

The operational use of meteorological satellite data at the Meteorological Service of New Zealand

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Abstract

- Operational forecasting staff at the Meteorological Service of New Zealand Limited are required to produce forecasts to tight deadlines. Forecasters are therefore required to be efficient in their use of all meteorological data, including satellite products. This paper illustrates
 - how New Zealand forecasters use satellite products,
 - which tools provide the most benefit, and
 - why some products are more useful than others in the New Zealand context.



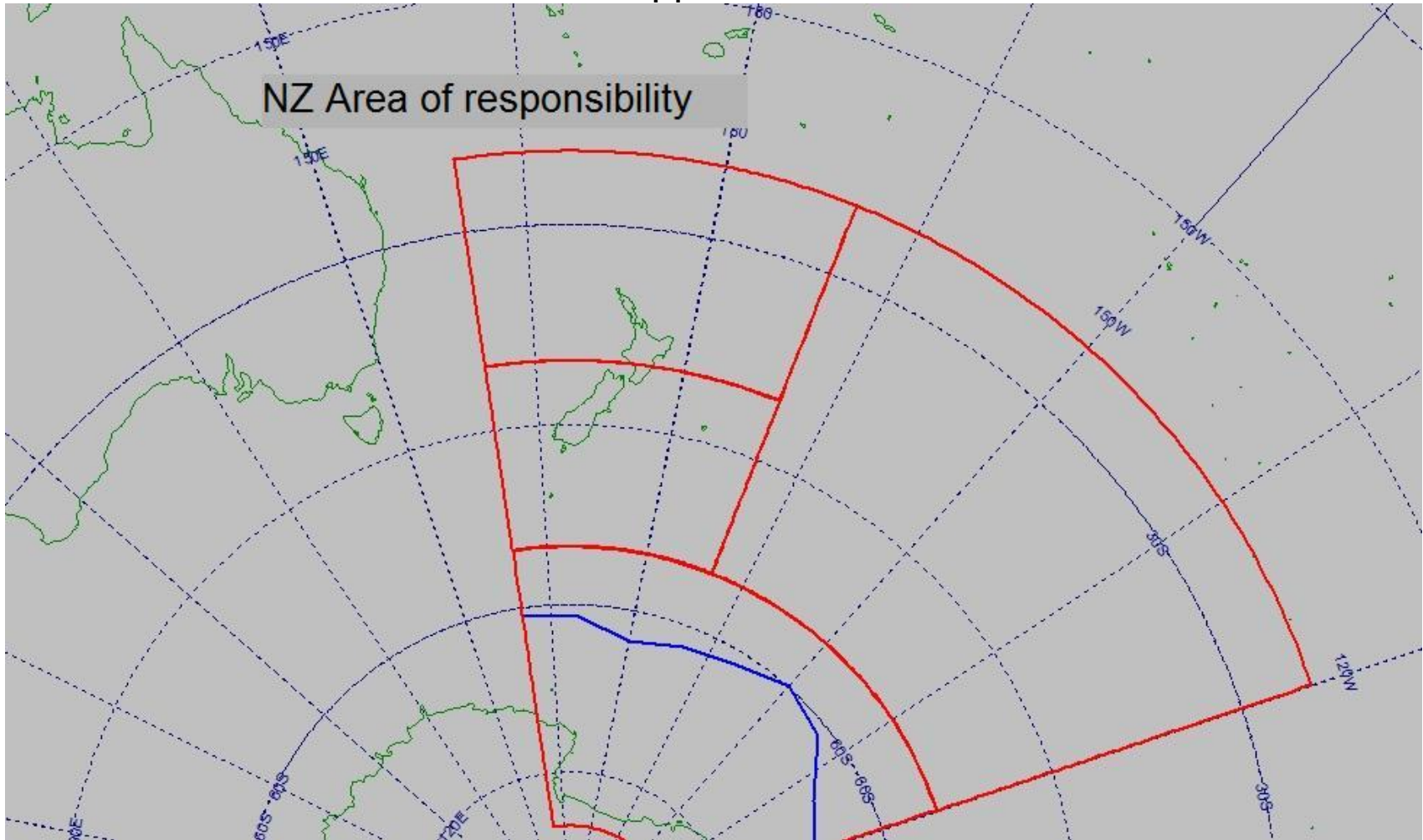
Operational Forecasting in New Zealand

- We have been using satellite products for 25 years.
- During that time technological and infrastructure advances have increased the frequency and quantity of incoming data.
- Since much of New Zealand is in the “roaring forties” the weather is highly changeable, and our organisation has changed it's products as well. We now put more effort into short range forecasts, sometimes as little as an hour ahead.



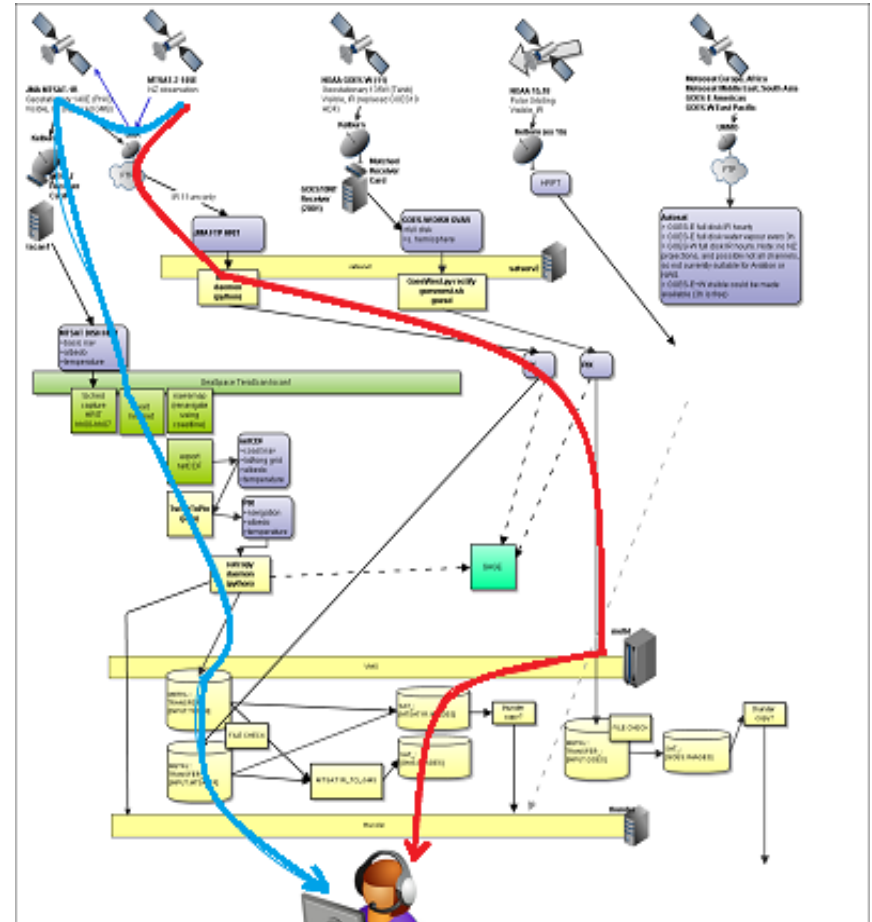
Where Meteorological Service of New Zealand operates.

We need to see around NZ and approx 1/8 of the worlds oceans



How we get Satellite products

- MTSAT is most important to us because of its regularity. We receive it via two data paths
 - direct broadcast
 - FTP site
- Having two robust data paths has been useful during eclipse events. It is also important in our Disaster Preparation plans.



Antennas.

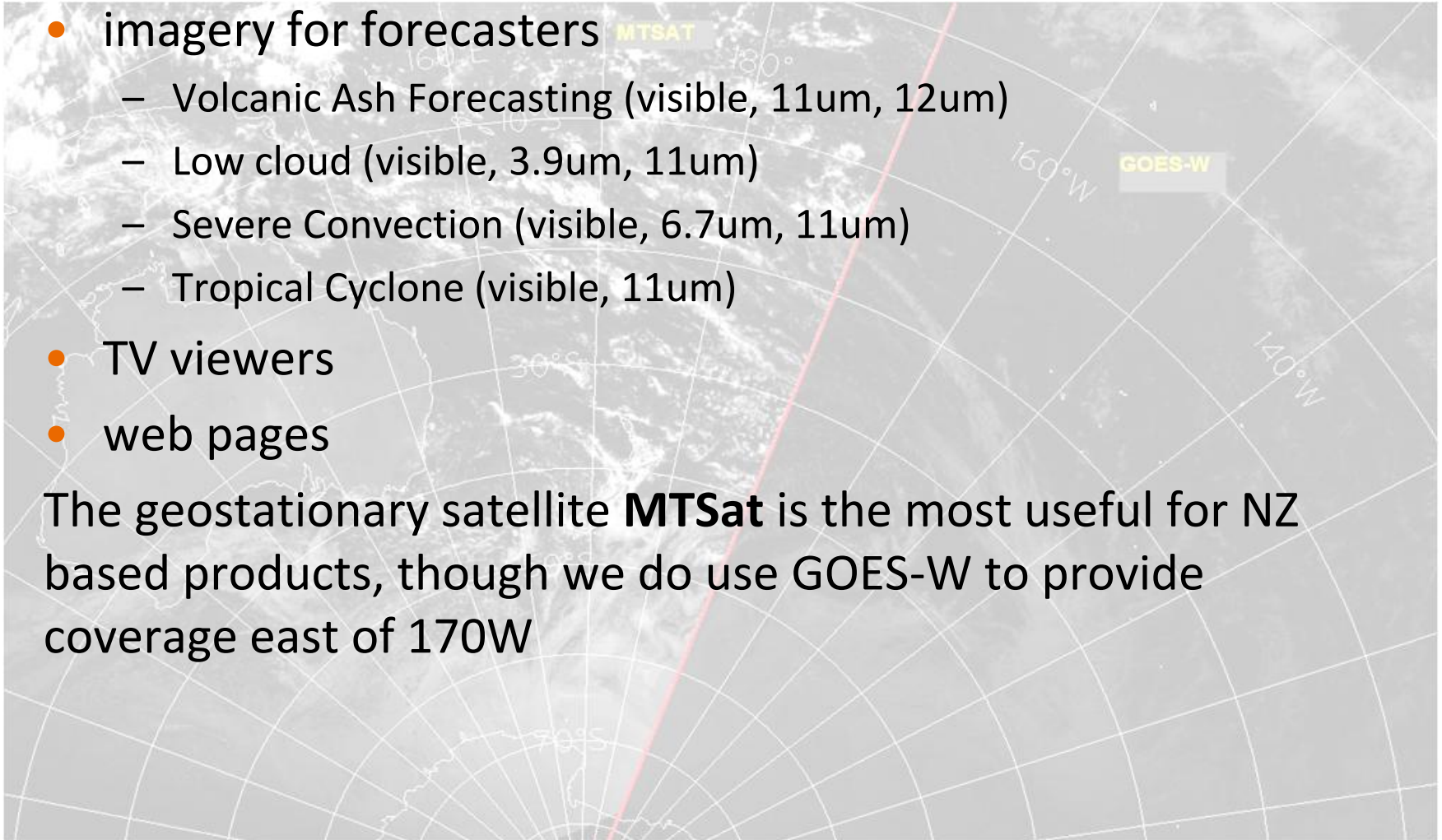
- The number of satellites that we track from our roof antennas is slowly decreasing as internet feeds take over



Where satellite products are used

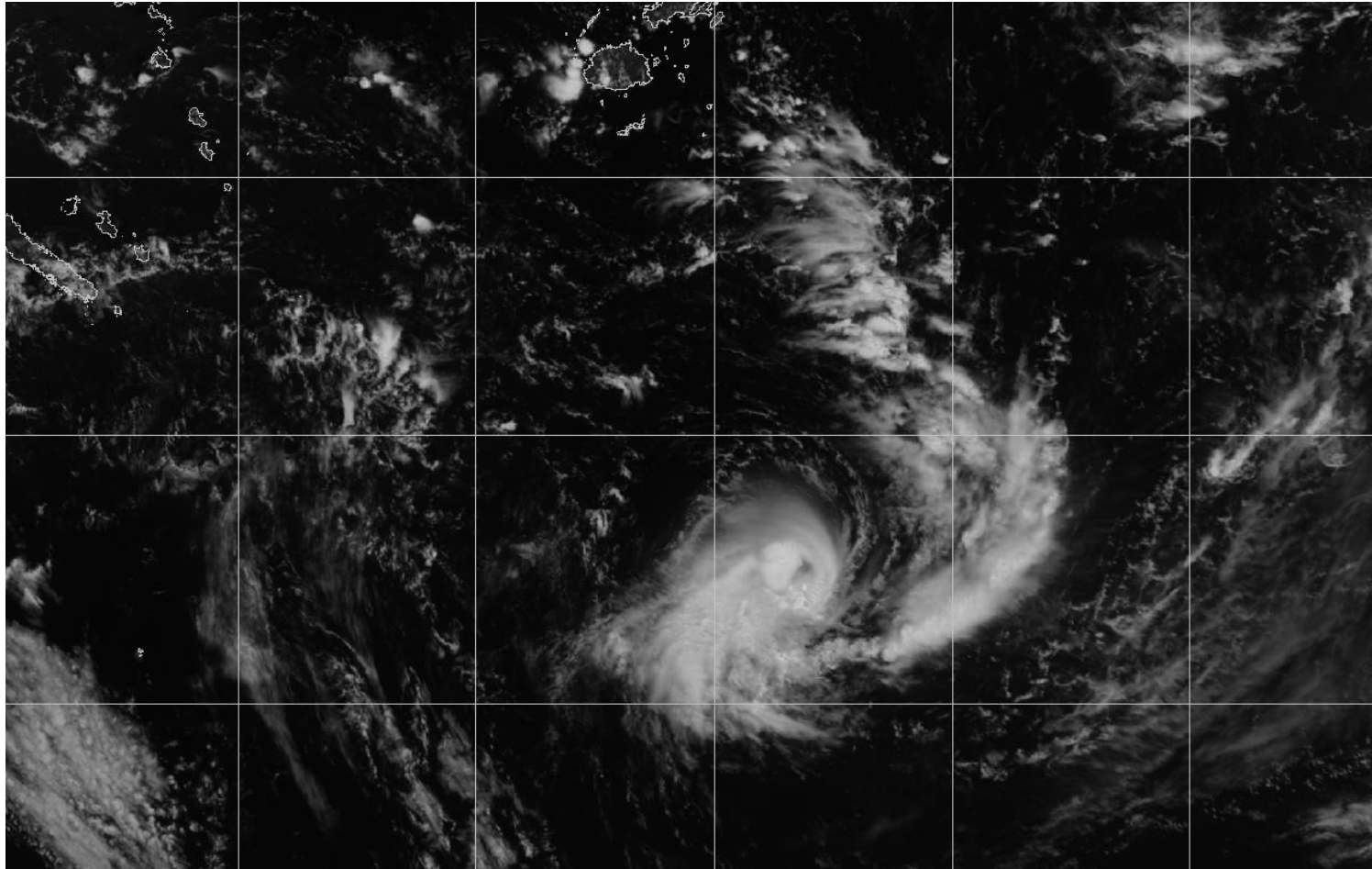
- imagery for forecasters
 - Volcanic Ash Forecasting (visible, 11um, 12um)
 - Low cloud (visible, 3.9um, 11um)
 - Severe Convection (visible, 6.7um, 11um)
 - Tropical Cyclone (visible, 11um)
- TV viewers
- web pages

The geostationary satellite **MTSat** is the most useful for NZ based products, though we do use GOES-W to provide coverage east of 170W



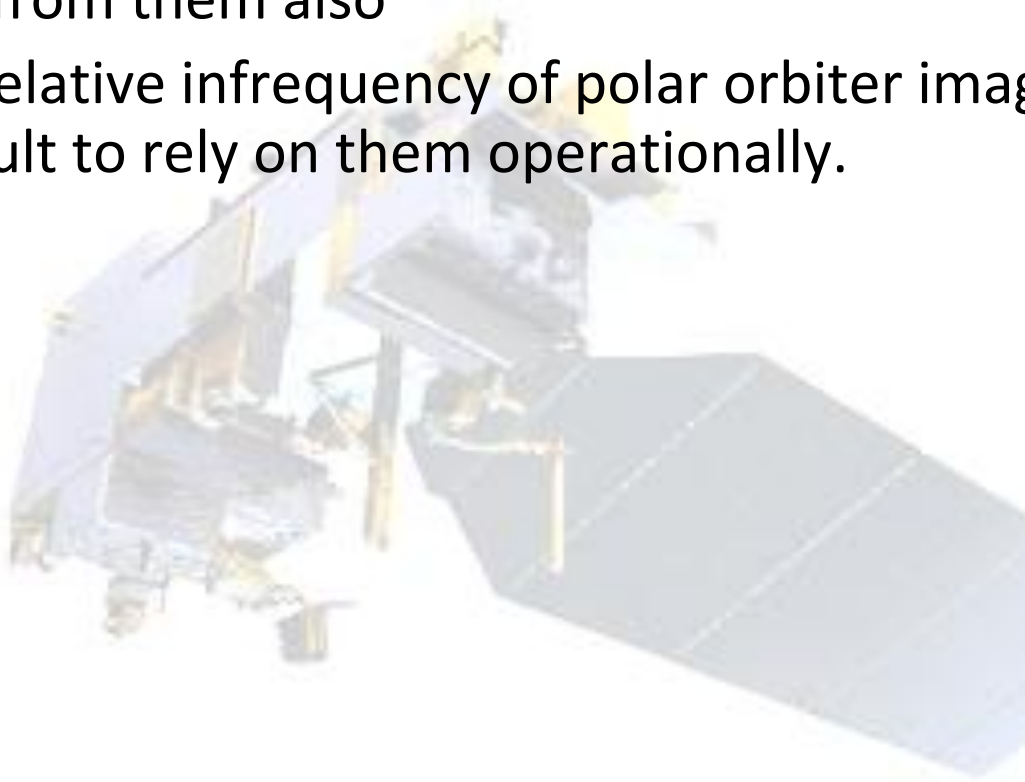
High resolution satellite imagery.

Vital in nowcasting, for example tracking Tropical Cyclones December - April



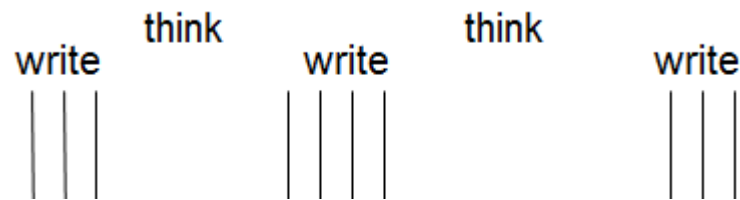
Polar Orbiters.

- We have just started getting NOAA imagery from a NZ research organisation, NIWA and have plans to get MODIS data from them also
- The relative infrequency of polar orbiter images makes it difficult to rely on them operationally.



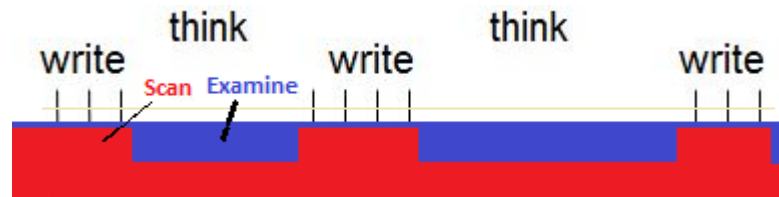
Forecast “rhythm”

- We try and allow for a period of thinking time before one or more forecasts are issued. This leads to alternate periods of thinking and then very busy forecast writing. Typically the thinking period is 15-20 minutes long and then forecasts are due during the following 20 minutes.



Forecast modes

- Forecasters use incoming data in two thought modes:
 - “**Scan**”- checking that the weather is following our conceptual model of the atmosphere. This is the most common way of thinking in our forecast room, especially when writing forecasts.
 - “**Examine**” – if some aspect of the weather is not behaving as expected then we look into this in detail and possibly adjust our conceptual model. Mostly this is done **between** bouts of forecast writing.



- The prevalence of “scan thinking” means that forecasters are always glancing at their visualisation tools looking for updates. **Scan thinking works best if the incoming data is updated about every 15 minutes.**



Update frequency of different forecast data

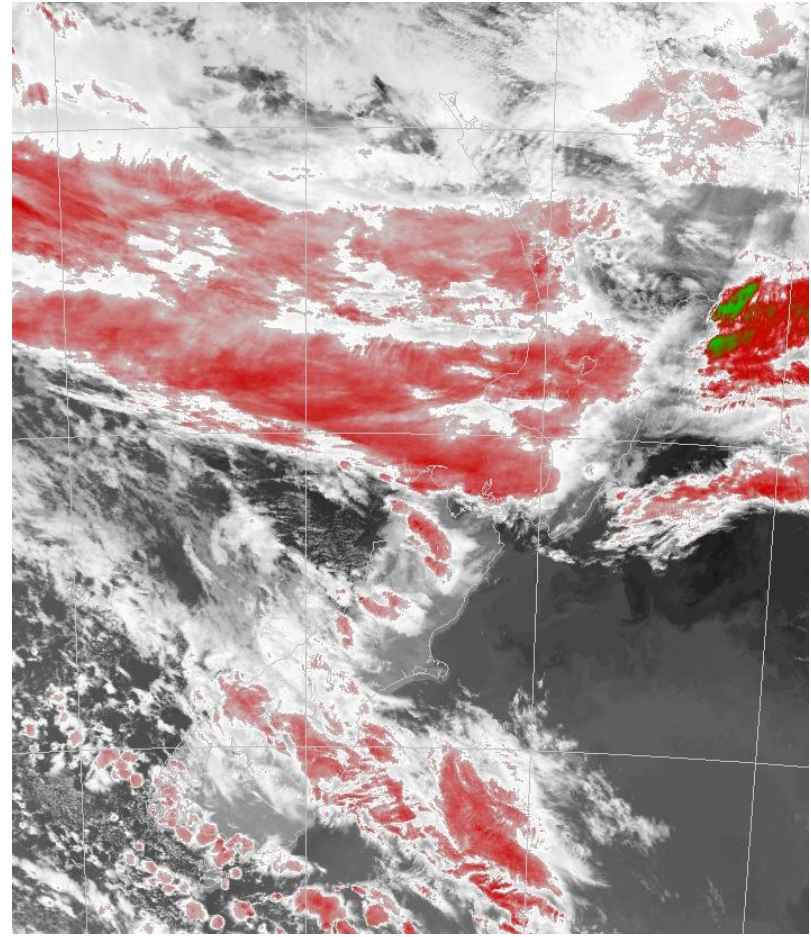
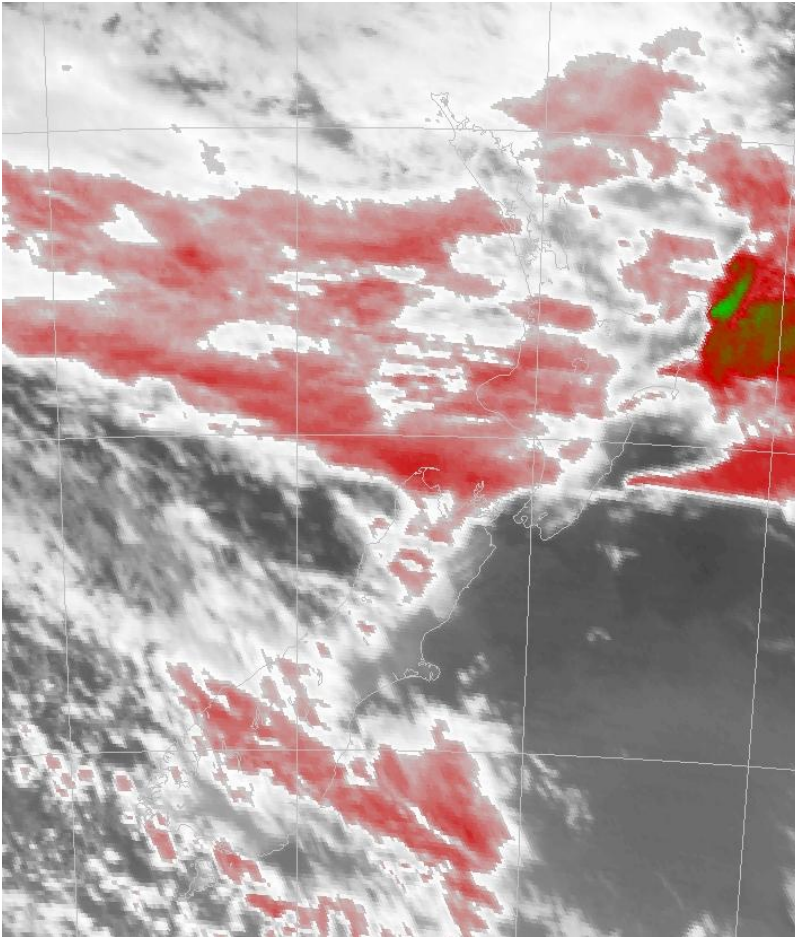
Data type	Minutes (2011)	Minutes (2015)
Surface observation	1	1
Radar	7.5	7.5
Geostationary Satellite	60	10
NWP	360	180
Ship observation	180	180
Polar Orbiter Satellite	240	240

- The fact that the next generation of JMA geostationary satellite will have an update frequency which is less than 20 minutes has large implications for the workflow in our forecast room. Forecasters will be able to use satellite imagery in a similar way to radar and observations because of their update cycles are compatible with our product deadlines.

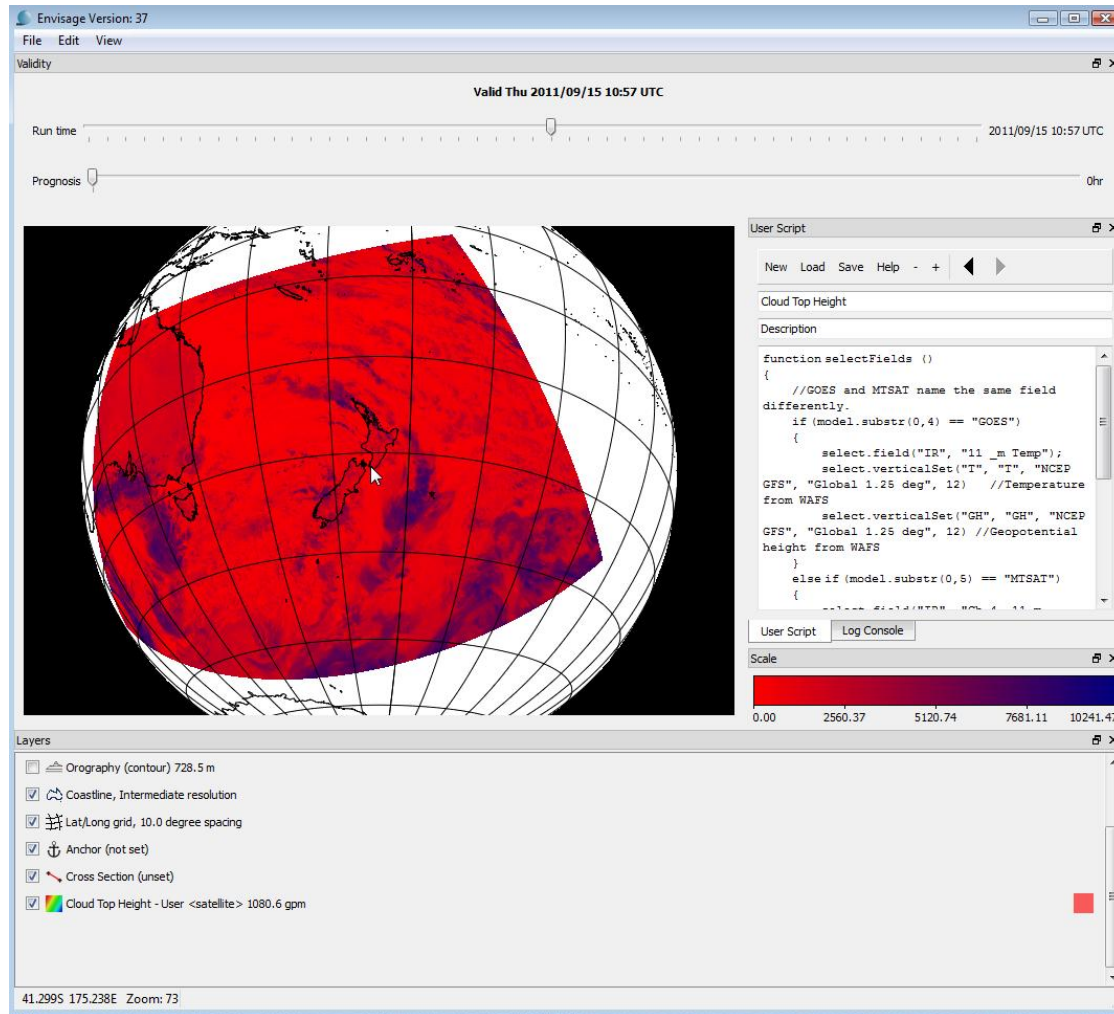


In scan mode we use a *fairly* simple animation tool.

Where possible we merge polar orbiter and geostationary imagery to save forecaster time. This has been done in the frame on the right



In examine mode we use a slow but powerful application which allows channel differencing and scripting



Conclusion

- Our forecast operations are increasingly geared towards producing forecasts rapidly, and updating them rapidly.
- This has led to a reliance on radar and observation data above satellite, so we welcome the change to 10 minute scans from Himarwari-8.
- It is equally important that our organisation can obtain satellite data with minimal latency.
- Recent earthquakes in New Zealand mean that we are still keen to maintain two paths for satellite data to the forecasters.



The Author

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- WMO/WIS/GTS
- Interaction NMS to NMS
- NWP contracts with global providers

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