 1 km is approximately 28 microradians in geosynchronous orbit.

Registration between repeated images every 48 hours is 210 microradians and channel to channel registration is 28 microradians. More information on *GOES I-M* can be found in the *GOES I-M* databook at

<http://goes.gsfc.nasa.gov/text/databook/databook.pdf>

With the launch of the follow-on generation of satellites, *GOES N-P*, built by *Boeing Satellite Systems*, there are more improvements that we will enjoy. *GOES N-P* are equipped with a similar 5-channel imager, 19-channel sounder, space environment monitor, data collection system and search and rescue capability. The imager on *GOES-O* and *GOES-P* has improved resolution, from 8 km to 4 km in the 13 micron channel. The *GOES-N* series imagers and sounders have improved stray light rejection in their telescopes, so that they can tolerate more of the solar intrusions that occur, particularly during eclipse periods. A new 5-channel extreme ultraviolet sensor directly measures the solar energy which heats the upper atmosphere and creates the ionosphere. This heating can change the upper atmosphere density by a factor of ten, and can effect radio communications and low Earth-orbiting satellite drag. *The Solar X-ray Imager (SXI)* first flew on *GOES-12* and a newer version built by Lockheed Martin has been developed for the *GOES-N* Series. It is a telescope that monitors the sun's soft x-ray emissions including flares and coronal mass ejections. The information is used to alert space agencies like NASA with their shuttle fleet and international space station, the USAF, and other users such as power utilities and airlines.

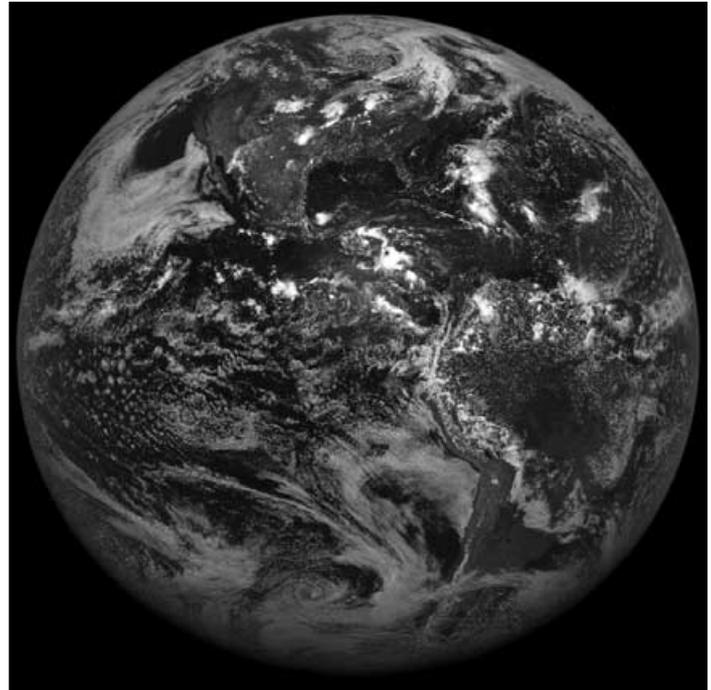
The data transmission channels are similar to GOES I-M, with the exception of a new channel dedicated to transmitting the Emergency Manager's Weather Information Network transmission. In the past, the EMWIN signal shared the weather facsimile channel, WEFAX, with the Low Resolution Image Transmission (LRIT). Also 300 bps and 1200 bps data rate capabilities were added to the Data Collection System so that it could accommodate more data platform transmissions.

Description	Source	Uplink (MHz)	Downlink (MHz)	Destination
Command	CDA/DSN	2034.2		Spacecraft
Telemetry	Spacecraft		1694/2209.086	CDA, DSN
WEFAX/LRIT	CDA	2033.0	1691.0 586 KBW	Users
Data Collection Platform Interrogation	CDA	2034.9	468.825	Data Collection Platform
Data Collection Platform Report	Data Collection Platform	401.9	1694.5	CDA, Users
Search and Rescue	Emergency Locator Transmitter	Narrow: 406.025 Wide: 406.05	1544.5	Mission Control Center
MDL diagnostic data	Spacecraft		1681.5	Satellite Operation Control Center
Emergency Managers Weather Information Network	CDA	2034.7	1692.7	Civil Emergency Managers
Processed Data Relay (GVAR)	CDA	2027.7	1685.7	Users
Sensor Data	Spacecraft		1676.0	CDA

The imager 10-bit signal quantisation is also similar to that on GOES I-M.

Description	Wavelength (µm)	Measurement Range	Field of View	Use
1	0.52-0.71	0-100% albedo	1 km	Cloud Cover
2	3.73-4.07	4-335 K	4 km	Night-time Clouds
3	13.0-13.7	4-320 K	8 km (GOES-N) 4 km (GOES-O,P)	Cloud Cover and Height
4	10.2-11.2	4-320 K	4 km	Sea Surface Temp
5	5.8-7.3	4-320 K	4 km	Water Vapour

There is stripping reduction in the images because the imager can dwell on the calibrating blackbody for 2 full seconds—instead of just 0.2 seconds for GOES I-M. There is less noise in the images because a yaw flip configuration is now designed; this can flip the satellite 180 degrees between seasons, keeping the sun out of the radiant coolers and allowing the instrument's infrared detectors to run cooler.



The first visible image from GOES-13 - © NASA

There is improved image navigation and registration as well. The registration within a 25 minute image has been decreased: from 50 microradians to 33 microradians in the east to west direction and to 28 microradians in the north to south direction. Registration between repeated images in a 48 hr period has also been decreased: from 210 microradians to 28 microradians. The channel to channel registration has remained the same, at 28 microradians.

What does this mean to me? It means a more stable image loop animation and precise registration to ground features. These improvements were made by developing better algorithms, better sensor inputs, the use of multiple star trackers and isolating the imager and sounder from the spacecraft bus thermal cycling.

The GOES-N Series spacecraft have more power, so that they do not have to shut anything down during eclipse periods; this provides more opportunities for additional images and soundings. The additional power comes from 16% larger solar arrays that are more efficient, generating approximately twice the power of the previous GOES series satellites. In addition, a nickel-hydrogen battery with a 123 ampere-hour capacity replaces the two nickel-cadmium batteries which had a total capacity of only 56 amp-hour, to provide power during eclipse periods.

One big improvement for those of us who keep track of which satellite is active and what kind of transmissions it sends is the design life, which has been increased from 7 years to 10 years. GOES-13 and GOES-14 arrived on orbit with approximately 14 years of station-keeping fuel. More information on the GOES N-P series can be found at

<http://goes.gsfc.nasa.gov/text/goes.databookn.html> .

Since GOES-13 is in standby mode and GOES-14 is being checked out, you will see the best is yet to come. In the meantime, enjoy GOES-13's first full disk visible image taken on June 22, 2006 between 1730-1800 UT

<http://goes.gsfc.nasa.gov/text/goes13results.html>

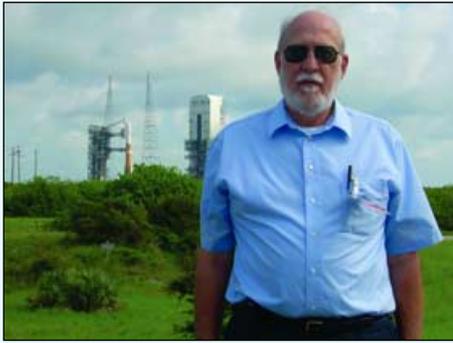
and GOES-14's first full disk visible image taken on July 27, 2009 at 19:00 UT (see also page 31)

[http://www.nasa.gov/mission\\_pages/GOES-O/news/goes14\\_first\\_image.html](http://www.nasa.gov/mission_pages/GOES-O/news/goes14_first_image.html)

You can view rapid-scan movies of Hurricane Hurricane Bill at

<http://goes.gsfc.nasa.gov/text/goes14results.html>





Fred Piering at LC-34 Delta on LC-37



The scene inside the Observation Deck awaiting the launch on Day 1



Anxiously watching the screens inside the Observation Deck on Day 2



Spectators looking towards LC37 from the observation deck



The Vehicle Assembly Building viewed from the observation deck



A distant view of the launch from the observation deck



GOES-O is on its way

# Symposium 2009

Francis Bell

The decision was made to hold our annual 2009 symposium in Guildford, 30 miles south of London. The rationale behind this decision was to deliberately move our symposium venue around the country, thus providing more convenient access to a different subset of our membership. It was also noted that we have many members in London and the south and south east of England.

Also in the background was the hope that we could co-locate our symposium with a meeting of another satellite group. Complications occurred and this idea was not progressed this year but the concept was not ruled out for events that we may hold in the future. To share a venue with another related event may be an attractive idea.

Our venue at the Royal Grammar School (RGS) is no stranger to satellite and space related meetings; for example, British cosmonaut Helen Sharman has visited the school on several occasions, so there was confidence with the location and the technical facilities which the RGS could provide. Our meeting area was well prepared for us with plenty of exhibition space and a lecture theatre with appropriate seating and projection facilities. There was also ready access to a paved area on which we located satellite dishes with easy cable runs into our exhibition area. There was the complication that this area had unexpectedly been taken over by builders making alterations to the school during the holidays. As always, I admire the resourcefulness of GEO members; not being deterred by the building site obstructions, dishes were deployed, aligned and cable runs fed to the exhibition area inside half an hour of our arrival.

The date for the symposium was Saturday July 18, 2009, very different to our previous events which have been held during the month of May. Being summer this time, I offered to host a garden barbecue on the Friday evening prior to the symposium and was pleased that this was well attended by delegates. As expected, there were both technical and social dimensions to that afternoon and evening. I was particularly pleased to host eight of our Dutch friends for this pleasant evening. I know some of what occurred in the background, with Arne van Belle revitalising John Tellick's computer by writing all the data from a faulty drive on to a new one. As can be seen in a photograph opposite, the problem related to part of the plastic part of the disk's SATA connector having broken off, leading to looseness in the connection, probably as a result of travelling to give displays at shows and rallies around the country. I think it was resolved to John's satisfaction. Further technical discussions and experiments took place, not to mention food and other refreshments, which kept everybody busy until late evening.

## Saturday

On the Saturday, setting up equipment was quite straightforward as the school had provided tables and configured the seating to our requirements. In the auditorium, GEO had its reception area together with display boards and banner, plus tables with our own literature and materials provided by EUMETSAT and BNSC. Clive and Carol Finnis established a shop area which pleasingly transacted a worthwhile amount of business during the day. Our Dutch members provided live *EUMETCast* reception together with a display of their new APT-HRPT receiver. John Tellick also ran live *EUMETCast* reception. Most importantly, tea, coffee and soft drinks were available courtesy Peter Green.

## Programme

I opened proceedings with a brief but sincere welcome to the delegates, and noted that eight delegates had come from The

Netherlands and others from Scotland and distant parts of England.

## Combined APT/HRPT Receiver

The first talk came from Ben Schellekens (chairman of *Werkgroep Kunstmanen*) and Arne van Belle about their recently developed combined APT and HRPT receiver. Some of the technical details were beyond me but I certainly admire the resourcefulness of those developing a sophisticated receiver that would, perhaps, not be viable from a commercial perspective.

## Antarctica

Ferdinand Valk gave us a very professional presentation relating to the current changes in Antarctica. His talk was not only illustrated with satellite imagery but also his personal experiences and photographs. I, like many other people, recognise the exquisite sensitivity of Antarctica as a barometer of global warming; although the causation may be interrogative the effect can certainly be observed in the warming of this continent. This was supplemented by a joint presentation from Cecilia and David Taylor relating to their own recent experiences in the Antarctic.

## Lunch Break

The lunch break gave an opportunity to spend some time viewing the exhibition stands, engage in technical conversations and experiments—with lunch as well if there was time for food.

## EUMETSAT

I was very pleased that Gordon Bridge, Head of Training at EUMETSAT, had agreed to attend our symposium and give his presentation: *Monitoring Weather, Climate and the Environment*. Gordon spent an hour bringing us up to date with EUMETSAT's programmes and the application of their products. His presentation was very clear and his visual material was outstanding. As with other speakers he spent several minutes answering delegate questions relating to his talk. The full presentation—both audio and *Powerpoint* slideshow—are available to interested readers: see the special note at the end of this report.

## Software

David Taylor gave short presentation relating to his latest *SatSignal* software, Fred van den Bosch gave a talk about his latest *Presentation Manger* software while Rob Alblas explained his latest software, which allows users to be very selective about the data streams they receive from *EUMETCast* without being overwhelmed with too much data.

## Lightning

Arne van Belle gave a presentation about lightning surge protection. I have twice have had some of my own home equipment damaged by lightning, so was particularly interested in what Arne had to say. I was impressed with the statistics he presented and the visual records of lightning discharges which can now be recorded over an extended period of time.

## AGM

With the formal sessions complete, I, as director of GEO, took the chair for this meeting, briefly reminding the audience that GEO is a limited company, limited by guarantee with no share holders. I have a legal responsibility to submit account and lists of directors to Companies House once a year. I also deal with tax matters; although GEO does not pay any tax, I still have to complete the paperwork. The best professional advice, when GEO was first formed, was to establish it as a company so that anything that is done in GEO's name becomes the responsibility of the company, not of an individual.

*continued on page 30*



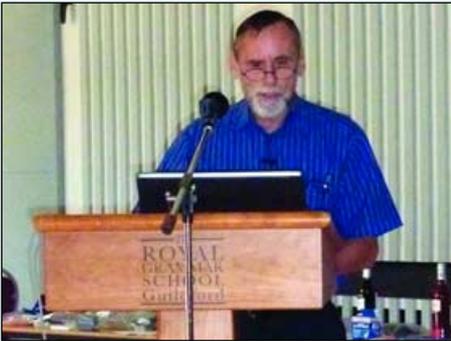
Ben Schellekens presents a progress report on the combined APT/HRPT receiver



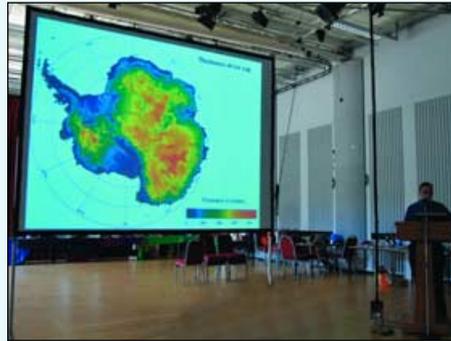
Ben Schellekens with the prototype receiver



Arne van Belle adjusting his dish for best reception.



Ferdinand Valk - Photo: Arne van Belle



Ferdinand Valk's talk on Antarctica



Cecilia Taylor's talk on Antarctica



Gordon Bridge (EUMETSAT)  
Photo: Arne van Belle



Enjoying the barbecue offered by Nadine and Francis Bell  
Photo: Cecilia Taylor



John Tellick, Arne van Belle and David Simmons at the Barbecue  
Photo: Cecilia Taylor



Arne van Belle transfers data from a faulty hard drive



Close-up showing the damaged SATA socket  
Photo: Arne van Belle



Nadine and Francis Bell with Minh van den Bosch



Eric Dean shows off his weather satellite photos



Part of the Audience



Francis Bell thanks Arne van Belle for his talk

The formal accounts for last year were displayed at the symposium registration desk so that everybody had the opportunity to read them. The accounts fall into two categories: the membership account and the shop account.

The **Membership Account** only just breaks even each year. In UK terms, with a membership of about 500 paying a subscription of £20, this generates £10,000 income per annum. The cost of printing the Quarterly is about £7,500 and postage is about £2,000. This leaves only a very small margin to cover other running costs. The last bank statement for this account showed a balance of £3,211 but it should be recognised that, historically, several sponsors had contributed money to establish GEO just over five years ago. The membership account liabilities amount to the expectation of members receiving four Quarterly publications during the membership year.

The **Shop Account** relates to the items sold from GEO Shop. Unfortunately, Clive and Carol Finnis who run the shop for us had to leave before the meeting reached this item of business. On behalf of GEO, in their absence, I thanked Clive and Carol for running the shop for five years. Not only have they generated money on behalf of the group but, more importantly, together with help from others, they have made equipment available to the membership and others throughout the world which would have been impossible to source elsewhere. The two prime examples are the R2FX APT receiver and the DVB *EUMETCast* receiver. The shop account has a balance of £10,294 with only small, if any, outstanding liabilities. I have written the Clive and Carol expressing our gratitude to them for their efforts on behalf of GEO. A reminder here may be appropriate to those reading this report that technical hardware queries should not be sent directly to the shop but should initially be directed to David Simmons, the member of our management team who deals with these matters. The shop will fulfil orders but should not be expected to be a source of advice.

**Membership Secretary** David Anderson confirmed that membership numbers are about 500. He emphasised the need to inform GEO if your address or other details change as this ensures continued membership with an appropriate reminder at the end of the membership year. David also emphasised the need to increase member numbers; if every member recruited one new person it would make our group stronger financially and perhaps broaden the technical skills and experiences which we all value.

**John Tellick** drew to the attention of the meeting the help and the cooperation that our Dutch friends had contributed towards evaluating the latest DVB receiver. Detailed tests showed that this receiver was among the best available. John also spoke about the breadth of articles published in *GEO Quarterly*. It would certainly be appreciated by the editor if our membership could contribute more of their personal experiences to share with others. Technical articles are fine but publishing personal experiences is equally important for those without special technical skills as everybody can relate to these.

#### Raffle/Draw

The afternoon ended with the raffle and draw. Prizes had been donated by many people and there was an attractive table full of goodies waiting to be won. Unfortunately, this year I was unlucky and did not win anything. However, GEO came out as a winner because £170 was raised by the raffle. A special prize of a week-long stay in a west country cottage was auctioned and raised a further £125. A great end to the day.

We were an hour late in packing up and leaving the RGS but the delightful RGS security lady 'Janet' who had looked after us all day, was very tolerant of our time over-run.

#### Acknowledgements

I would like to place on record my thanks to all those who contributed to the day's programme either as a speaker, an

exhibitor or a delegate. Without this support and enthusiasm our symposium would have no purpose.

A particular thanks must be expressed to Paul le Feuvre, one of our members, who recorded the audio proceedings of the day at a professional standard. Paul is a presenter on local radio and is responsible for running *Wey Valley Radio* based in Alton, Hampshire. I know Paul took the trouble to install and test his recording equipment in the auditorium the day before the symposium, thus ensuring no last minute problems on the day. All our speakers agreed to have their presentations recorded and this has generated a big bonus for us all. Paul has made all these recordings available to me on a single mp3 format disc and I will make this available to any interested member (details below).

#### Symposium 2010

At this time no equivalent symposium is planned for next year. The suggestion has been made that we try to co-locate our GEO AGM with another event of overlapping interest: weather, space and radio related events are being researched. There is one potential option which looks particularly attractive and this will be actively pursued.

#### In Conclusion

I wish to express my disappointment that, in spite of published notices in *GEO Quarterly*, on our web site and three notices in *RadCom*, only 38 people were present at our symposium this year. The quality of speakers, and the technical skill and advice from those present was outstanding, while the social events before, during and after the symposium were delightful. The day was worthy of many more delegates so it will not be repeated in the same format in the foreseeable future. A great loss of opportunity for the membership. Instead we will progress the co-location of the Symposium with another event.

#### Obtaining Presentations

To receive a copy of the audio proceedings of the symposium on a disc, in mp3 format, plus another disc containing Gordon Bridge's *PowerPoint* presentation, UK members should send six first class stamps with their request to:

Francis Bell  
Coturnix House  
Rake Lane  
Milford  
Godalming GU8 5AB

Readers outside the UK may email a request for the discs to

[francis@geo-web.org.uk](mailto:francis@geo-web.org.uk)

The audio commentary given by Gordon during his presentation substantially enriches the data provided on the presentation slides.

It may be that other presentations made on the day will become available. If so, they should also be of great interest to run in parallel with the audio recording. For the availability of these visual presentation keep in touch via the web site.

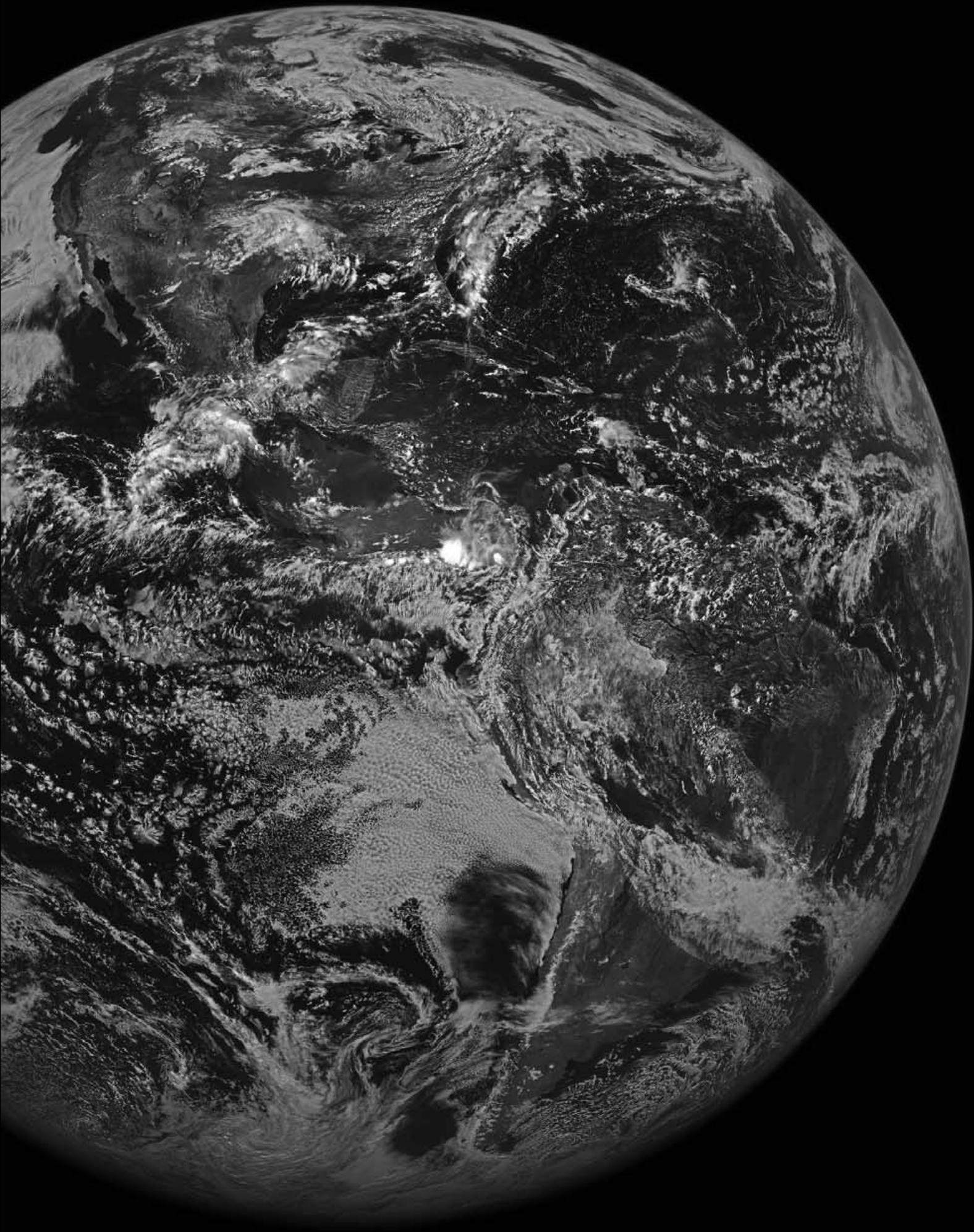
#### Photographs

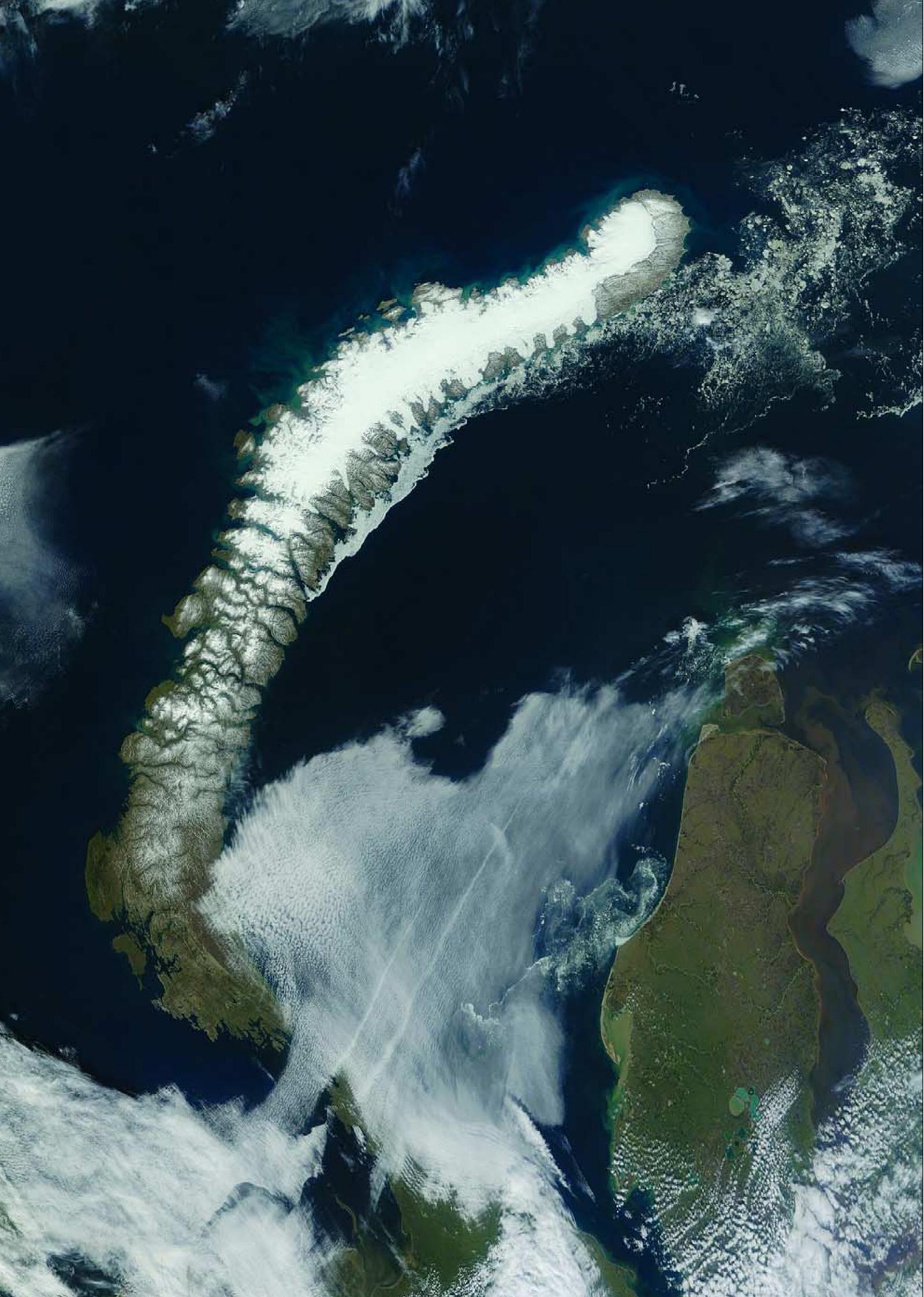
All photographs by David Taylor except where stated otherwise.

### ***This Issue's Masthead Photograph***

For the past four years, the background images to the masthead on the *GEO Quarterly* cover have been dedicated to scenes of cloud and sky.

For the first time, this issue sets its sights somewhat lower, showing a spectacular late evening view of Britain's finest mountain range, the Skye Cuillin. Taken from the Talisker road, the entire range appears crystal clear in the fading light, with just a single standing wave over Sgurr nan Gilleann generating a stationary billow of cloud trailing eastward.





# Novaya Zemlya

## Based on a NASA Earth Observatory Feature

The MODIS image opposite shows the Arctic archipelago of Novaya Zemlya ('New Land'), part of the administrative region of Archangel'sk Oblast. Besides several smaller islands, Novaya Zemlya, which separates the Barents Sea from the Kara Sea, consists of two major islands, *Severnaya* in the north and *Yuzhny* in the south, separated by the narrow *Matochkin Shar* strait. Novaya Zemlya, which is mountainous throughout, is in fact an extension of the Ural mountains, with a highest point at 1547 metres above sea level. Glaciers cover much of *Severnaya* while *Yuzhny* has a tundra landscape covered mainly by stunted arctic willow, mosses and lichens. The indigenous population consists of about 100 *Nenets* who subsist mainly on fishing, trapping, polar bear hunting and seal hunting.

The Moderate Resolution Imaging Spectroradiometer on NASA's *Terra* satellite captured this true-colour image July 27, 2009. The sparsely vegetated land appears in shades of beige and icy white. Hints of turquoise along the northwestern coast probably result from sediments running off the island, or being churned up from the ocean floor by currents. A narrow band of sea ice still hugs the southeastern coast while smaller pieces of sea ice float off the northern island's northeastern tip.

The Russians knew of Novaya Zemlya from the 11<sup>th</sup> century, when traders from Novgorod visited the area. For western Europeans, the search for the *Northeast Passage* during the 16<sup>th</sup> century led to its first visit from a west European, Hugh Willoughby, in 1553, where he met Russian ships from the already established hunting trade. Dutch explorer Willem Barentsz reached the west coast of Novaya Zemlya in 1594 and, in a subsequent expedition two years later, rounded its northern point and wintered on the north-east coast.

### Nuclear Testing

In July 1954, more than half the area of Novaya Zemlya was given over to Soviet nuclear testing sites and remained so during much of the Cold War. The largest underground test, on September 12, 1973, of 4.2 megatons total yield, produced an earthquake of seismic magnitude 6.97 and set off an 80 million tonne avalanche that blocked two glacial streams and created a lake two kilometres in length. The final nuclear test explosion was in 1990. Over its entire history as a nuclear test site, Novaya Zemlya hosted 224 nuclear detonations with a total explosive energy equivalent to 265 megatons of TNT, more than one hundred times greater than all the explosives—including the two US nuclear bombs—used during World War II.

Before the turn of the twentieth century, Arctic sea ice used to linger along the coast of Novaya Zemlya's larger island each July. Since that time, however, increased summertime melting has made open ocean around the archipelago more common.

Image: Jeff Schmaltz, MODIS Rapid Response Team, NASA GSFC

# TURKISH DELIGHT

## Francis Bell

Regular readers of *GEO Quarterly* may have seen my intermittent reports relating to APT reception when, on occasion, duties or holidays have dispatched me to foreign lands.

On my travels, I like to take my APT receiving equipment with me and I have been known to set up a receiving station in hotels, gardens, a cruise ship or even a boat on the River Napo in the Amazon basin. Pages 45 and 47 of *GEO Quarterly* No 15 illustrate the equipment I often take with me. In anticipation of my next trip abroad, I planned this time to use my mobile home-made coat-hanger wire and plastic piping turnstile antenna which is shown on those photographs. But there was one important difference: this time there was to be no computer.

Nadine and I planned a short break to Turkey at the coastal resort of Marmaris, and as usual I planned to take my APT receiving equipment with me. I had little expectation of being able to receive worthwhile signals because I knew our hotel was located almost in the centre of Marmaris, so a clear view of the sky was unlikely. With this in mind, I decided to take the minimum amount of receiving equipment. I needed my antenna, of course, and a 137 MHz receiver but I decided not to take my laptop computer. My laptop is quite heavy and perhaps represented a security risk, so instead I took my *Sony MZ-R700 Recording MD Walkman* mini-disc digital recorder. According to the mode in which it is used, it can give about three hours recording on one mini disc. This recorder is so small that it will easily fit into the palm of my hand and is powered by a single rechargeable AA battery. I have experimented



Sony MZ-R700 mini-disc recorder

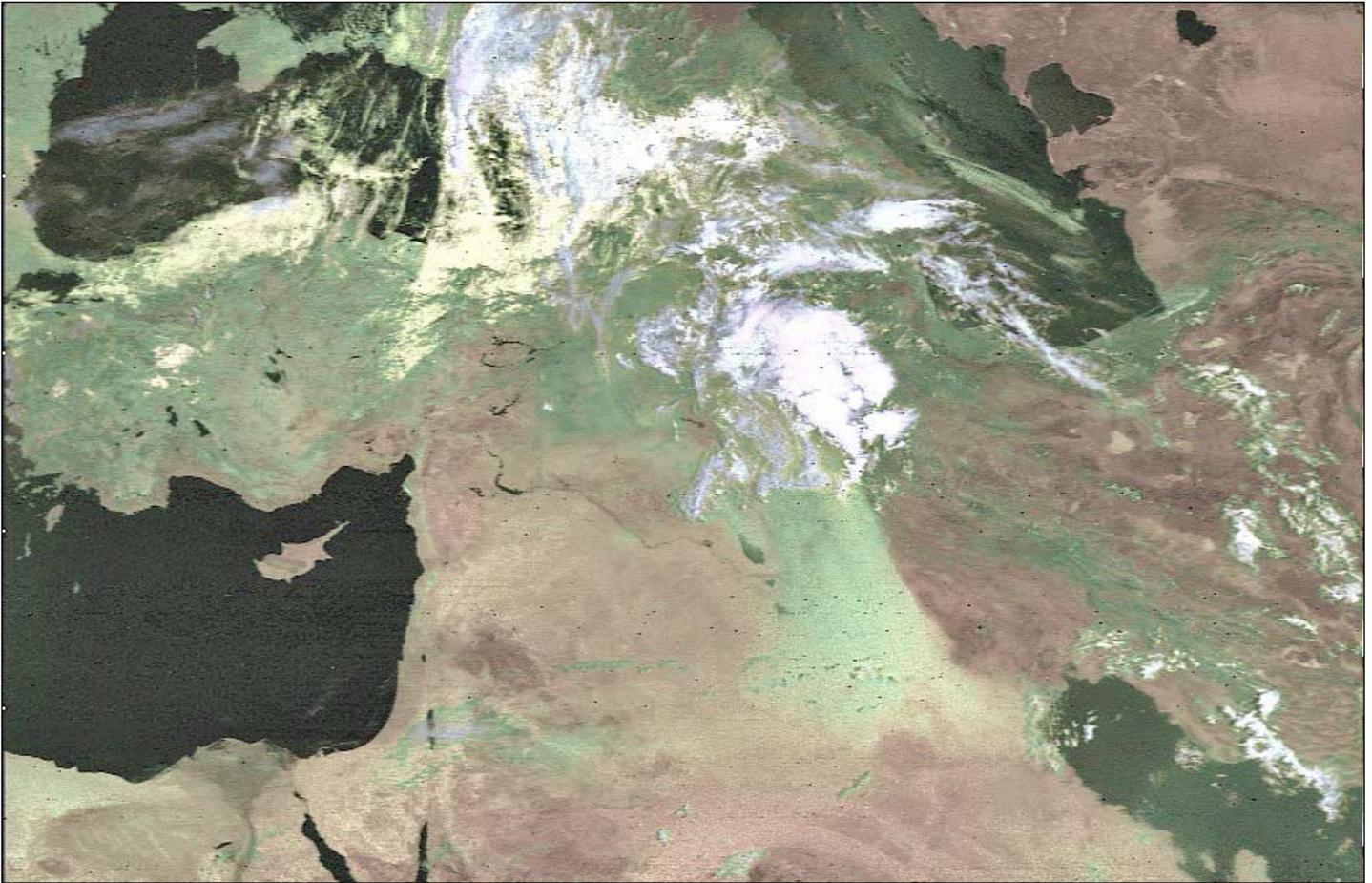
with the recorder at home for recording APT signals and, as best I can judge, there was no loss of quality when replaying APT audio into a computer. My recorder is several years old but I'm sure equivalents are still for sale in the shops today.

The rationale for taking my APT equipment was to receive images from as far east as possible. I wasn't interested in images of the Mediterranean or western Europe because I can do this from home. The potential to fulfil my ambition depended on a detailed view of the sky from the hotel in Turkey.

On arrival it just so happened that the hotel room we were allocated was on the fourth floor—at the top of the hotel with a small balcony facing east. This was almost perfect for my anticipated APT reception. Without inconveniencing anybody and without drawing attention to my activities I could do everything from the hotel room and balcony.

Because I decided not to take a computer with me I had to have the satellite predictions in advance. I used the web site [www.heavens-above.com](http://www.heavens-above.com) for predictions. I looked up the latitude and longitude of Marmaris ( 37 deg. N 28 deg. E ) and generated tables for NOAA satellite passes. The advantage of this was that before departure I could identify those daylight passes to the east with a modest elevation hoping that they would give me the images I wanted. The tables generated eight passes which fulfilled my criteria.

The plan worked well. I tied the antenna to the balcony railings just before an anticipated satellite pass and feed a short cable into the bedroom. Under the best conditions with the satellite above about 20 deg. the signal strength meter on my receiver hit the end stop. There was no preamp but I also noted the short coax cable so the signal strength could not have been better. After the pass I disconnected everything and put it back in the suitcase.



This NOAA-18 image was acquired on June 16, 2009

I successfully recorded several images and considering the surrounding buildings and mountains I don't think I could have done any better. Some images showed as far east as the Caspian Sea, the Red Sea and Persian Gulf.

However, this is not a disappointment, but I had to wait several days until I returned home to see what I had recorded. Although I was delighted with the results and the recording were perfect I have to admit that part of the satisfaction of APT reception is the line by line instant image display on your computer screen. I missed this and viewing the images a few days later, however technically correct had lost some of the charm of APT reception.



The *Turkish Delight* Hotel. The operations room with its balcony can be seen at upper left, hence giving a good view of the eastern sky.



The coat hanger wire turnstile

I may repeat this exercise if I'm in a far-away place and cannot take a take a computer but within the constraints of security and baggage allowance I will favour the use of a laptop for live APT reception in future. However, it was an interesting experiment and I'm sure small digital recorders have their place when recording in difficult circumstances but in future, on location, I will try to take a laptop for displaying APT images in real time.

This image on page 34 was recorded from a NOAA 18 pass on June 16 2009. The coastline of Turkey, where Marmaris is located, can be seen on the extreme left centre of the image close to the island of Rhodes. The Red Sea can be seen at lower left, the Persian Gulf at lower right, and the Caspian Sea and what's left of the Aral Sea at upper right. There is some slight, but I hope excusable, interference on the image.

# Tale of a Tree

Robert Moore

Towards the end of 2008, the data I was receiving via *EUMETCast* was beginning to deteriorate in quality, but I decided to leave it until after the move to *EUROBIRD* because there was a possibility that I might lose reception altogether after the move. I thought the trouble arose from tall trees on my southern horizon but, once the TV installer climbed on to my roof to realign the dish, we discovered that it was a tree in my own garden—and therefore much closer—that was blocking the view of *EUROBIRD*. Problem solved, then? All I had to do was trim my tree. Well, not quite solved, because the parts that needed trimming were overhanging a neighbour's garden.

If you have a tree overhanging a neighbouring garden, your neighbour has the right to trim the overhanging bits. But you have no right to enter their premises to trim your own tree and so without goodwill you are stuck. You should not take what follows as professional advice. If you find yourself in my position you will need to consult a lawyer. But the story seems to go something like this: you do have a right to enter other premises to trim a tree if the tree constitutes an immediate threat to life or property, i.e. in an emergency. If it is not an emergency and your neighbour says 'No', then consult the deeds to your house; it is unlikely, but there may be some provision granting you leave to maintain fences, hedges and so on by entering the neighbouring property.

If the obstruction caused by the tree or trees is interfering with the conduct of a business, you might have a case for civil action against the neighbour. But for a hobby you would have no such case. Furthermore, judges are apparently reluctant to hear cases which they regard as trivial disputes between neighbours. Neighbours have been known to spend their life-savings in the Courts over six inches of earth in the positioning of a fence or other boundary between properties, and judges see these as perverse disputes that should not tie up court time. I don't know whether arbitration is possible in such cases but the courts do nevertheless remain the final option. As in all legal proceedings, the issue for both parties is cost: how much are you prepared to spend to stop your neighbour

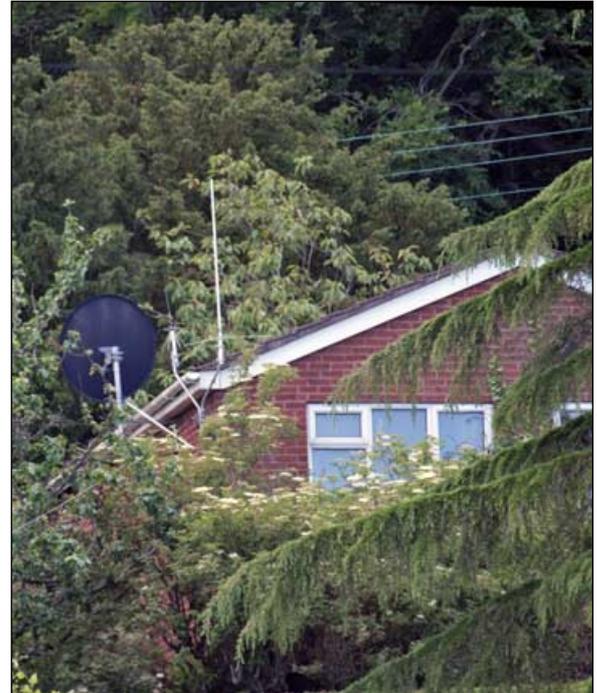
trimming a tree? There's a risk for the tree owner too: not only might it be difficult to establish whether you have any rights to enforce—even if you win a case, you might not get all the costs awarded, or not recover them.

In the event, a solicitor's letter did the trick and a tree surgeon fixed the problem in less than an hour. In case readers wonder why I didn't simply move the dish, the answer is simple—while my house is 25 metres long and the garden is 0.2 hectares in area, there is only one spot in the whole location where I could see *Hot Bird*, and now, thankfully *EUROBIRD*. People walking along the road actually look down into the dish. When we came to live here, the key (hobby) issues for me were good radio reception and a decent position for NOAA POES reception. The former is excellent and the latter is good; although I lose some POES coverage to the south and south east, I get very good coverage to the north and west, which is what I want. I suppose the moral of this story is that if you're viewing a house today, take your compass and inclinometer with you.

The top photograph shows the dish aerial mounted on the wall outside my study. The other aeriels are an airband VHF/UHF stick aerial, a mini-discone and my HF long wire, which can be seen running to the bottom left hand side of the picture. Although the location appears to be buried in foliage and hopeless for *EUMETCast* reception, none of the trees visible in this picture obstructs the dish.

The middle photo shows more of the house, with a my VHF yagi pointing at Winter Hill (to bring music to my Hi-Fi system): less visible is an HF stick aerial dedicated to radio wefax reception. My HRPT dish, by the way, is even further to the right, out of the picture. *EUROBIRD* is located in the clear sky roughly left-centre at the top of the picture.

The final photo was taken from the road and shows that the dish is in fact clear of immediate obstructions. The branch of the yew tree, overhead in the picture, and adjacent branches had extended outwards and downwards to cover the line of sight between the dish and *EUROBIRD*. As can be seen, these have now been trimmed back



The dish antenna mounted outside the author's study



Author's house showing woodlands to the south



The dish, viewed from the road

# Receiving MSG on a 'Barebone' PC

Luc van de Peer

I enjoy building my own PCs, starting with 'barebone' kit. Not only is it enjoyable but it is also less expensive. My latest project has been to receive EUMETCast images of Meteosat using a small-format PC built from a *Foxconn R10-S3* barebone fitted with a 45SC motherboard, *Intel Atom 330* processor and *Intel 945GC* chipset (figure 1). Additionally, I installed a single row 2 GB 667 RAM, a 500 MB hard disk, a CD/DVD reader and an old keyboard mouse and screen found in the shack. What would be possible with this 1.6 GHz PC?

## Setup for EUMETCast

My EUMETCast kit consisted of a 90 cm dish, two antenna amplifiers, a splitter and twin USB *Skystar* receivers. In addition to the computer described above, I also tried out another *Foxconn* barebone (this one with an *Atom 270* processor), equipped with an old CD reader and 160 GB ATA hard disk. Its motherboard had only two SATA connectors, so I had to use a SATA/IDE bidirectional converter.

The computers run under *Windows XP* with T Systems *tc\_recv* v 2.4.4a and *Aladdin PKI Client* v 4.5.39 software installed.

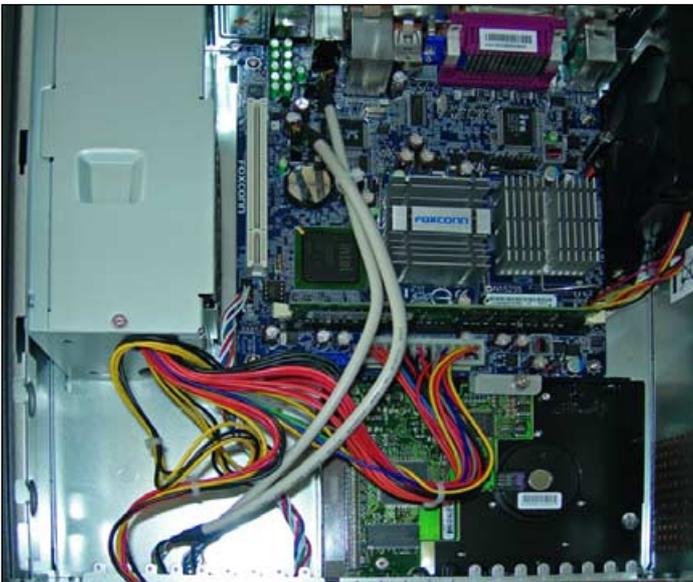


Figure 1 - The interior of the *Foxconn Atom* computer

## Test 1

In the beginning of the first test with this Atom, I tried to minimise the workload for the processor. My goal was to run two installations of *MSG Data Manager*, one for HRIT (12 channels) and World-FSD (all channels) and the second for RSS with only HRIT (12 channels) and *MSG Animator* running day and night, and *Geosatsignal*. All this was possible with this small computer without a single missing segment.

## How I did it

First, I changed the following lines in my *recv.ini* file:

- `log_level = none`  
This disables data logging
- `File_database_directory=Z:\receiving`  
All files will be saved to the RAMDISK in the Z: drive. MSG



Figure 2 - The small-format *Foxconn* computer

Data Manager now has to look for the received files in the RAMdisk and **not** on C:

- `File_database_size=190000000`  
This is the required size of the *Arsoft* RAMdisk.

In the *recv.channels* file I send the EUMETCast data channels I need to the RAMdisk too. (figure 2).

Additionally, in the *file controls* section of *MSG Data Manager*, you need to add '*Z:\Ecast\Data Channel X*' as the 'Tellicast received files' location. This means that not only are all the partial files going to the RAMdisk but so are the assembled *Tellicast* files: so less work for your hard disk.

In another test, I tried to send the assembled *Tellicast* files not to the RAMdisk but to a *SANDISK Cruzer* USB stick. This has worked fine for several months but I have no idea of the lifetime limit of the USB stick.

A word of caution: when you start up your system, the partial files immediately start flowing to RAMdisk, but it takes some time before the assembled files flow to the RAMdisk. This means that, after only a few minutes, you will find the folder *Ecast* in the RAMdisk.

```
[TSL Announcement channel]
target_directory=C:\Ecast\MSG

#[Info-Channel-1]
#target_directory=C:\Ecast\MSG

[EUMETSAT Data Channel 2]
target_directory=Z:\Ecast\Data Channel 2

[EUMETSAT Data Channel 3]
target_directory=Z:\Ecast\Data Channel 2

[EUMETSAT Data Channel 5]
target_directory=Z:\Ecast\Data Channel 5

#[DWDSAT]
#target_directory=C:\Ecast\Data Channel 2

#[EPS-10]
#target_directory=C:\Ecast\EPS-10

#[EPS-15]
#target_directory=C:\Ecast\EPS-15

#[EUMETSAT Data Channel 1]
#target_directory=C:\Ecast\Data Channel 1
```

Figure 3 - the *recv.channels* file

continued on page 39 ...

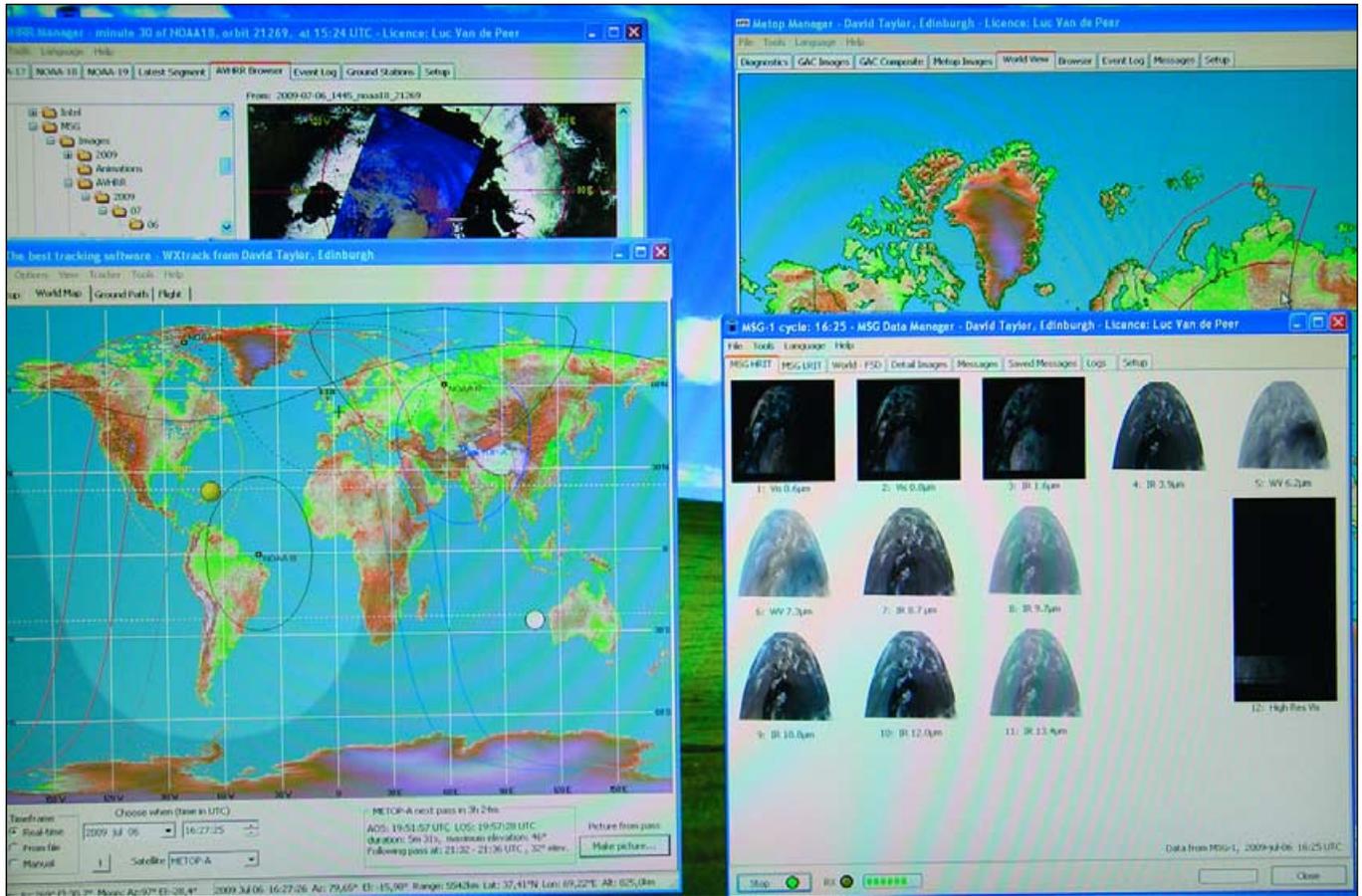
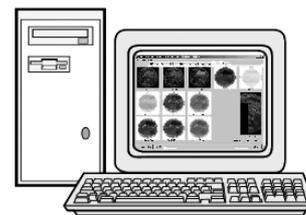


Figure 4 - MSG Data Manager, AVHRR Manager, Metop Manager and WXtrack all running simultaneously on the Foxconn Atom computer



Fred van den Bosch has been experimenting with a small 'netbook' computer to receive APT. Read more on page 43.

# Computer Corner



**Douglas Deans - dsdeans@tiscali.co.uk**

Following the introduction to *Windows 7* in my last column, I have had a chance to speak directly with some users and, perhaps more importantly, with those also running a *EUMETCast* system. Reports are most favourable, although my own experience of setting up the new operating system was less successful. More of that later.

I can also now reveal that *Microsoft* have confirmed that *Windows 7* will be officially launched in Europe on October 22, 2009, so as mentioned in my last column, my hunch that *Microsoft* were anxious to get this out to the public has proven correct. Although some of the following information will be out of date before this publication, as I pen this column in mid July some very interesting things have come to light.

Some time ago, the European Commission advised *Microsoft* that they were unhappy about *Windows* operating systems shipping with their own web browser. It was felt to be against fair competition. What the Commission actually wanted was for *Microsoft* to provide a list of web browsers in their software, including their own, which could be downloaded separately. Pre-empting the EC's final decision, due imminently, and to avoid further hold-ups to the release of *Windows 7*, *Microsoft* decided to remove *Internet Explorer* all together and not provide the options menu from within the operating system.

One cannot help but feel that *Microsoft* have lifted two fingers to the Commission and we have now ended up with the worst of all options. Still, that is not unusual for the European Commission, whose interference has once again created a ludicrous situation whereby Europe has to be different from the rest of the world in that it will not be possible to have a Windows 7 upgrade: only a clean install will be available.

Upgrading from XP or Vista would require that existing *Internet Explorer* software be removed to comply with the EC directive, and *Microsoft* are unhappy that people's personal data could be lost if that were attempted. *Microsoft* have, however, recognised this and are offering a very reasonable introductory price for *Windows 7 E Home Premium*. This is the special version, for Europe only, for which a limited number of copies can be pre-ordered between July 15 and August 9 for £49.99—or until the limited pre-order quantities run out. As I understand, it will still be October 22 before the pre-ordered copies are delivered. It is expected that, for a short time thereafter, it will cost £79.99 before becoming available at its normal price of £149.99. There are other versions also being offered but *Home Premium* is likely to be the most favoured for domestic use. Both 32-bit and 64-bit versions of the software are provided with each purchase. Of course, for readers outwith Europe, there are different launch dates, but for you *Windows 7* will include *Internet Explorer 8*.

So there we are. A very good deal, but yet again the EC has meddled where it should not have and made life difficult for

the consumer. Of course the web browser and *Windows* mail can be freely loaded after the OS is installed, but remembering that you do not have a browser included, make sure you attend to that before you clean install *Windows 7*!

I also have a tale to tell regarding a peculiarity I found in my own *Vista* system and I would be curious to learn if any other readers have found a similar problem. An Internet search suggests I am not alone and the problem has potential to cause serious processor problems, which could be catastrophic for smooth operation of *DVB/Tellique* and many other programs.

My apologies if some readers feel that there has been too much of my recent columns set aside for *Windows 7*. I do feel that the release of a new operating system merits some attention and within a few months 95% of all new computer systems are likely to be shipping with *Windows 7*; so it is an important issue. Whilst I hope to continue with reports, I expect more of the column to return to covering software issues appertaining to our hobby.

## Windows 7

It does seem that this new operating system is living up to its promise and those with whom I have spoken are very happy with their *Windows 7* experience. I decided to try the *Windows 7* release candidate, which is available to all for download. It is a huge download, even for those with good Broadband speeds, and those with monthly limits may have to be careful. However, all went extremely smoothly, including the requirement of saving an image file to DVD. *Windows 7* loaded in without problem and in no time I was up and running.

It soon became clear, however, that my graphics, while quite useable, were not up to scratch. A quick check in *Device Manager* indicated an issue with the graphics driver (the infamous yellow exclamation mark). Repeated efforts to resolve this were unsuccessful and some checks on the Internet established that ATI were not going to provide *Windows 7* drivers for my *ATI Radeon X700* graphics card with 256 MB memory. Strangely, *Vista* drivers would not work correctly either and nothing I did would resolve the issue. So it was back to XP. To be fair, my *ATI Radeon X700* is not the newest of graphics cards but nevertheless I am surprised that *Vista* drivers, whilst working, were greatly restricting my options. No *Aero* for example.

## Strange Problem

For very many years, I have used a two computer networked system for my *EUMETCast* reception, including the pre-MSG times when I was receiving only ATOVS and Meteosat-6. Some time ago, and as a result of all the good things I was reading, I decided to purchase a *DVB World* box from the *GEO Shop* as a back-up to my now ageing and well used PCI card. As everything was working extremely well, the USB box lay unopened for over six months. I decided that I had better

check it out and, following some excellent reports, chose to test it on a single computer system comprising an AMD 6400 with 3 GB RAM and running *Vista Home Premium*. My brother was reporting almost perfect results on a single *Vista* (and subsequently *Windows 7*) computer with a slightly lower specification than mine. Well, there have been one or two issues with this set up but one in particular puzzled me. It seemed that there was regular segment loss whilst I was on-line downloading mail. In fact just opening the *Windows Mail* program was sufficient to cause problems. Further investigation drew my attention to considerable CPU usage—indeed very frequently 100%—when *Windows Mail* was open. Why was my CPU in such turmoil with a low resource programme?

Well, some checks at this end plus some information from the Internet led me to discover that, in my series of folders which hold the e-mails for inbox, outbox, deleted items, drafts etc., I had thousand of files with 0 bytes. Yes, thousand of files, in fact 5,650 to be exact. Whether the computer was struggling to read those files when the program was opened I have no idea, but on deleting them the CPU usage fell to zero (when *Windows Mail* was open) and my segment loss improved accordingly. Although the files showed as 0 kb, they could be opened but were found to be what I can only describe as eml shells. When opened they use the time and date of the opening,

From said 'Sender Unspecified'  
To said 'none' and  
Subject said 'no subject'.

As I said an eml shell.

I should also point out that I do not keep a huge backlog of mails, so in context I had perhaps about 100 genuine emails along with the 5,650 of 0 kb files. As those files do not show up in *Windows Mail* then they cannot be deleted without going into the folders themselves.

I have been unable to establish the cause of this problem but have noticed a massive improvement when I altered the default settings for 'Junk e-mail options' in *Windows Mail* itself. Not having junk mail moved to the Junk e-mail folder has reduced the problem by more than 90%. There are still some occasional 0 kb files, perhaps 10 or 20 each week, but not the massive amounts I found before. I did read of one chap who had over 10,000 of those files.

So, thanks to my desire to have zero segment loss, *EUMETCast* led me to what was in fact a serious *Windows* issue which had previously gone unnoticed.

I would be curious to learn if anyone else has those files and if they are present in large quantities. Please feel free to e-mail me with your findings using my address on the column heading. Any suggestions as to what might be causing this would also be most welcome. I can confirm that stopping *Norton Internet Security* (which does scan incoming and outgoing mails) had no effect on the problem.

To find the necessary folders in *Vista* select *Desktop* and open the folder with your username. Thereafter the necessary folders will be found under

#### **AppData/Local/Microsoft/Windows Mail/Local Folders**

where you will find the usual mail folders, including any you have made up, such as the one I have for Eumetsat OPS, using the rule that mail with 'OPS' should be put there.

I will report any feedback from membership in my next column so please get those reports coming. Reports saying 'no problems' will be just as useful as they may give an indication of the scale of this issue.

## Software Updates

Just a reminder that the list below is for full tested releases and does not include the latest beta (or alpha) versions currently on test. Those can also be downloaded from David Taylor's website

### David Taylor's programs (latest releases)

ATOVS Reader	v 1.1.4
AVHRR Manager	v 1.6.4
BUFR Viewer	v 1.0.0
CMA Viewer	v 1.2.0
DWDSAT HRPT Viewer	v 1.1.2
GeoSatSignal	v 7.0.6
GRIB Viewer	v 2.2.4
GroundMap	v 2.0.6
HDF Viewer	v 1.3.2
HRPT Reader	v 2.8.6
Kepler Manager	v 1.3.2
MapToGeo	v 1.1.6
Metop Manager	v 1.3.4
MSG Animator	v 2.5.30
MSG Data Manager	v 2.5.30
PassControl	v 3.2.2
SatSignal	v 5.1.4
Sea-Ice & Viewer	v 1.3.4
Wxtrack	v 3.7.6

To learn more about those programs and to download the latest updates please go to :-

<http://www.satsignal.eu> ==> **Satellite Tools**

## Receiving MSG on a 'Barebone' PC

... continued from page 36

So when you start *MSG Data Manager* too early, the program cannot find the *Ecast* folder and the files. If you wait too long, the RAMdisk fills up completely and stops working.

Anyway, both methods gave me the opportunity to run two installations each of David Taylor's *MSG Data Manager*, *MSG Animator* and *GeoSatSignal*, day and night, without a single missing segment—all this without wearing out my hard disk, in a small *Atom* system that cost me just 250 euros, and which consumes only 50 watts.

### Test 2

In the first configuration, the *Tellique* assembled files were sent to a RAMdisk. This is not possible in a configuration where more programs are running and more RAMdisk space is needed for the receiving subfolder (0.fsy file) .

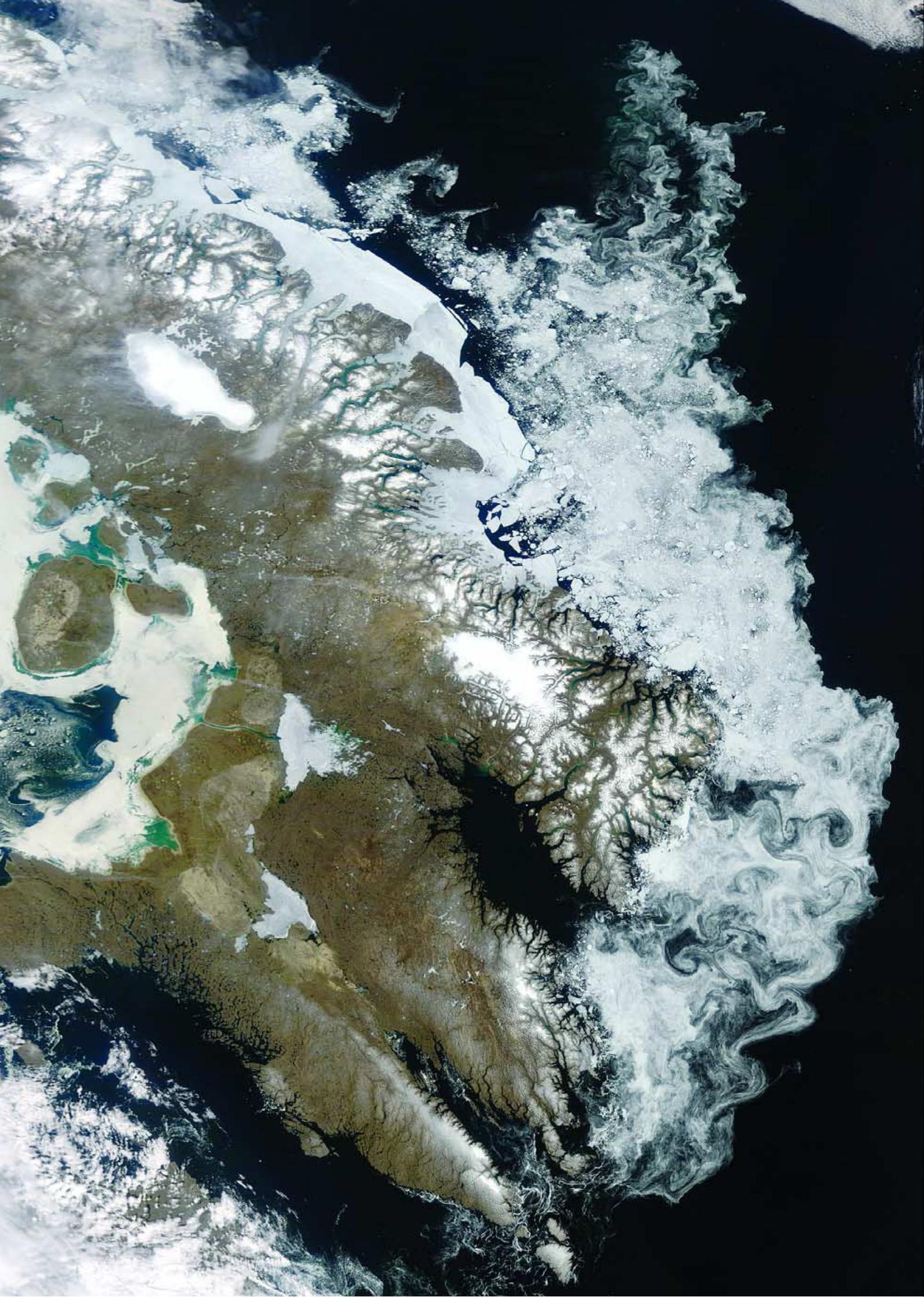
The size of the RAMdisk is limited because the maximum memory on the *Atom* motherboard is 2 GB; also, the onboard VGA uses 192 MB.

This setup uses the following seven programs, running 24/7 without missing segments

- 1 Wxtrack
- 2 AVHRR Manager
- 3 METOP Manager — Metop + GAC NO missing chunks
- 4 MSG Data manager RSS (HRIT 12 Channels)
- 5 MSG Animator (2 half screen animated images)  
Screen: *Samsung SyncMaster 205BW* 1680 by 1050
- 6 HRPTReader to view the Metop and the AVHRR Images
- 7 GeoSatSignal.

At the same time I can open a browser and surf the Internet and install new programs.

On the second machine with the less powerful *Atom* 270 processor the same programs are running without problems. All this and maybe more is possible with this tiny *Atom* computer.



# Malaysia's RazakSat

## Launched into Novel Orbit



The RazakSat Spacecraft  
Credit: ATSB

Peter Wakelin

Malaysia's imaging satellite programme began in 2001 but it took eight years for the spacecraft to eventually achieve orbit. Due to the nation's equatorial location, an orbit inclination of only nine degrees was chosen. *RazakSat* was the first commercial payload to be launched aboard the *SpaceX Falcon-1* rocket.

### Background

Prior to beginning its own imaging satellite programme in 2001, Malaysia purchased a UoSat-class satellite from Surrey Satellite in Guildford, UK which was launched, together with four other small payloads, on a *Dnepr* rocket (a refurbished Soviet-era R-36M2 ballistic missile) on September 26, 2000 into a 65° inclination orbit. It was called *TiungSat* and had a resolution of 80 metres.

*RazakSat* started life as *MACSat*, MAC being the Medium-sized Aperture Camera, its main instrument but was renamed *RazakSat* in tribute to the second Prime Minister of Malaysia, Abdul Razak—known as the Bapa Pembangunan Malaysia (Father of Malaysian Development) for his contribution to the development of Malaysia.

Early plans were over-ambitious and the planned 2005 launch was not achieved. Launch arrangements were changed and it was not until early 2007 that a contract with *SpaceX* was signed to launch *RazakSat* on a *Falcon-1* vehicle.

### The Spacecraft

*RazakSat* was developed and built jointly by a Malaysian company, Astronautic Technology (M) Sdn. Bhd. (ATSB), which is owned by the Malaysian Ministry of Finance, and the South Korean Company Satrec Initiative. Based on Satrec's SI-200 satellite bus, *RazakSat's* optical system was also built by the Korean company.

The spacecraft has a mass of 180 kg of which 50 kg is instrumentation. Power is obtained by GaAs/Ge solar cells which will generate at least 300 W after three years of



Malaysia - Credit: World Travel Guide



RazakSAT undergoing final preparation for shipping  
Photo: SpaceX

operation. NiCd batteries with a total of 18 Ah capacity will provide power when the satellite is not in sunlight. Three-axis stabilisation is achieved by using four reaction wheels and the pointing accuracy should be better than 0.2 degrees.

The Medium-sized Aperture Camera (MAC) can image at 2.5 m resolution in the panchromatic mode and 5 m in multispectral mode, which is comparable to that achieved by far more massive, and very much more expensive, spacecraft. At the nominal orbit height of 685 km the swath width is 20 km. Solid-state recorders on board can store up to 32 Gbit of data and the X-band downlink can dump data to ground stations in Banting and Shah Alam at a rate of 30 Mbit/s. In addition to imaging instruments, *RazakSat* also carries technology demonstration equipment designed and built in Malaysia.

### The Orbit

The most commonly used orbit for Earth observation is the near-polar sun-synchronous orbit. The plane of an orbit inclined at exactly 90 degrees to the equator will remain fixed in space; all points on Earth will pass through this plane nearly 4 minutes earlier each day due to the Earth's orbital motion around the sun. By inclining the plane at about 98 degrees, the Earth's equatorial bulge causes the plane to precess eastwards at about a degree a day thereby offsetting the effect of Earth's orbital motion. The result is a sun-synchronous orbit where a point on the surface passes through the orbit plane at the same time every day. Inclinations to the equator are measured from the eastward direction and inclinations less than 90° result in a westward precession whereas higher inclinations lead to an eastward precession.

As well as the peninsular part of Malaysia situated between Thailand and Singapore, Sarawak and Sabah, in the north of the island of Borneo, are also part of Malaysia. The entire nation lies between latitudes one and 8 degrees north of the equator so a satellite in a sun-synchronous orbit would spend very little time each day in range of Malaysia. As tropical oceanic regions, especially hilly ones like Malaysia, are frequently cloud-covered, it was decided to use an orbit inclined at only 9 degrees. At this inclination the satellite passes the longitude of Malaysia every 100 minutes or so throughout the day thereby maximising the chances of cloud-free imagery. Of course, half the passes will be to the south of Malaysia but other countries in the region, and also in equatorial South America, have expressed an interest in using imagery from *RazakSat*.

### The Launch

The *Falcon-1* rocket stands 21 metres tall with a diameter of 1.7 m and has a fuelled mass of almost 28 tonnes. It was designed and built by *SpaceX* using private money, although the Pentagon has made



SpaceX's *Falcon-1* carrying *RazakSat* lifts off from tiny Omelek Island  
Credit: US Army SMDC

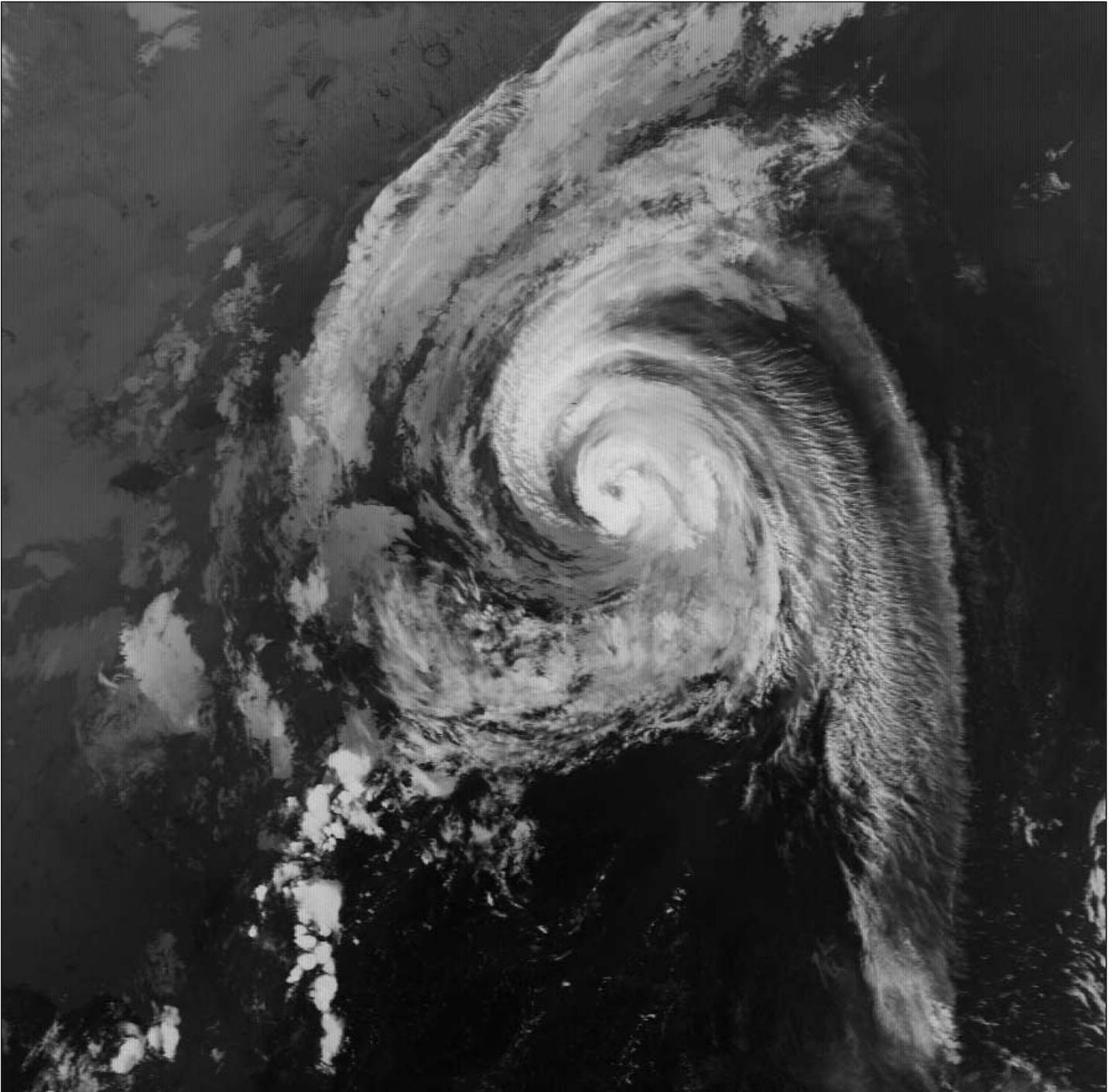
significant contributions to the development programme. The Department of Defense paid for the first two test flights (in 2006 and 2007) under a programme that evaluates new US-built launch vehicles. The first three flights all failed to orbit their payloads and as the Malaysian authorities insisted on a successful test flight before risking their spacecraft, *RazakSat* was not launched until July 14, 2009 following a successful test flight in September 2008.

The fifth *Falcon-1* flight, carrying *RazakSat*, lifted off from Omelek Island at 0336 UTC and the second stage rocket's first burn

took it to a parking orbit with an apogee of about 680 km. The second burn, followed by spacecraft separation, placed the spacecraft in a near-circular orbit slightly short of the planned 685 km. Omelek Island is one of several in Kwajalein Atoll in the US Marshall Islands in the North Pacific Ocean. The facilities in Kwajalein are operated by the US Army's Space and Missile Defense Command. The latitude of the launch site is close to 9 degrees, matching the desired orbit inclination, thus enabling a launch due east and thereby gaining maximum benefit from the Earth's rotation.



An onboard camera captures the scene as *Falcon-1* climbs towards orbit  
Photo: SpaceX



Keith Fraser sent GEO this August 23 NOAA-19 APT image of Hurricane Bill Keith wrote: "I was intrigued by the delicate cloud tracery of the east side of the storm. Considering that no visible light is involved—it's all heat—the fine detail is magnificent."

## Using a Netbook Computer for APT Reception

*Fred van den Bosch*

For my mobile APT station, I use a small receiver (R2FX) and a PITA antenna. This has now been supplemented by the addition of a *Samsung NC10* netbook computer with a 10.2 inch screen and weighing 1.3 kg. This appeared sufficient to run *WXtoImg*. [See photograph on page 37.](#)

However, the reception initially proved rather problematic: there were lots of lines on the recording but little recognisable

imagery apart from the sync-bars.

Because there is only a microphone input on this netbook, I thought that the volume setting must be too high. Adjusting the volume in the R2FX did help, but only a very little. Regulating the soundcard itself was the similar.

I was thinking of connecting an extra potentiometer between the receiver and the

netbook until I discovered a separate entry on the Realtek Audio Configuration screen. I saw on the 'Microphone' tab that the 'noise limiter' option was selected; deselecting it immediately resulted in the usual beautiful images.

I hope that this hint will save people time. It cost me a number of satellite passes before I discovered the cause.

# FEEDBACK

## The Column for Readers' Letters and Queries

email: [geoeditor@geo-web.org.uk](mailto:geoeditor@geo-web.org.uk)

Dear Francis,

I am responding to the question posed on page 40 of the June 2009 issue of The GEO Quarterly: 'How is snow kept off commercial satellite dishes?'

I worked for *Cable & Wireless* for six years and then for *Mercury Communications* in the UK for around three years. In this time I worked on the installation and operation of *Intelsat* Earth stations in various parts of the world. What follows is what I learned during that time.

### Radomes

The white protective radomes placed over some dishes can either be self supporting or be supported by the pressure of air blown inside to support the fabric. Advantages of this covering are :

- The dish is not exposed to the elements and so does not need constant attention for corrosion.
- Dishes have a maximum windspeed limit before they have to be stowed (with the dish pointing straight up, towards the zenith). In this configuration you cannot point at a satellite so your communications are down until the wind speed reduces. One of the early Marconi-made dishes I worked on had a maximum allowable windspeed of 60 mph (gusts) before it had to be stowed. The newer dishes I worked on (NEC) could go to well in excess of 80 mph—but I think they had to stop tracking and sit with the brakes on. Anyway, with a radome this would not be an issue so the dish would be able to continue to track a satellite in very bad weather.
- For a military dish covered by a radome, it is not possible to monitor where the dish is pointing or how quickly it is tracking—such information would give some orbital information away.

The disadvantage of a radome is that the material it is made from causes some attenuation of the transmitted and received signals. Rain on the radome can increase the received noise level as it means that the dish is looking through warmish water rather than at cold sky. My understanding is that radomes are kept clear of snow by circulating warmed air in the inside—but I have not worked on a dish with a radome—so perhaps someone else may be able to confirm this.

### Dishes in the Tropics

The dishes I worked on in the tropics had no de-icing, as it was not required.

### Whitehill

I worked briefly at the Whitehill site in Oxfordshire in the UK. This Earth station site is in an old quarry so gets quite cold and damp. The dish there had electric resistance heating attached to the reflector petals and also on the sub-reflector [1]. A warm air blower was used to keep the feed window clear of rain and snow. The heater and blower were located in the hub behind the dish and the warm air ran up a duct on the side of the feed.

The end of the duct fed a nozzle which directed the warmed air across the feed window, hence keeping it clear of rain or snow. Rain or snow sitting on the feed window causes higher background noise levels as well as attenuating the

transmit signals; thus you had electrical cabling on the rear of the dish to connect to the resistance heating panels. This site had a stand-by diesel-alternator set just for the de-icing, so it must have required a lot of power.

### Thameside

After Whitehill I moved to the Thameside Earth Station in the Isle of Dogs, London. The original Earth station used a *Marconi* 13 metre diameter dish fitted with a feed window blower (not heated) but no other de-icing. This blower was just to keep the rain off the feed window. This dish was used for traffic to the USA, when I was there, so had a fairly low elevation: 13.5° I think. When we had snow one year, we had to clean it out of the dish using a broom with a long extension handle: yes, very high-tech! But it did work. The low elevation meant that we could broom the snow out of the reflector while standing on the ground.

### Chicago

We worked an Earth station in Chicago, USA. They told us that they used a steam de-icing system on their dish. I understood steam was raised and then run through pipes on the rear of the dish to keep the snow and ice off. I guess, with the winters Chicago experiences, they needed a really heavy duty solution.

### Footnote

All the commercial dishes I have worked on were Cassegrain types, where the large reflector was made up of aluminium petals or panels. These dishes reflected the received signal to a sub-reflector; this is the small object which looks a bit like a *Smartie*, which is mounted on three or four legs sticking out of the front of the reflector.

The sub-reflector focuses the received signal into the feed horn, which is usually a tube which sticks out a little way at the centre of the dish, pointing at the sub-reflector. The end of this tube is covered by the feed horn cover or feed horn window. The feed horn is connected by a waveguide to the low noise amplifiers and the high power amplifiers. The waveguide is pressurised slightly with dry air to prevent the ingress of moisture (hence the need for the feed dome window to stop the air escaping.)

Regards  
David Williams  
Sydney, Australia

### Symposium 2009

Dear Francis,

I just had to write and say how impressed I was with this year's Symposium, held in Guildford. I thought it a great success, with a particularly interesting contribution from Gordon Bridge (EUMETSAT). I also greatly enjoyed David and Cecilia Taylor's account of their visit to the Antarctic, and of course it was wonderful to welcome the enthusiastic group from the Netherlands and hear about their projects.

All in all, a very good day.

Eric Dean



