

Experiences with reception and processing of direct broadcast FY-3A and FY-3B data

Nigel Atkinson

in memory of Ian D. Brown, who was to have co-authored this poster.

1. Data reception

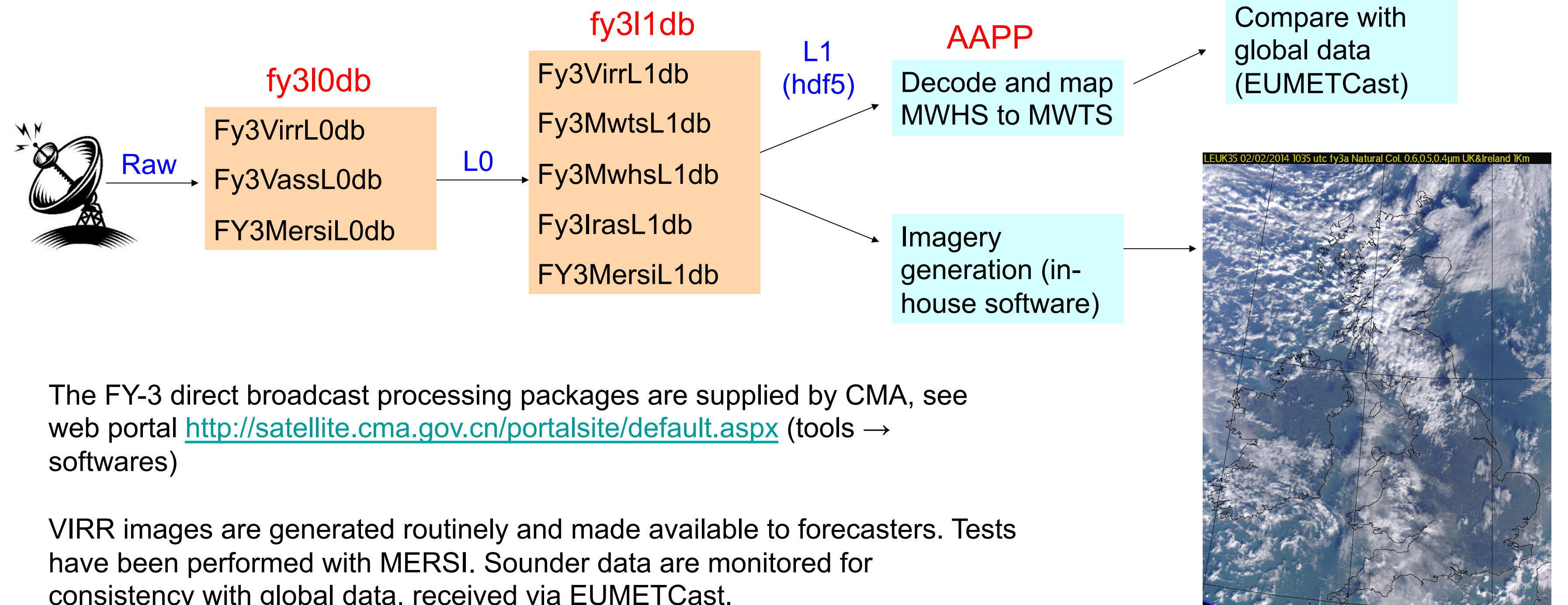
The two Met Office polar reception systems were upgraded in 2012 and 2013. Dish sizes are 3m and 2.4m. They now receive:

- NOAA HRPT (L-band), NOAA-15, 16, 18, 19
- Metop AHRPT (L-band), Metop-A, B
- Aqua and Terra (X-band)
- Suomi NPP (X-band)
- FY-3A and FY-3B (X band for MERSI or L-band for other instruments) currently normally configured for L-band



Figure 1. Upgrade of the Met Office direct broadcast reception facilities at Exeter HQ.

2. Processing chain for FY-3 data



The FY-3 direct broadcast processing packages are supplied by CMA, see web portal <http://satellite.cma.gov.cn/portalsite/default.aspx> (tools → softwares)

VIRR images are generated routinely and made available to forecasters. Tests have been performed with MERSI. Sounder data are monitored for consistency with global data, received via EUMETCast.

FY-3A is in a morning orbit (10 AM southbound local equator crossing time)
FY-3B is in afternoon orbit (2 PM northbound)

Figure 2. FY-3A VIRR true-colour image over UK.

3. Corrected reflectances for MERSI

University of Wisconsin have adapted their Corrected Reflectance software (crefl) for use with MERSI. However, with the standard fy3l1db setup the true-colour imagery colours are poor (Figure 3). Much improved when the data file `fy3l1db/SysData/DPPS_MERSI_Calibration_Parameters_F3B.cfg` is updated with new calibration constants (Figure 4).

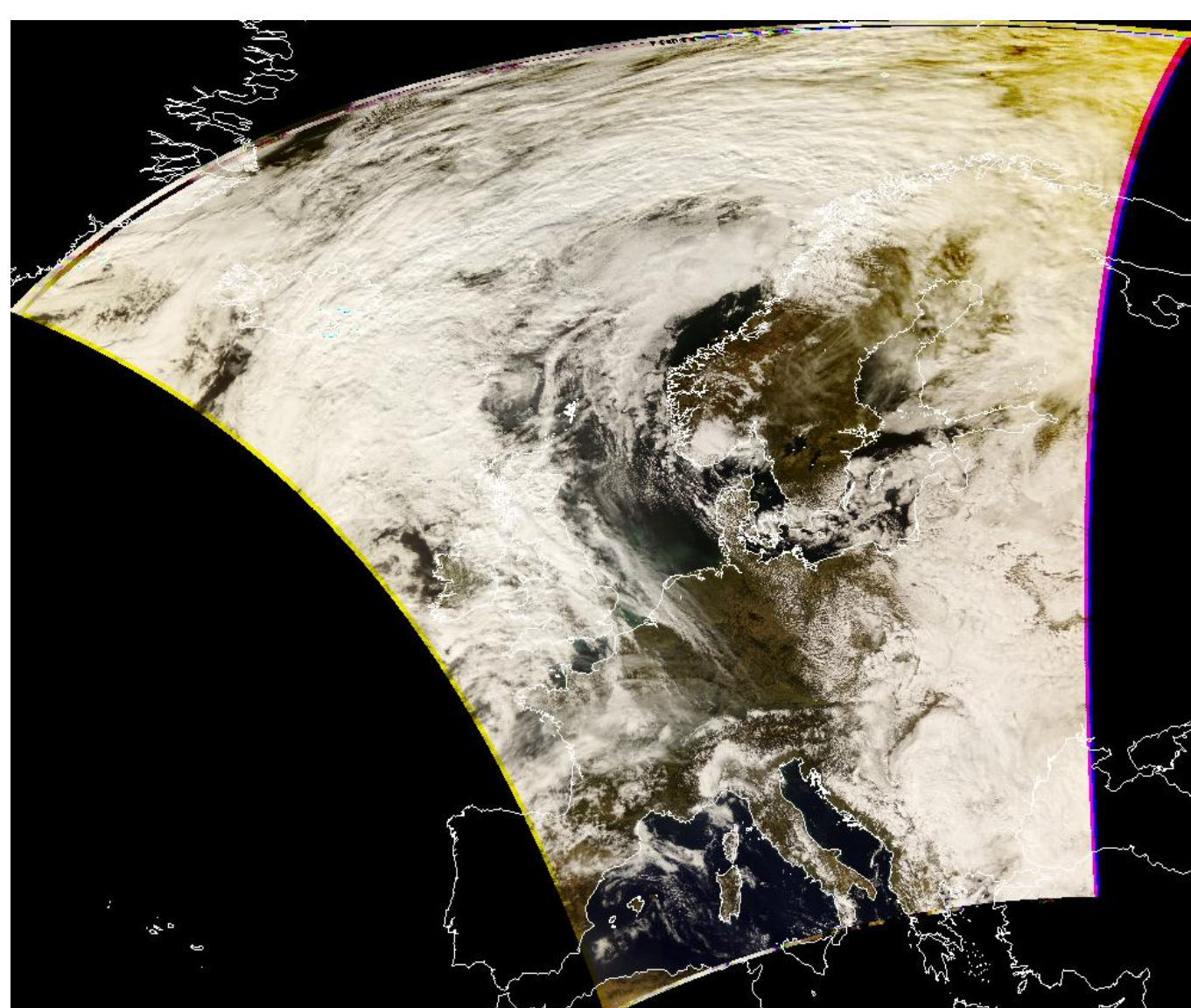


Figure 3. FY-3B MERSI true-colour image, using standard fy3l1db with UW's crefl software.

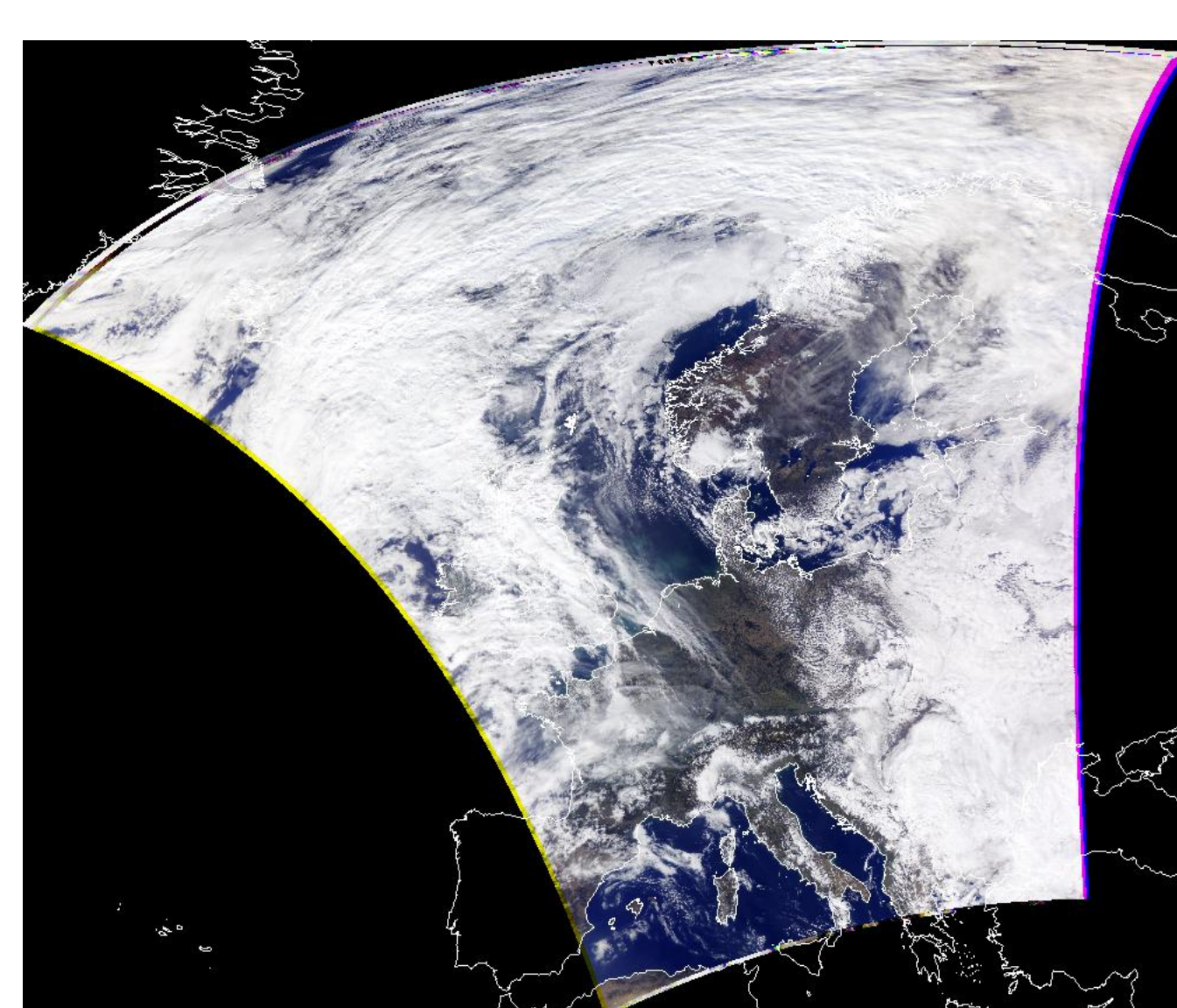


Figure 4. As Figure 3, but with updated visible calibration coefficients.

The new visible calibration coefficients were derived using the procedure given by Ling Sun et al., 2012, "Multisite Calibration Tracking for FY-3A MERSI Solar Bands", TGRS.

$$\text{Slope} = \alpha + \beta \text{DSL} + \gamma \text{DSL}^2 \quad \text{DSL} = \text{days since launch}$$

$$R = (\text{Slope} \times (c - \text{csp})) / \cos(z) \quad \text{where csp are the space counts (dataset SV_DN_average)}$$

For FY-3B, obtain α , β , γ from Web Portal data: attribute `RSB_Cal_Cor_Coeff` (not present in DB data)
For FY-3A, use the values from Sun et al. (2012)

4. Experiences with the VIRR imager

VIRR is a 10 channel imager, with 5 channels similar to AVHRR. Essentially the same instrument as MVISOR on FY-1 series (1988-2012).

In the CMA software, visible channel calibration coefficients have not been updated since 2010 – see definition of "refCalCoeff" in data files `FY3A_VIRR_CAL.XCONF` and `FY3B_VIRR_CAL.XCONF`. Updated values were substituted, using VIRR files downloaded from CMA web portal.

Reflectance correction (i.e. Rayleigh scattering) is not yet available in UW's crefl package, so we use uncorrected reflectances (e.g. Figure 2).

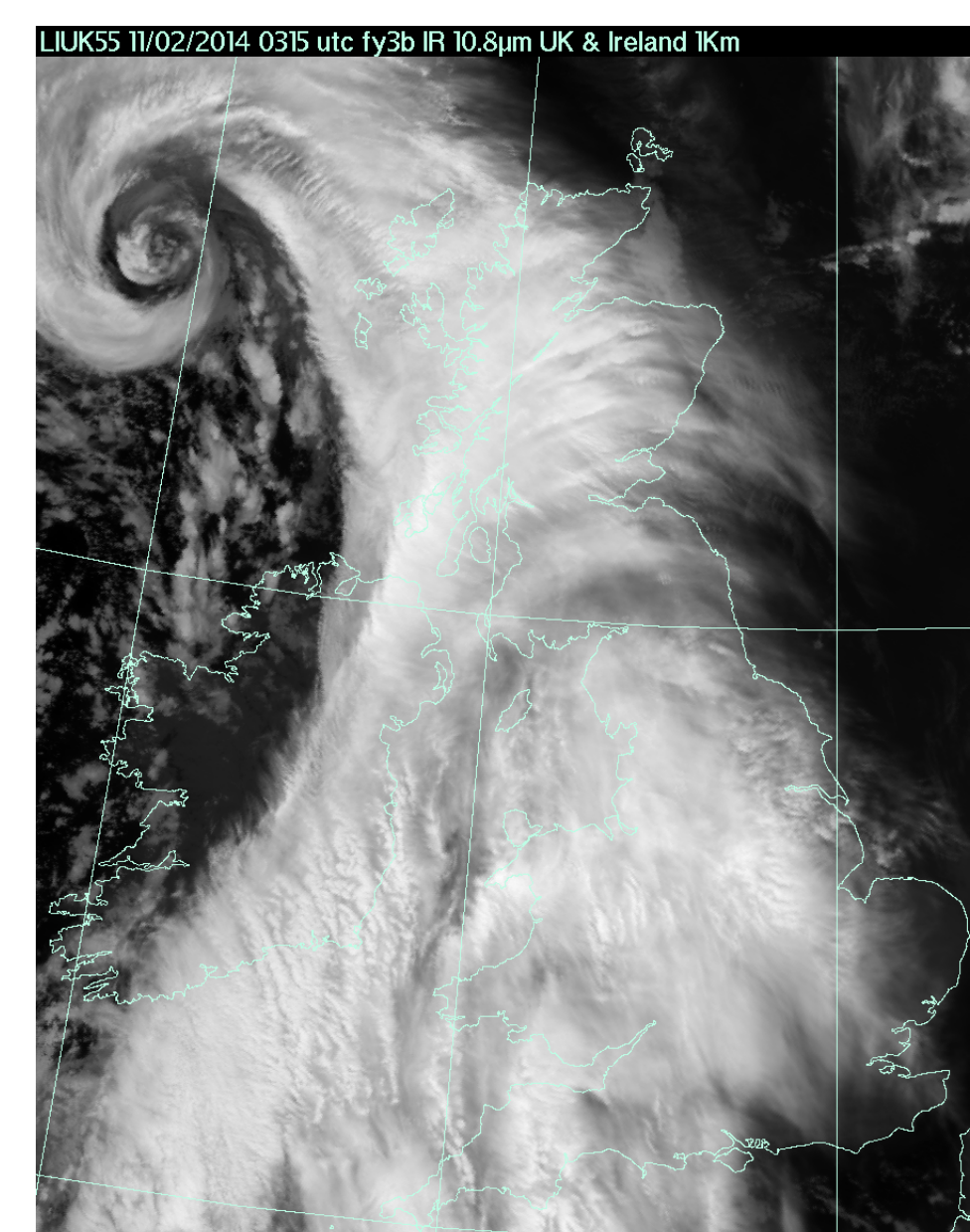


Figure 5. FY-3B 10.8 µm VIRR brightness temperature image over UK.

A range of visible and IR products are produced operationally, e.g. Figure 5.

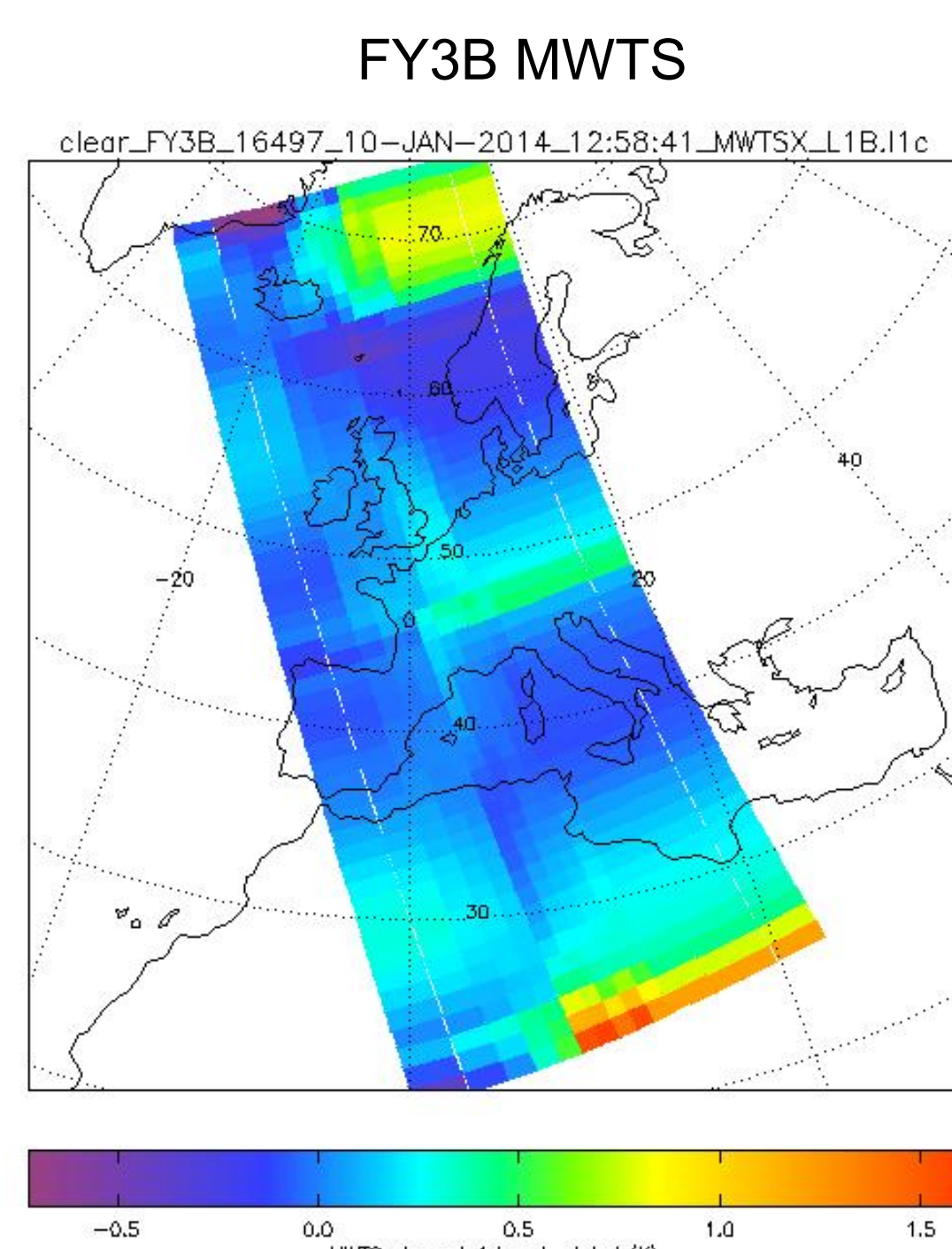
However, we have found that the 2-channel (10.8, 12.0 µm) volcanic ash product does not work for FY-3A or FY-3B, suggesting that the IR calibration is not as good as AVHRR.

For FY-3D onwards (2015+), MERSI and VIRR will be combined into a new 25-channel MERSI-2 instrument.

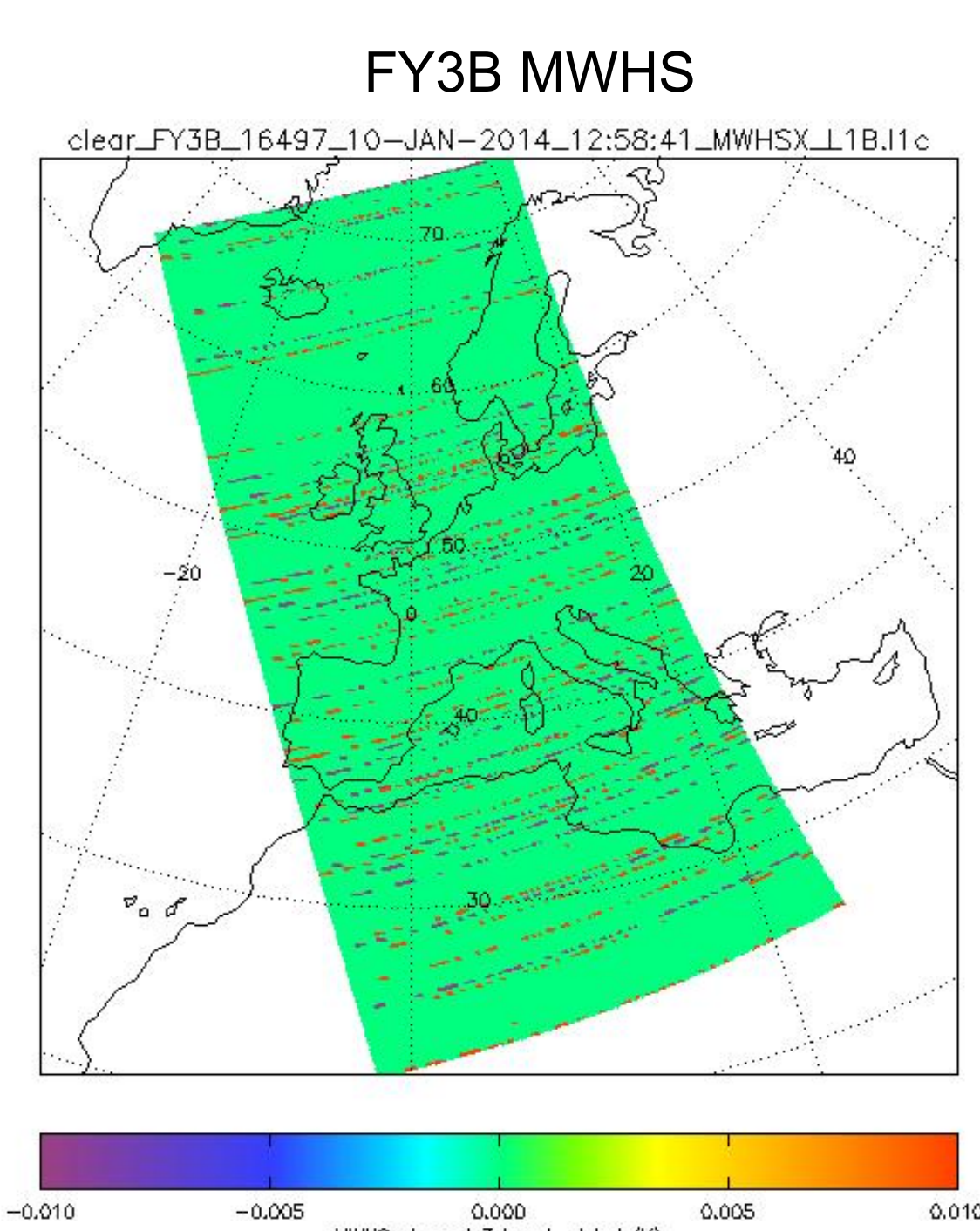
Note: The MERSI IR channel is not working on FY-3B direct readout (though OK in web portal data), so VIRR is the only source of FY-3B IR data.

Recommend that CMA provides a mechanism to update calibration constants, etc., in the DB package.

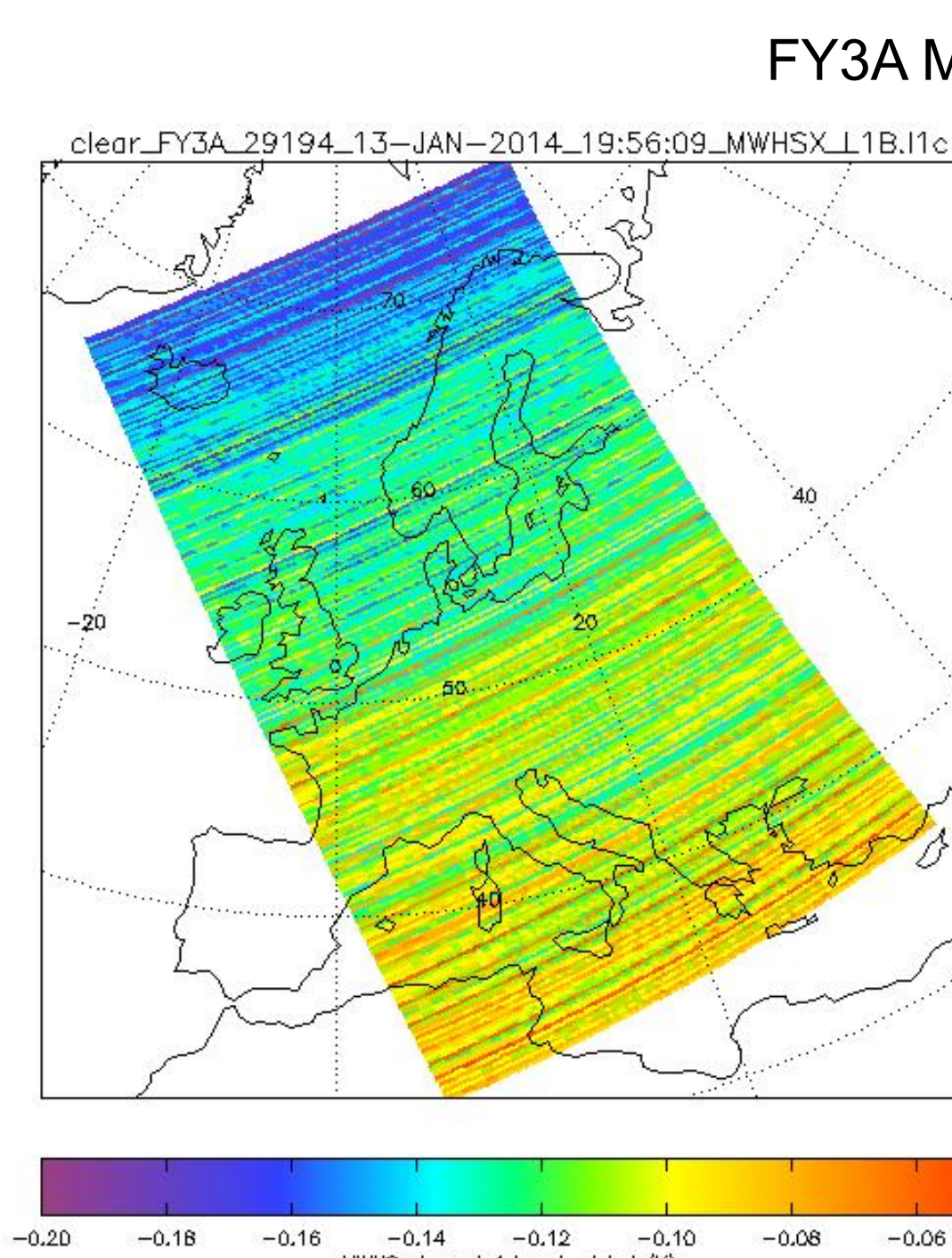
5. Microwave sounder data comparisons with global stream



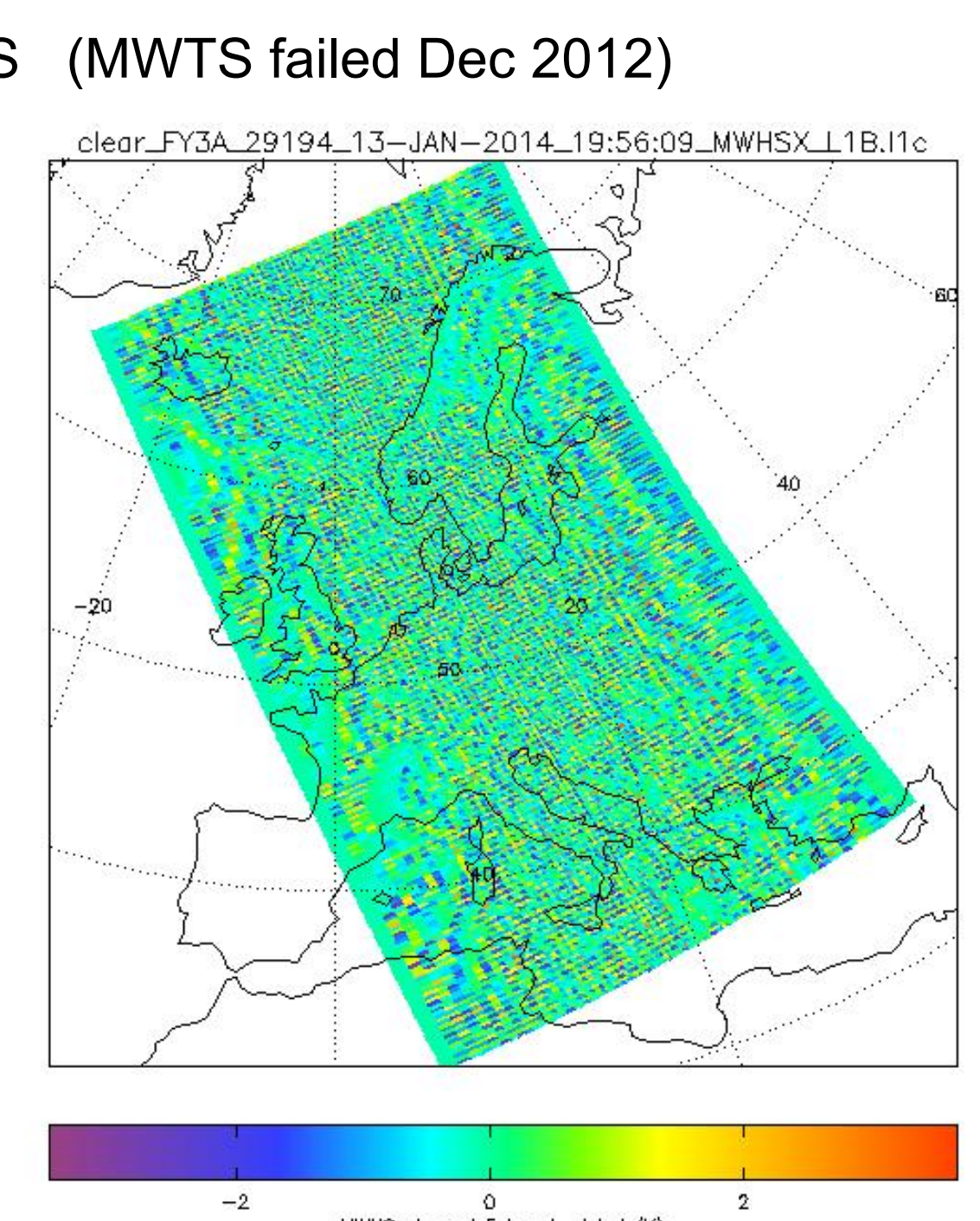
Poor consistency.
NB: Instrument scanner failed 10th Jan 2014



Excellent consistency



Channel 4: 0.12K bias and some striping



Channel 5: Some large discrepancies

Conclusions on local-global comparisons:

- Improvement needed if data are to be considered for NWP assimilation
- DB package not in step with CMA ground segment?

We look forward to evaluating the sounder data on FY-3C !

Acknowledgements: thanks to Willem Marais (UW) for the modified crefl software, and to Pascale Roquet (Météo-France) and Dave Wright (Dartcom) for providing test data.



Met Office FitzRoy Road, Exeter, Devon, EX1 3PB United Kingdom
Tel: 01392 885680 Fax: 01392 885681
Email: nigel.atkinson@metoffice.gov.uk