How MetService New Zealand uses satellite data

Wim van Dijk October 2013

The author, just before 3rd AOMSUC (November 2011). After a clash of heads in a football game.

Wim van Dijk

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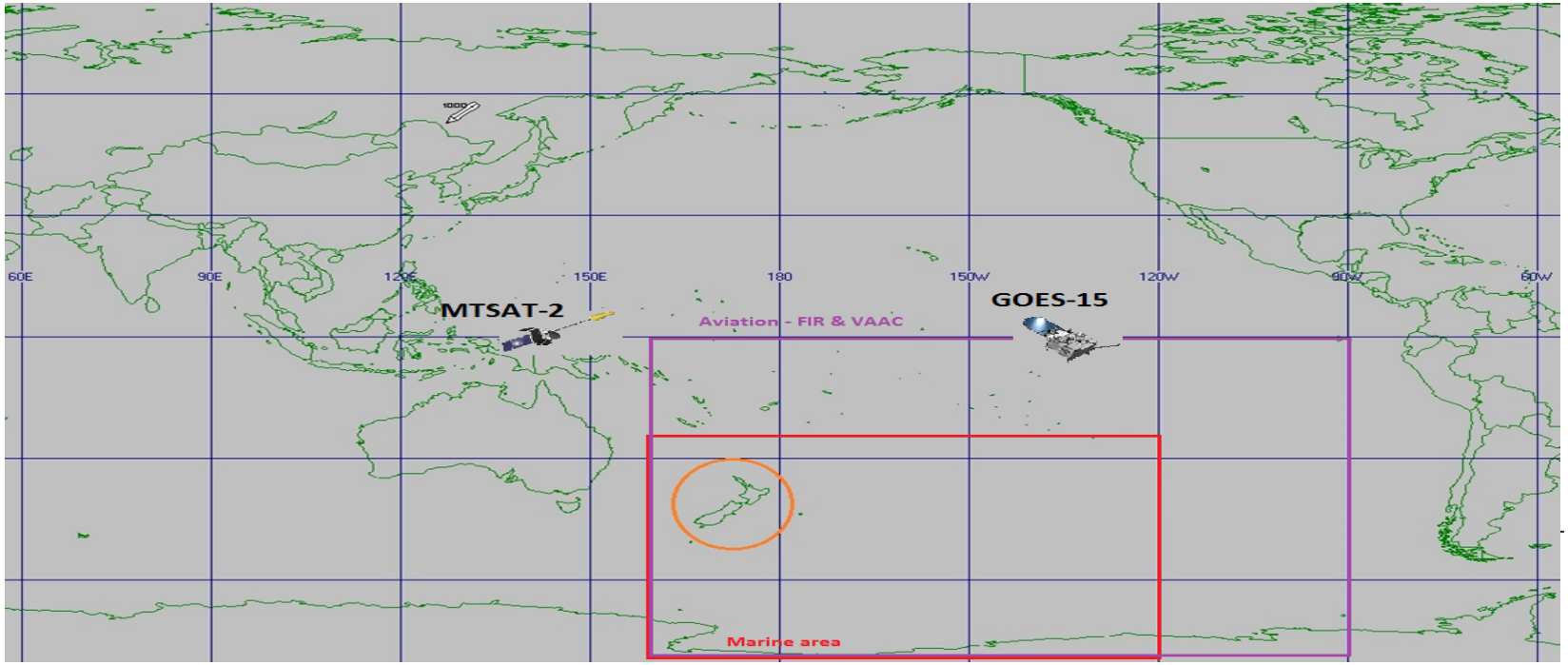
MetService

- National Meteorological Service (200+ staff, 50+ meteorologists)
- Forecasts/Warnings on behalf of NZ's Ministry of Transport
- Climate research and hydrological services provided by other agencies


Kelburn, Wellington

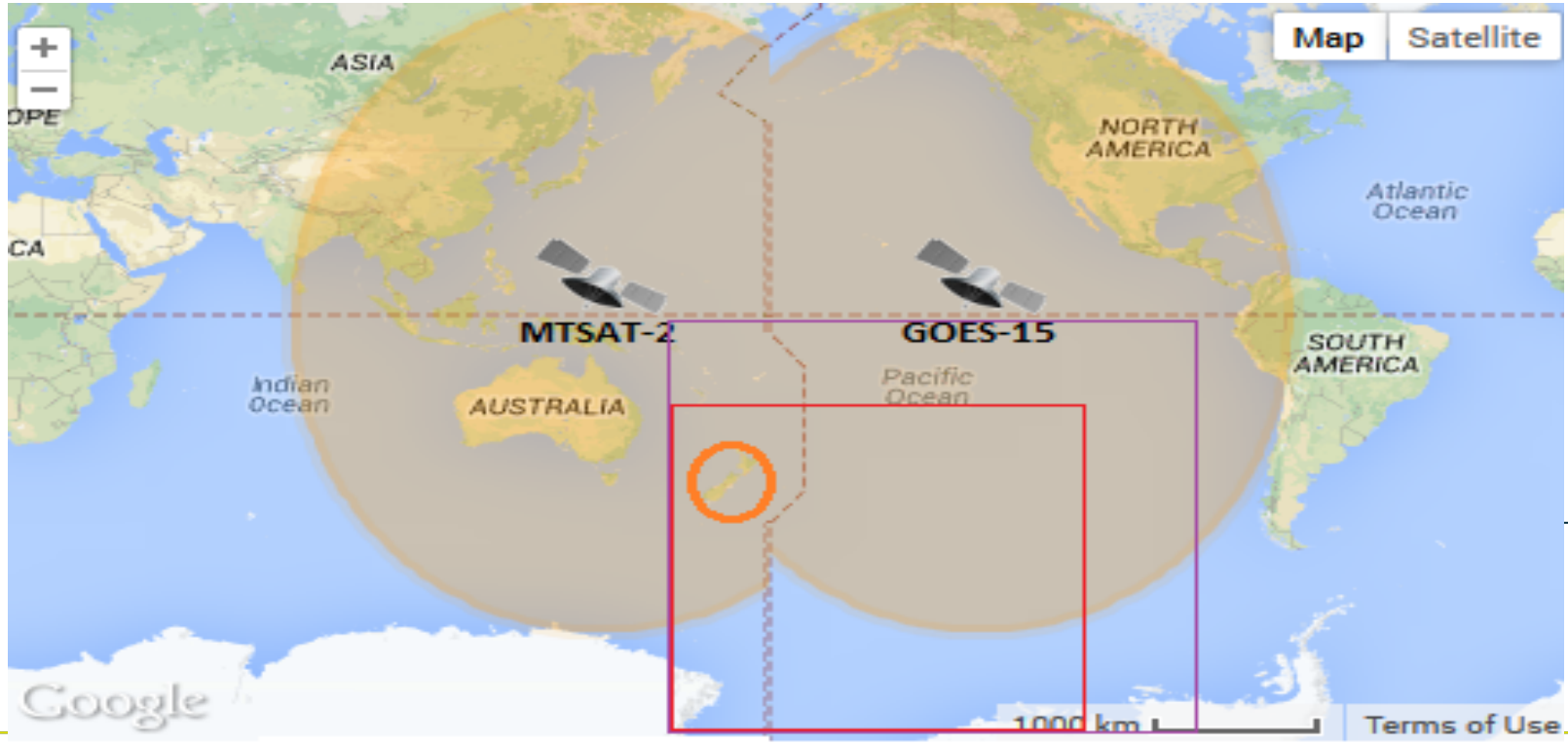
MetService

Where does MetService have to forecast for?



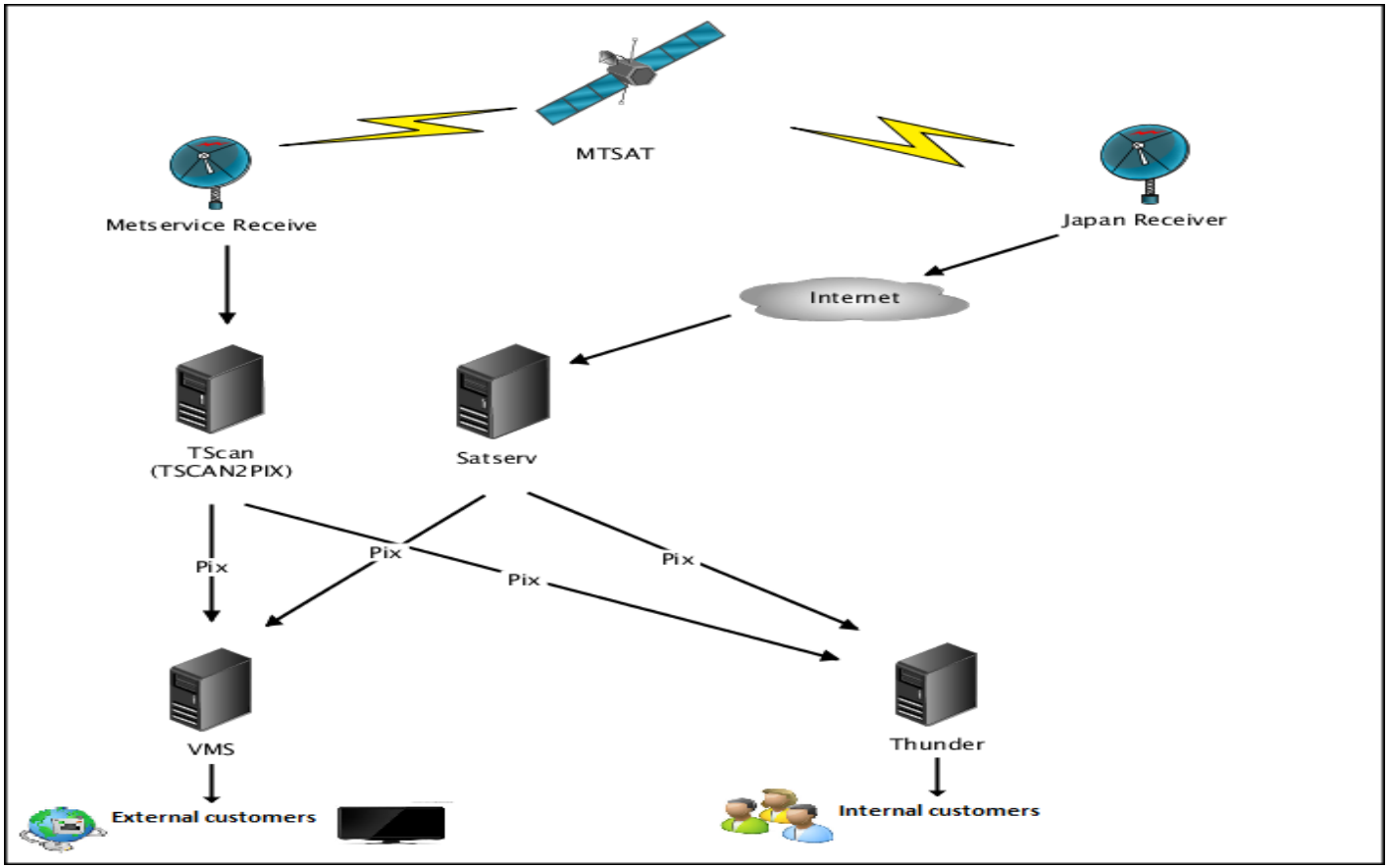
MetService

Geostationary Satellite Coverage For New Zealand Forecast Areas



How we ingest Geostationary Data at the moment

- The satellite that provides the most used data in our forecast room is MTSAT-2.
- We receive 0.7, 3.7, 7.5, 11, 12 μm data each hour via direct broadcast, and to provide some redundancy, we also get 11μm IR files from the JDDS service.
- The processing utilises Terascan on linux servers and product distribution uses OpenVMS running on HP Integrity servers.


MTSAT
Metservice Receive
Japan Receiver
Internet
TScan
(TSCAN2PIX)
Satserv
Pix
Pix
Pix
Pix
VMS
Thunder
External customers
Internal customers

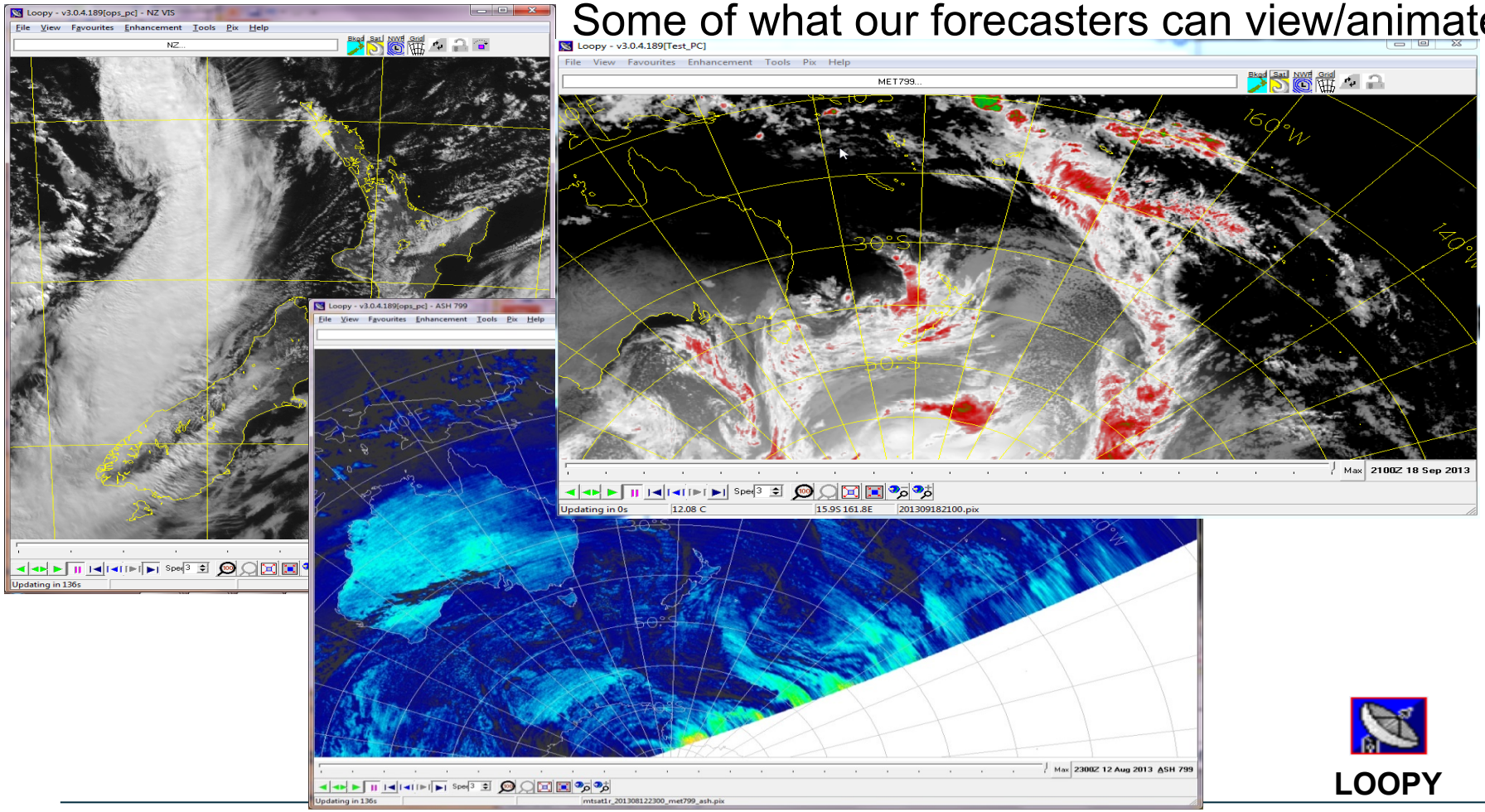
How we use MTSAT Data

Forecasters spend most of their time viewing animations of IR (11µm) and Visible imagery in our viewing application. The remaining channels are used for specialised forecasts, for example 3.7µm in fog detection.

Currently we don't often use Level 2 products such as RGB composites. However the 11-12µm "split window" is a vital part of VAAC operations and we combine NWP and IR imagery to produce a cloud-top-height product for airline customers.

A few products require imagery over the entire South Pacific. We use a MTSAT/GOES composite for those.

Some of what our forecasters can view/animate



LOOPY

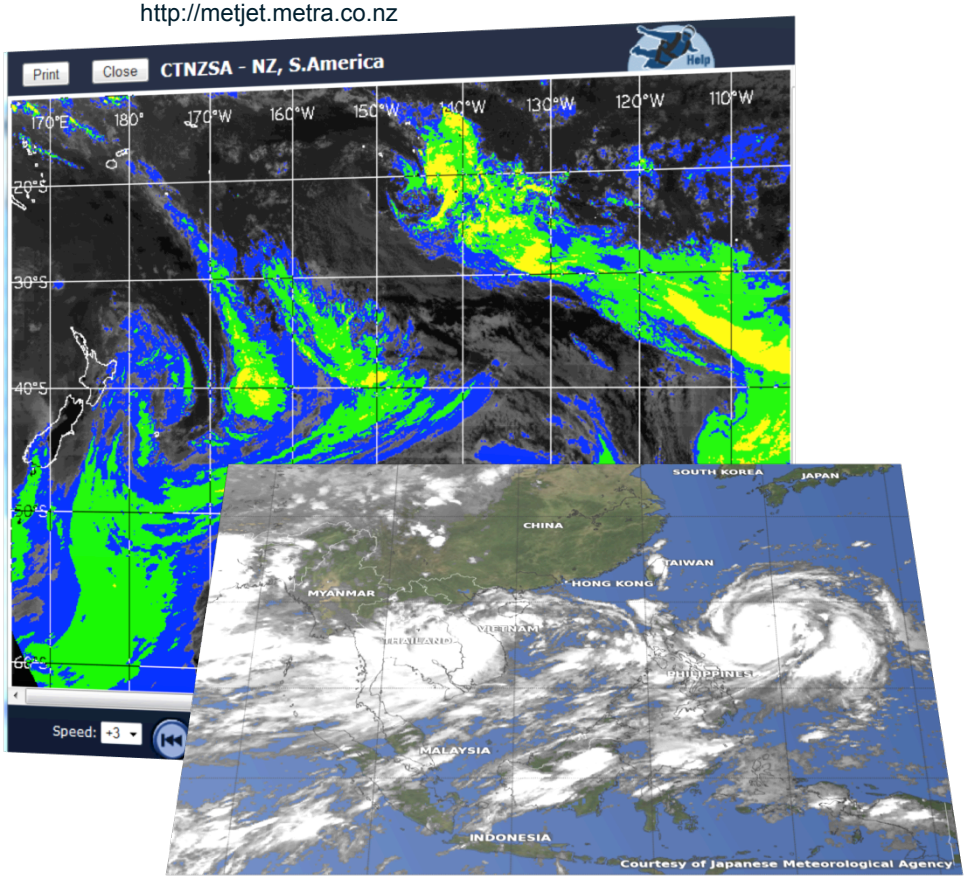
We also use MTSat data in TV products

… and on web sites

http://metflight.metra.co.nz/MetFlight.php

http://www.metservice.com/maps-radar/satellite/

http://metjet.metra.co.nz



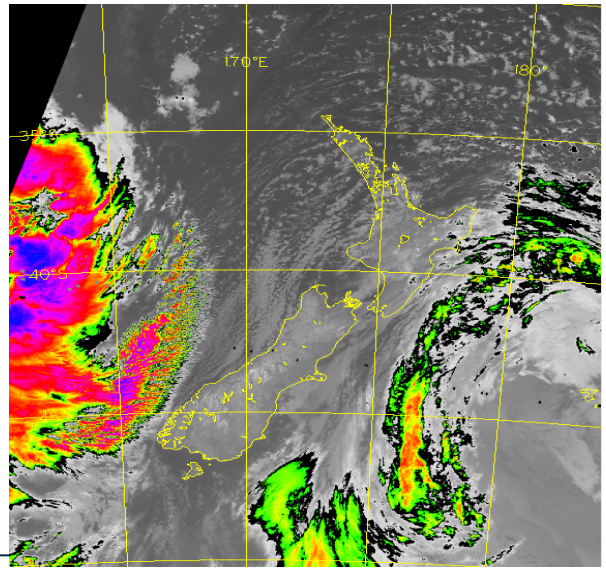
http://www.scmp.com/weather

Polar Orbiter Satellite Data at MetService

In 2011 our LBand polar orbiter hardware failed, so earlier this year we installed a new X/L band polar orbit receiver in Wellington which receives data from 8 sun-synchronous satellites. The return of this data has been very welcome for the forecasters and has helped aviation forecasting in particular.

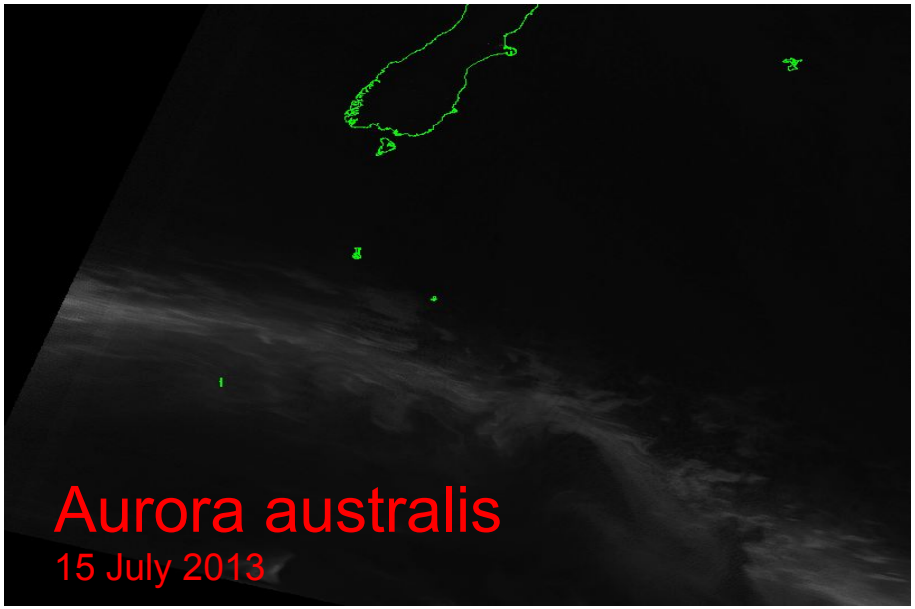
"Polar orbiting imagery has proven particularly useful in low cloud and fog events, more specifically in the onset and clearance times of marginal TAF criteria."

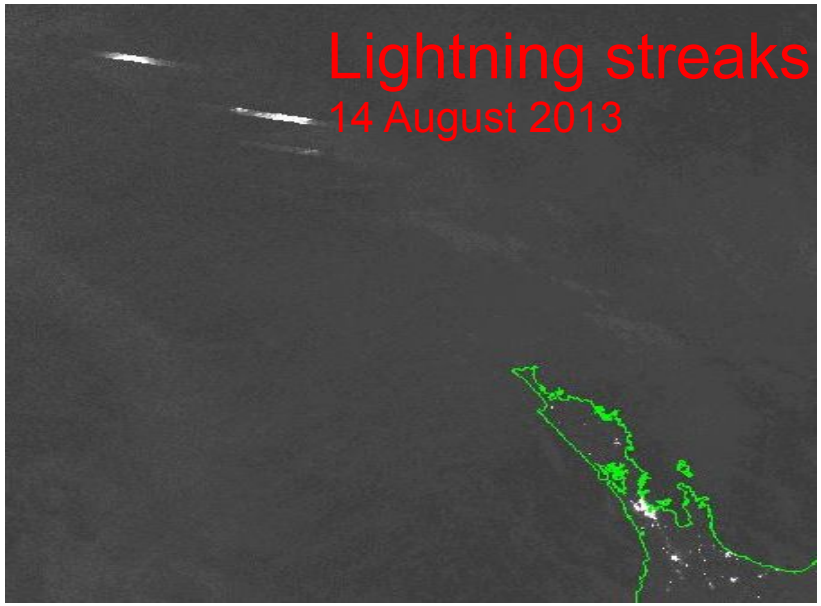
senior aviation forecaster



A couple of surprises in the Day Night Band data from Suomi NPP

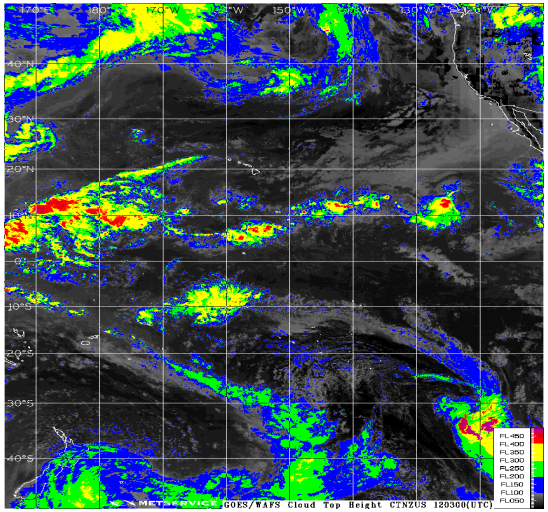
We are still learning the full extent of how we can use the XBand data





Other Geostationary Satellite Processing At MetService

- We also receive high resolution Meteosat and GOES grids, primarily for broadcast and aviation use.



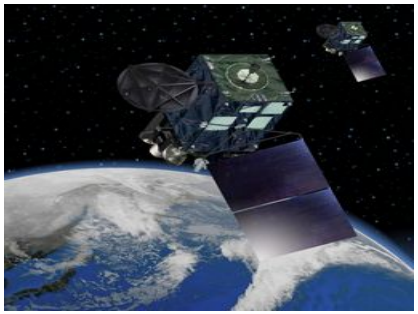
- GOES-W also provides additional coverage and backup for Pacific forecast operations. These products are not available quite as frequently as other satellite outputs.
- Sources are Met Office (Meteosat) and Weather Decision Technologies (GOES)

Satellite Strategy At MetService

Some themes:

- Data volumes are going to grow much faster than the number of forecasters. They will not be able to look at every Level1 product.
- In-house NWP is likely to become a significant consumer of satellite data
- Our computer infrastructure will have to be regularly upgraded. Current bandwidth, processing and storage aren't big enough
- A well-known and robust procedure is needed to provide access to archived imagery over selected projections and channels into existing processing and display systems.
- Operationally excellent ingest of geostationary imagery for anywhere of interest to our forecasters or our customers with minimal latency. This includes Himawari 8 and 9.

Himawari 8 – a big change for New Zealand



- We will have to invest in our IT infrastructure
- The change to Himawari 8 with higher geographical, temporal and spectral resolution is likely to affect forecast processes in significant ways.
- As stated previously, there is not enough time to view all the available imagery as radiances - our forecasting team will have to look derived products.

Himawari 8 – means different forecasts

The frequency of satellite imagery is becoming more similar to that for radar and surface based observations.

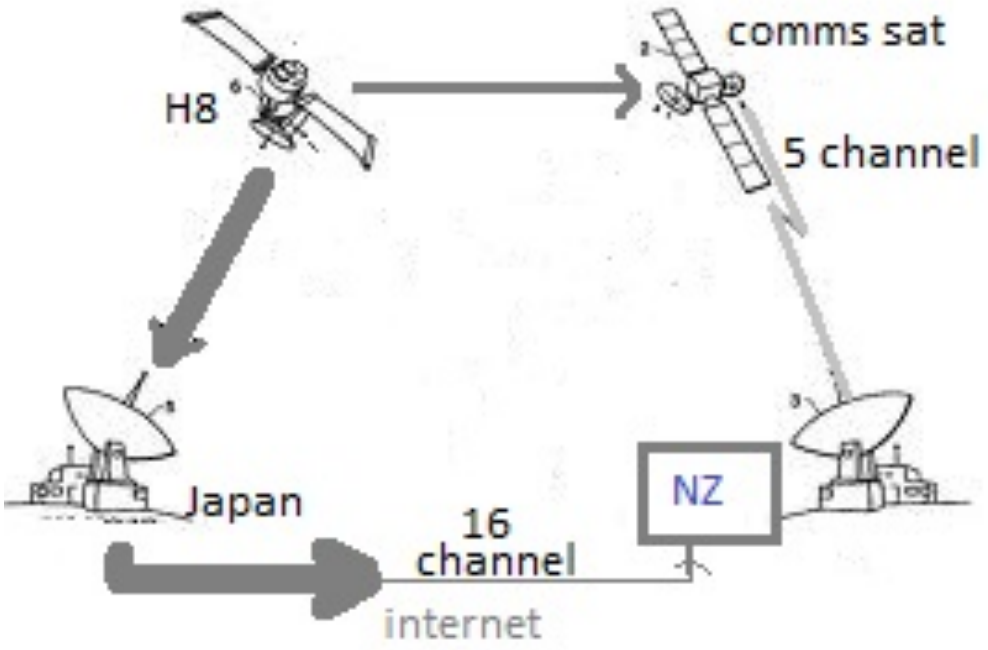
Data type	Update Frequency minutes 2013	Update Frequency minutes 2016
Surface observation	1	1
Radar	7.5	7.5
Geostationary Satellite	60	10
NWP	360	90-180
Ship observation	60-180	60
Polar Orbiter Satellite	140	120

This will have a profound impact on our forecast processes and what type of forecasts we develop

How We Want To Use Himawari 8

- Public and Aviation Weather Forecasting
  - Ingest the data at maximum spatial and temporal resolution for selected channels
  - Create level2 products useful in forecasting volcanic ash, fog and convective weather to examine finer-scale and rapidly evolving weather phenomena.
  - Ingest into NWP for specific products, for example volcanic ash dispersion
  - Access to old imagery for research and incident investigation
- Commercial:
  - Broadcast TV – hourly updates have been the norm, but this will change as traditional broadcasters move to become true multi-media providers. Minimum 30-minute updates in the next few years.
  - Mobile and web – developing area. Ultimately full high resolution 10 min, but infrastructure and data paths are not known yet. NZ, Australia, Asia.

Likely 2015 data flow for Himawari 8



- All channels available from internet
- 5 channels available from commercial communication satellite broadcast. Provides redundancy.
- Total bandwidth ~ **400GB/day**

Ideas For working with other organisations

- Compare and analyse level2 products between National Meteorological Services to ensure all data is effectively utilised.
  - ➢ Level2 product implementation for specialised services, eg. volcanic ash mass loading and ash cloud height products
- Use a common archive for old data.
- Help develop a web map service (WMS) for new data that will come from Himawari 8

Any Questions?