Use of Satellite Products for Weather & Environmental Monitoring in Singapore

2nd Asia/Oceania Meteorological Satellite User Conference

Tokyo, Japan

6 - 9 December 2011

Chiam Keng Oon

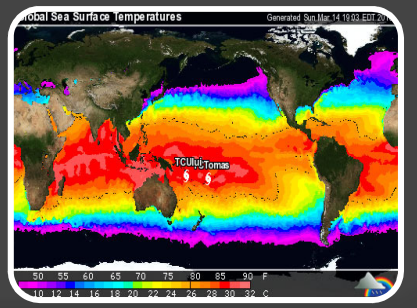
Meteorological Service Singapore

National Environment Agency

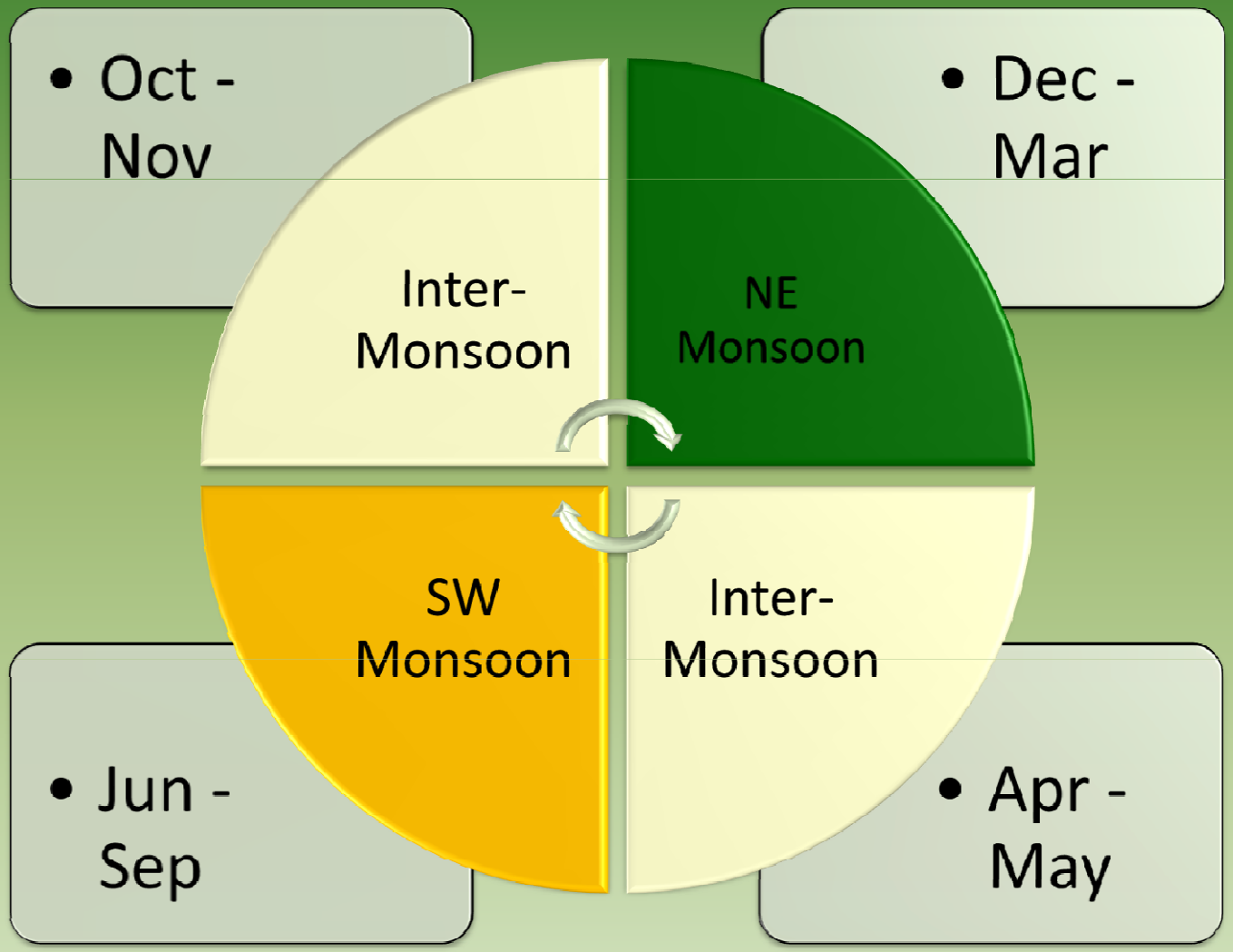
Our Environment · Sustain and Enjoy

SCOPE

- Overview of Weather and Climate of Singapore
- Satellite reception systems in Meteorological Service Singapore (MSS)
- Usage of satellite data and products
  - Weather Forecast
  - Aviation Monitoring
  - Environmental Monitoring
- Future Plans



Overview of Weather & Climate of Singapore



Climate of Singapore

- Monsoon onset determined by prevailing wind direction
- Onset timing varies from year to year

Weather System in Singapore

Convective Thunderstorms

- Common throughout the year

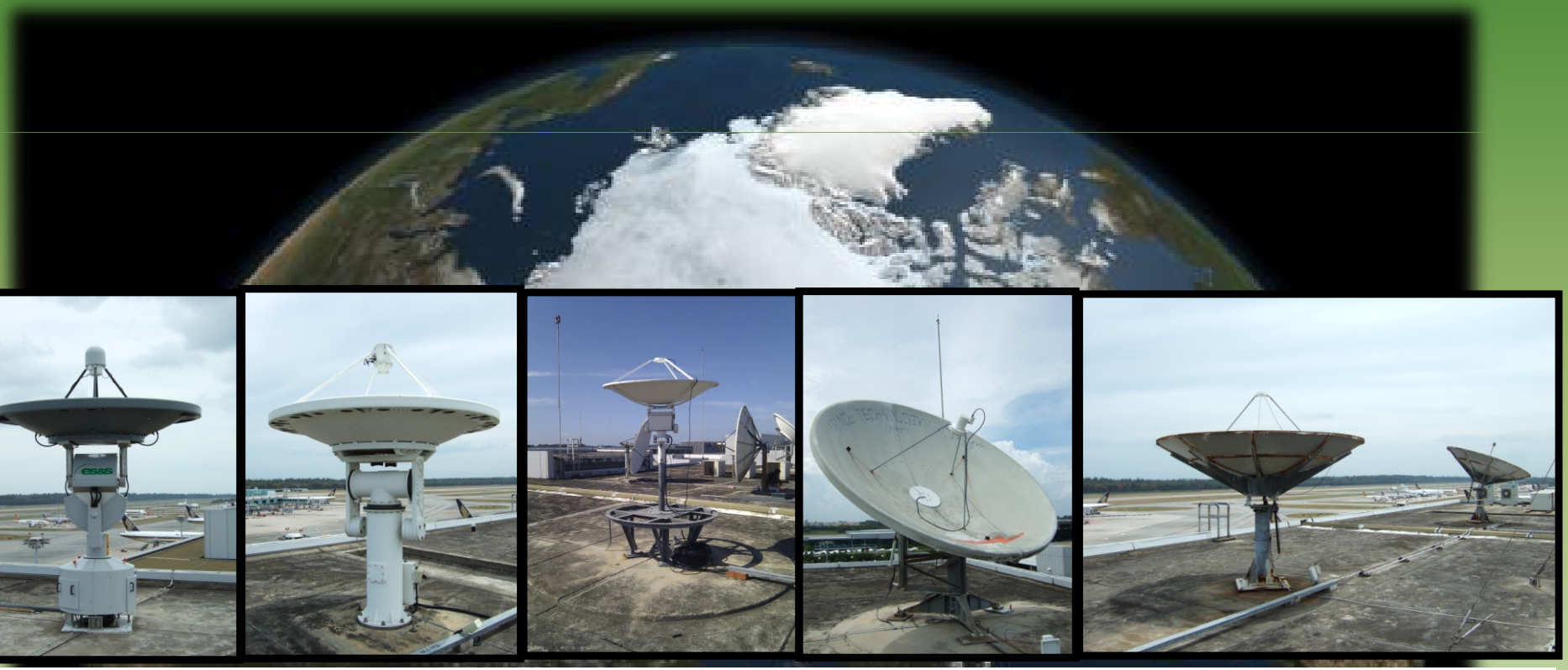
Squall

- Organised line of thunderstorms
- Common during SW Monsoon

Monsoon Surge

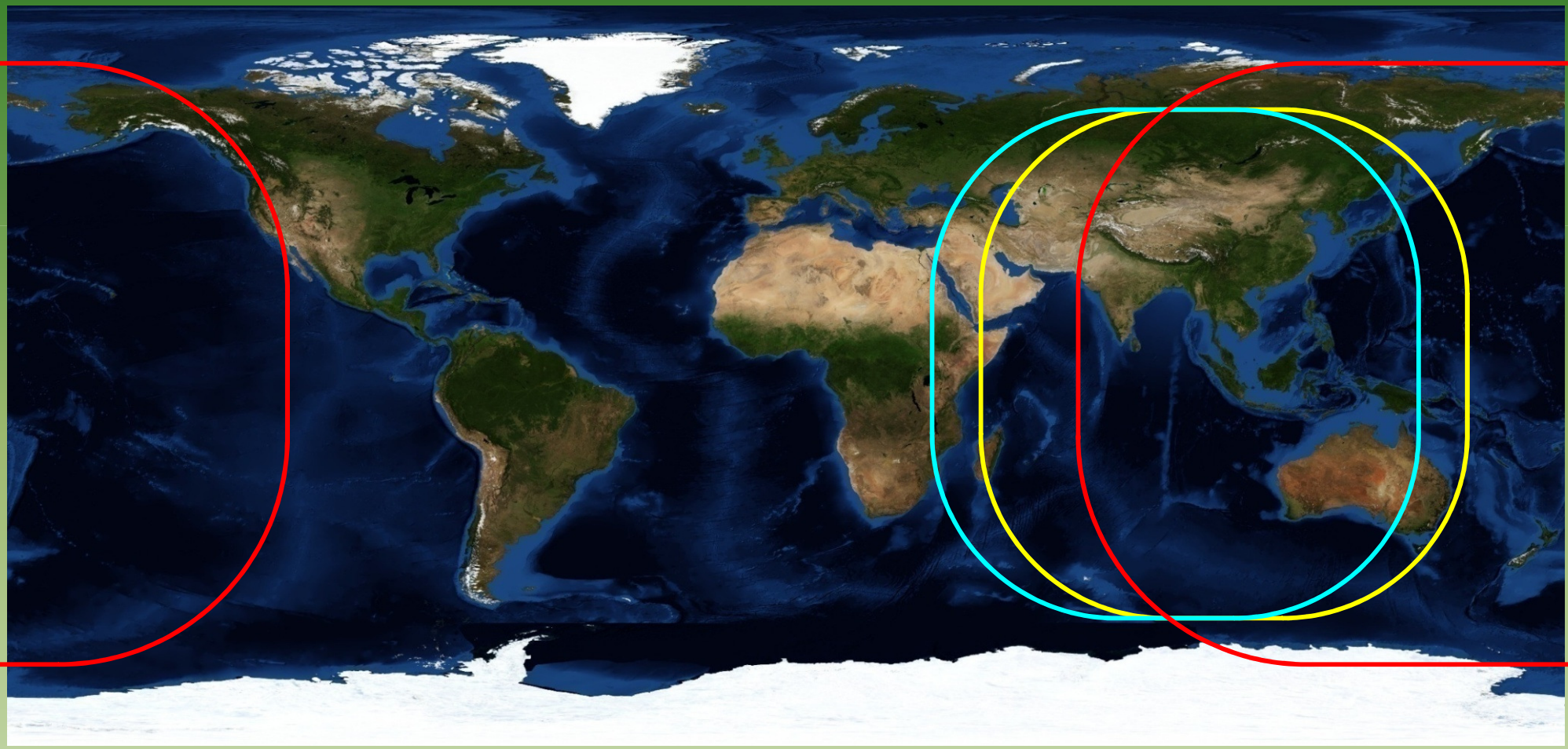
- Typically occur during NE Monsoon

Satellite reception systems in Meteorological Service Singapore (MSS)



Reception Facility at MSS	
Tracking Antenna	Stationary Antenna
3 tracking antenna for reception of data from polar orbiting satellites	3 stationary antenna for reception of data from geostationary satellites

Geostationary Satellites



- MSS receives from geostationary satellites operated by JMA and CMA
- Satellite imagery beyond our reception range are also obtained through the internet
- **MTSAT-2** (JMA/145^{0}E) most of the Asia Pacific region (red loop) while **FY2-D** (CMA/86.5^{0}E) & **FY2-E** (CMA/105^{0}E) provide overlapping coverage over much of the Indian Ocean and East Asia.

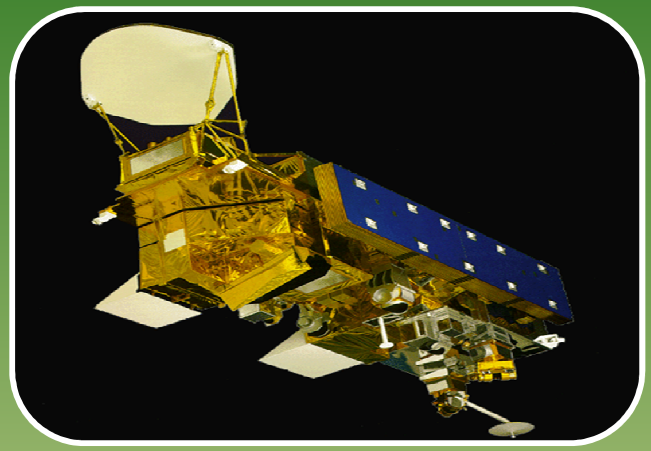
Polar Orbiting Satellites

NOAA-18

PM Secondary

EOS-TERRA

AM Constellation



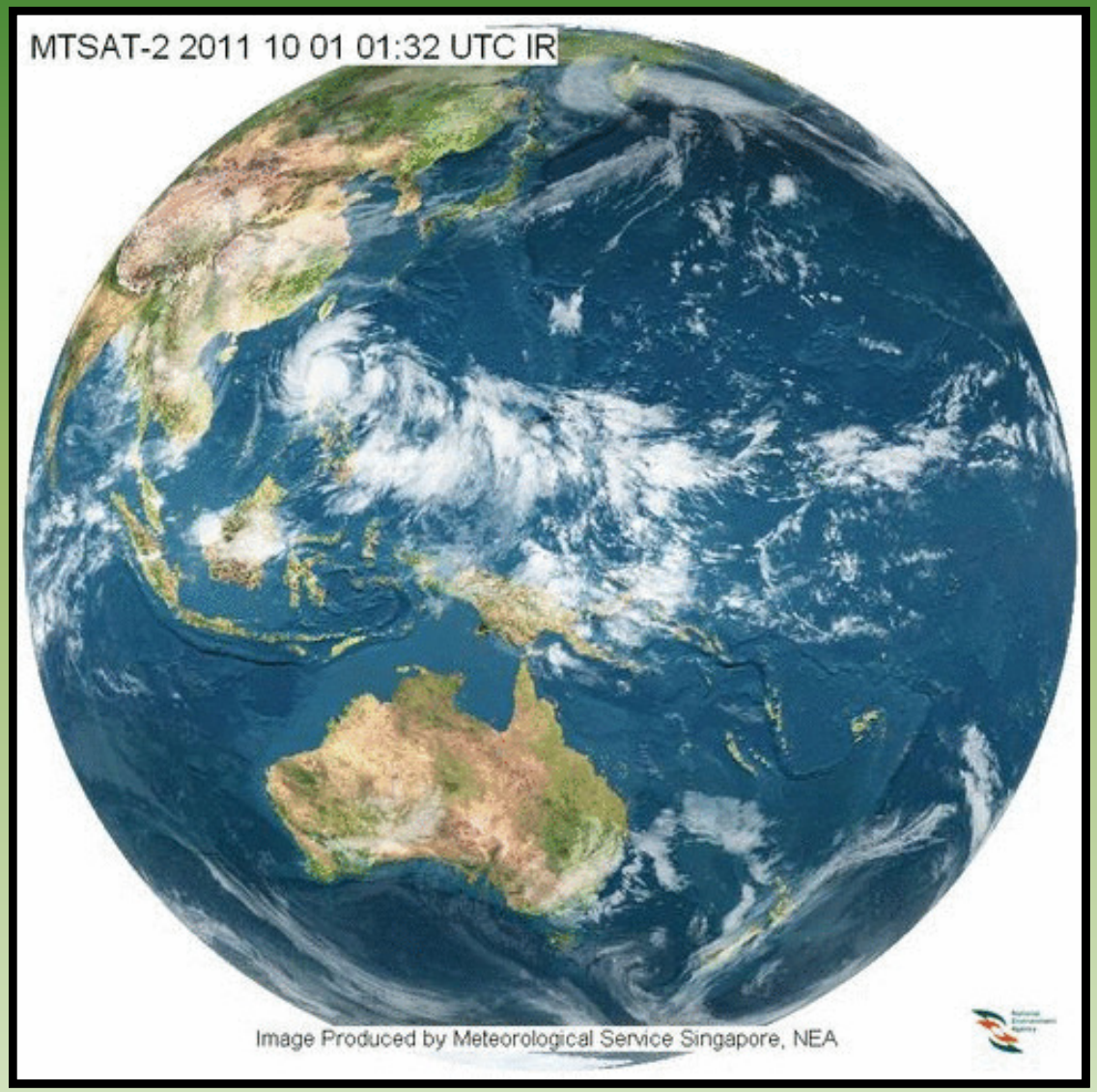
EOS-AQUA

PM Constellation

Polar Orbiting Satellites

- MSS receives from polar orbiting satellites such as NOAA POES and EOS TERRA & AQUA
- Used for environmental monitoring purposes
- Received from multiple polar orbiting satellites
  - Redundancy and more comprehensive monitoring

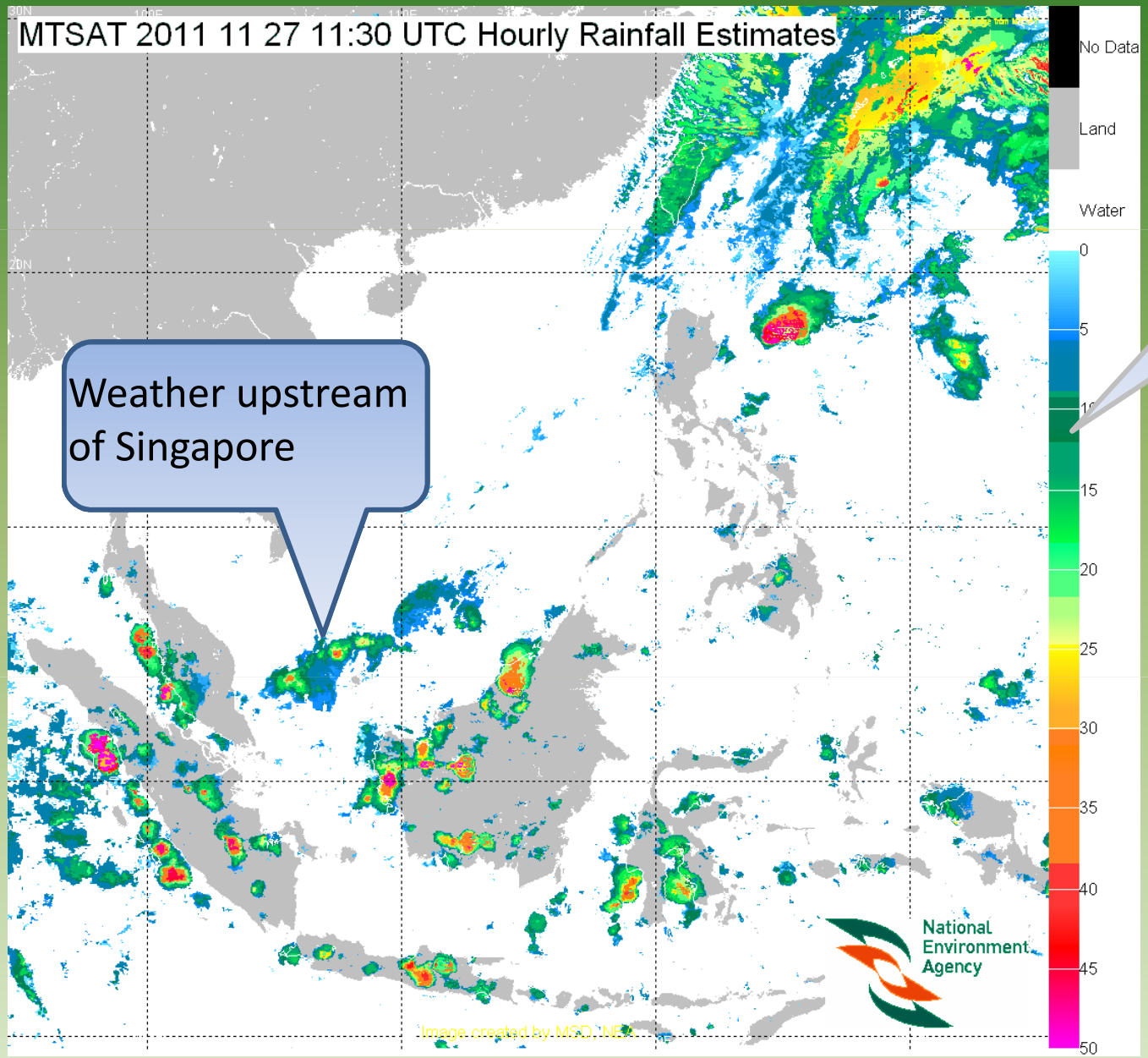
Usage of satellite data & products – Weather Forecast



Weather Forecasting

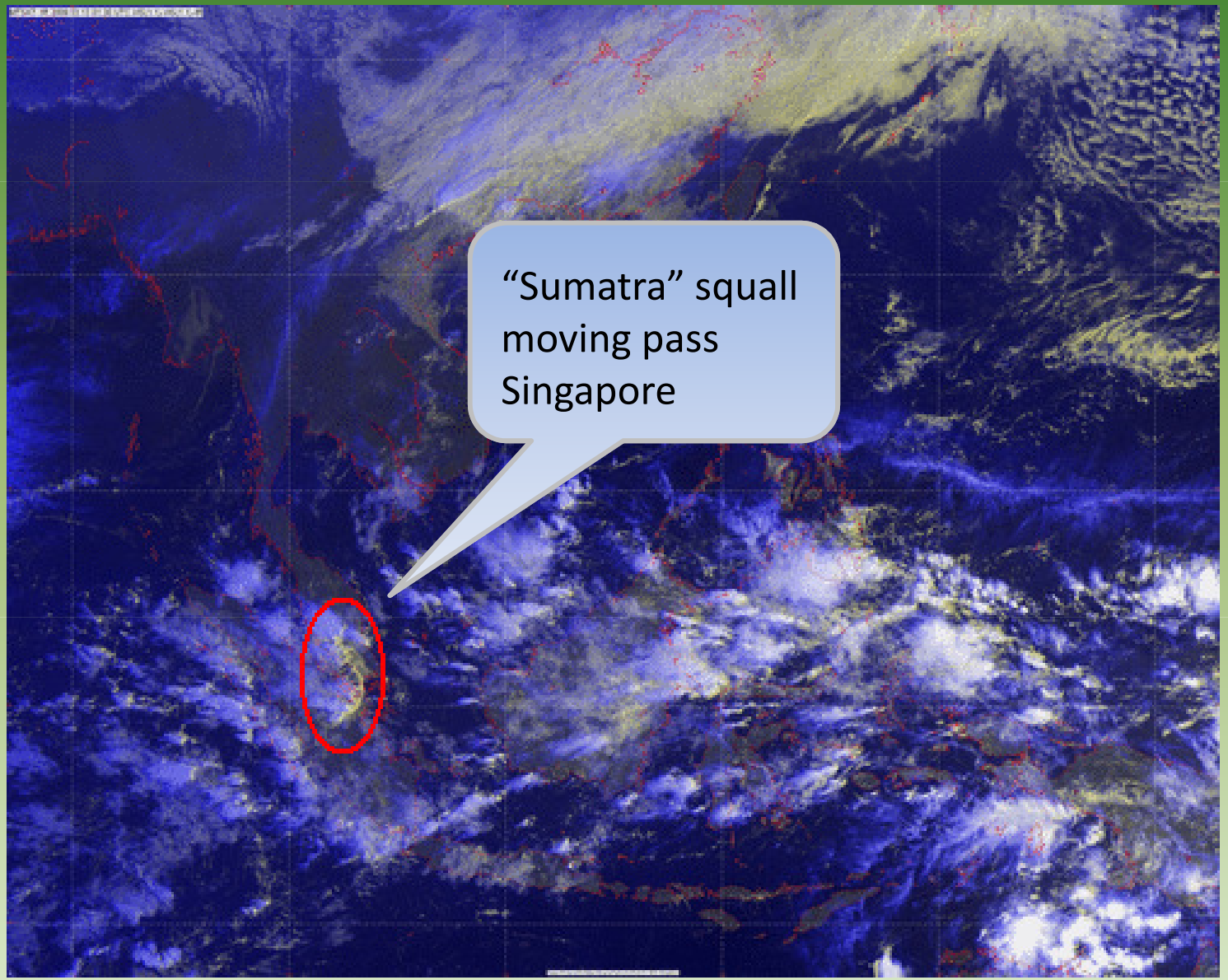
- Geostationary satellites depict evolution of weather systems
  - Good temporal coverage
    - Timely updates
  - Animated loops
    - Useful for monitoring of large scale weather systems

Usage of satellite data & products – Weather Forecast



National Environment Agency
Our Environment - Sustain and Enjoy

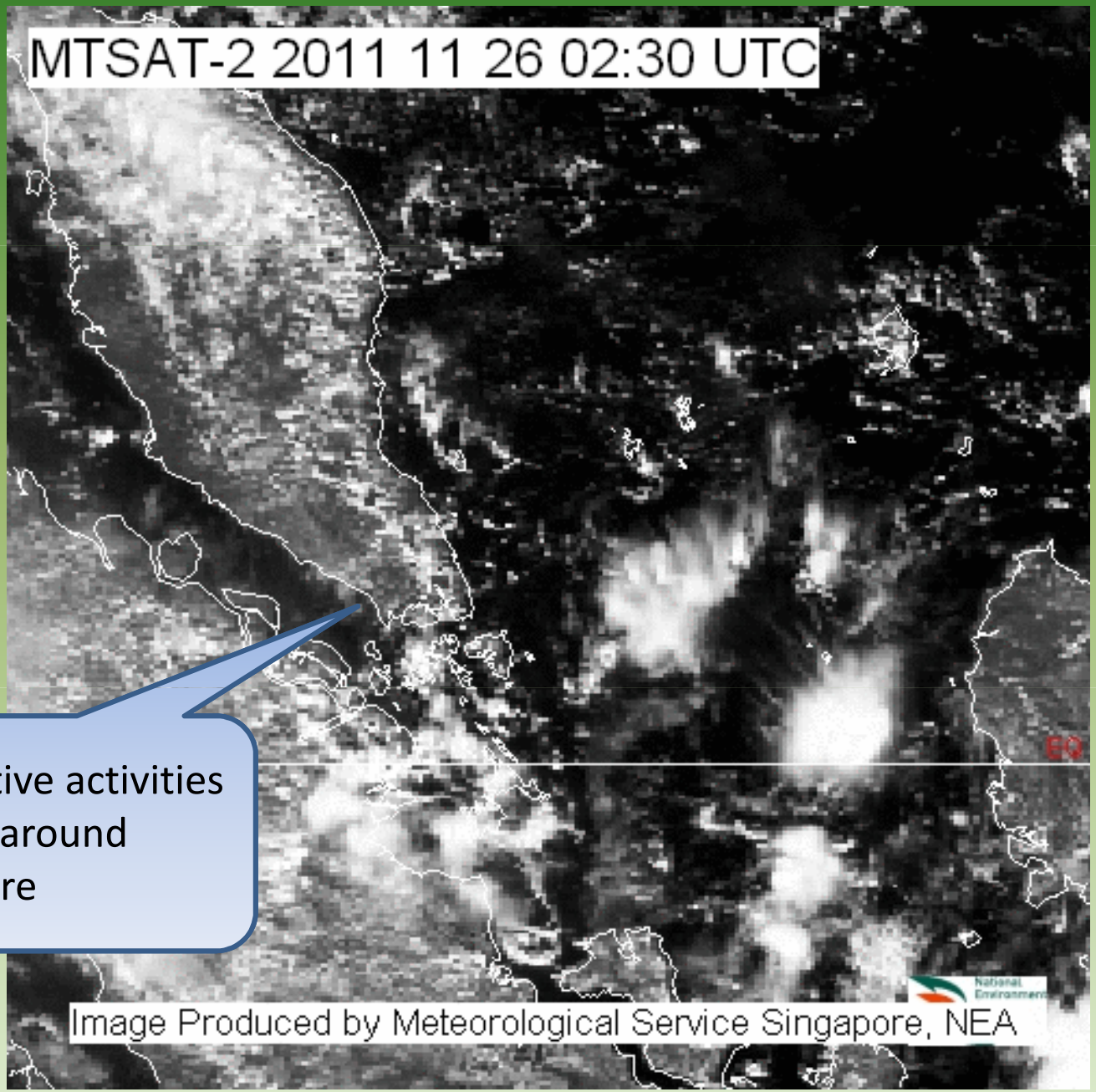
Usage of satellite data & products – Weather Forecast



National Environment Agency

Our Environment - Sustain and Enjoy

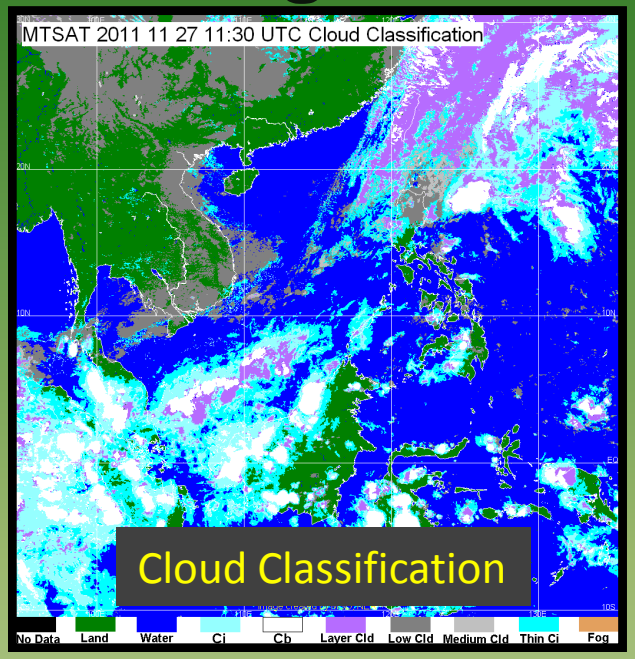
Usage of satellite data & products – Weather Forecast



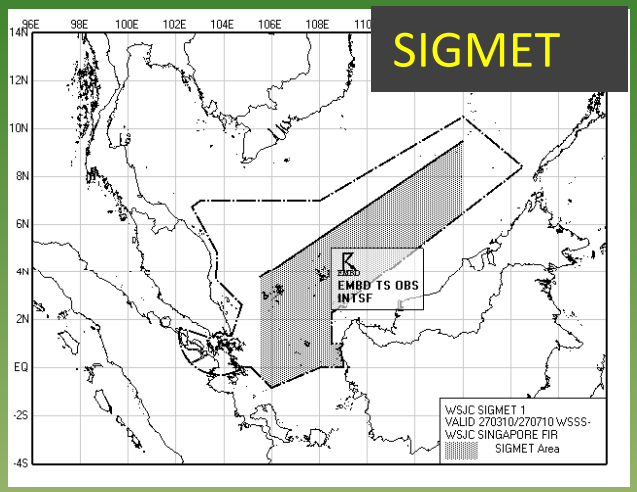
Convective activities over & around Singapore

National Environment Agency
Our Environment - Sustain and Enjoy

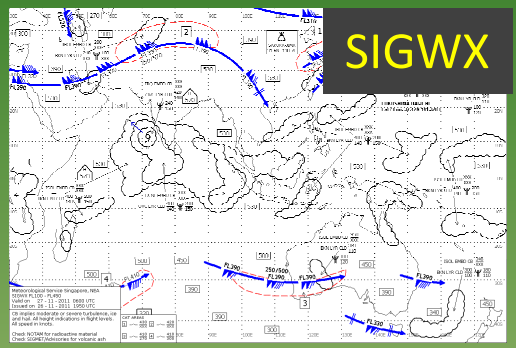
Usage of satellite data & products – Aviation Monitoring



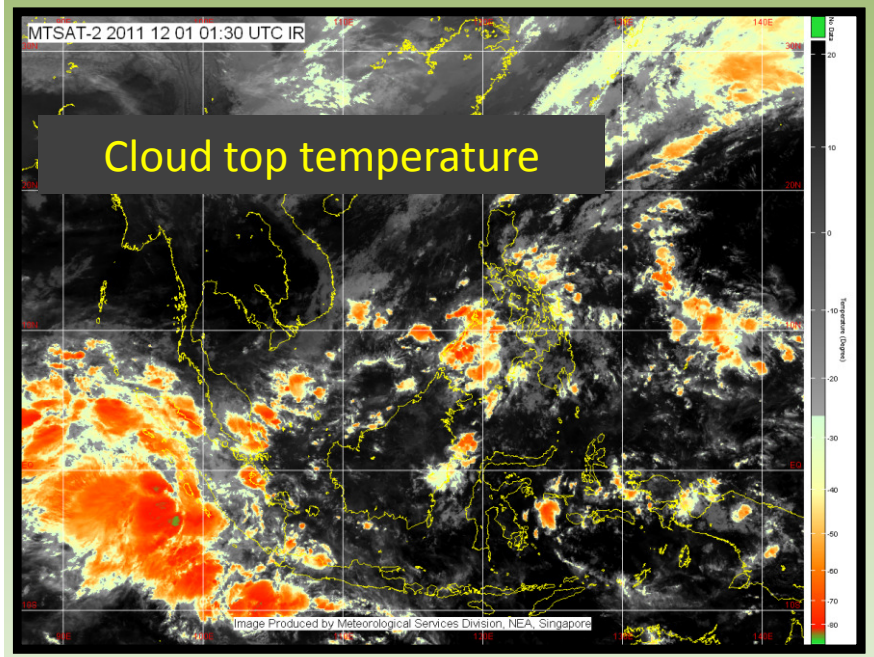
Cloud Classification



SIGMET



SIGWX



Cloud top temperature

Aviation Meteorology

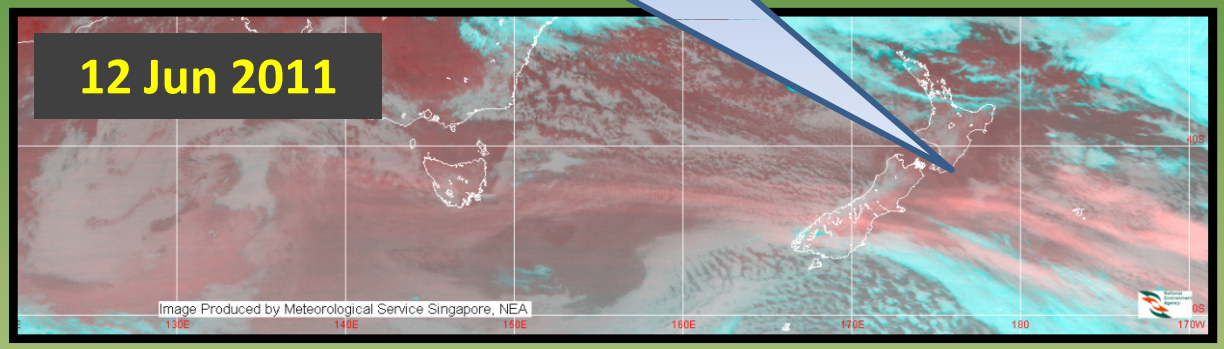
- Satellite products such as cloud top temperature, cloud classifications helped to churn out products such as SIGWX charts and SIGMET

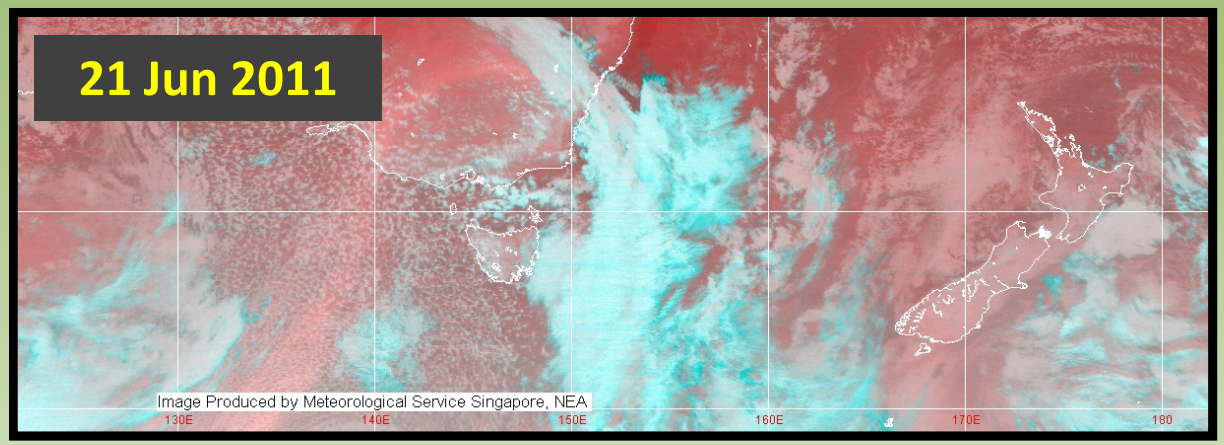
Usage of satellite data & products – Aviation Monitoring

Aviation Meteorology

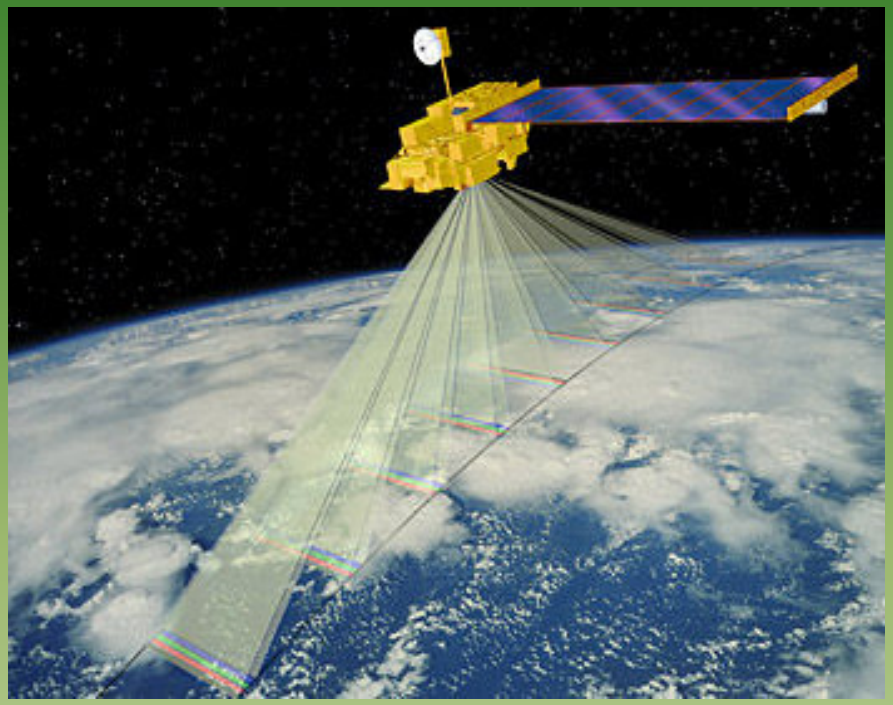
- Monitoring of volcanic eruption for civil aviation users

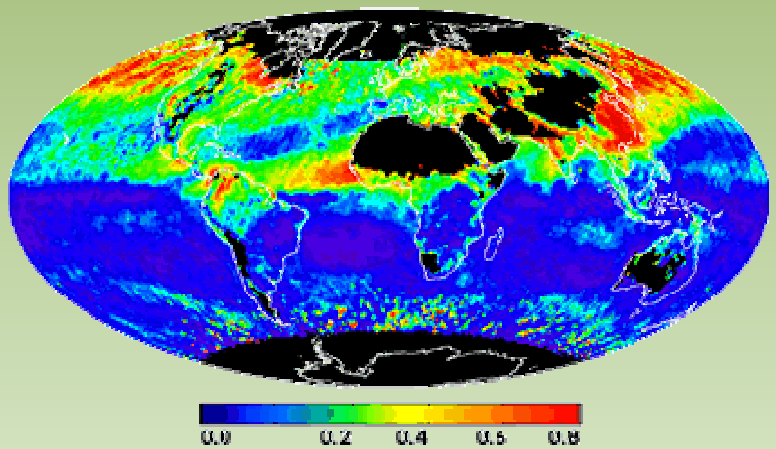
Volcanic ash cloud as detected by MTSAT-2





Usage of satellite data & products – Environmental Monitoring



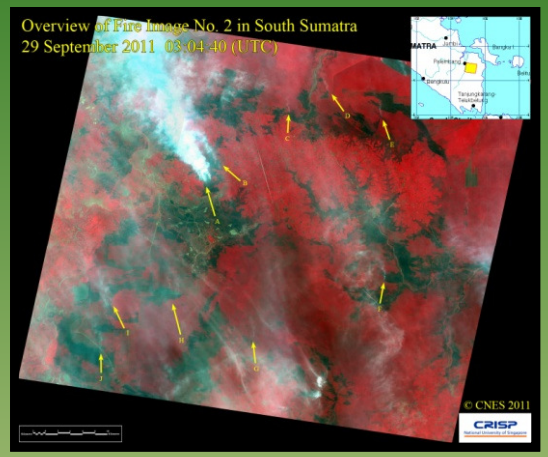


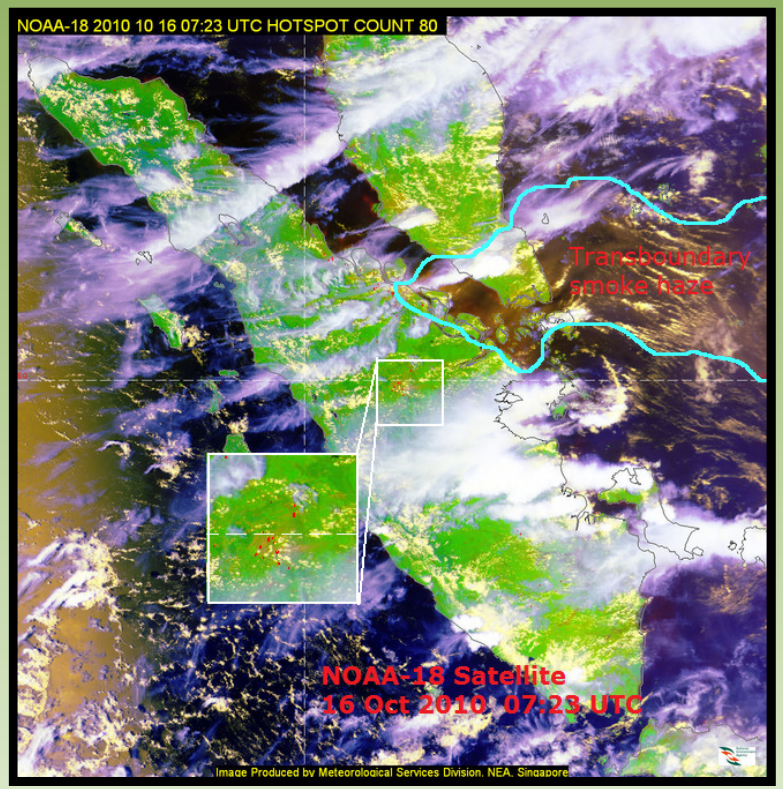
Environmental Monitoring

- Usage of polar orbiting satellites for regional environmental hazards
- The Southeast Asia region typically affected by transboundary smoke haze from forest fires

http://earthobservatory.nasa.gov/Features/RemoteSensingAtmosphere/remote_sensing3.php

Usage of satellite data & products – Environmental Monitoring

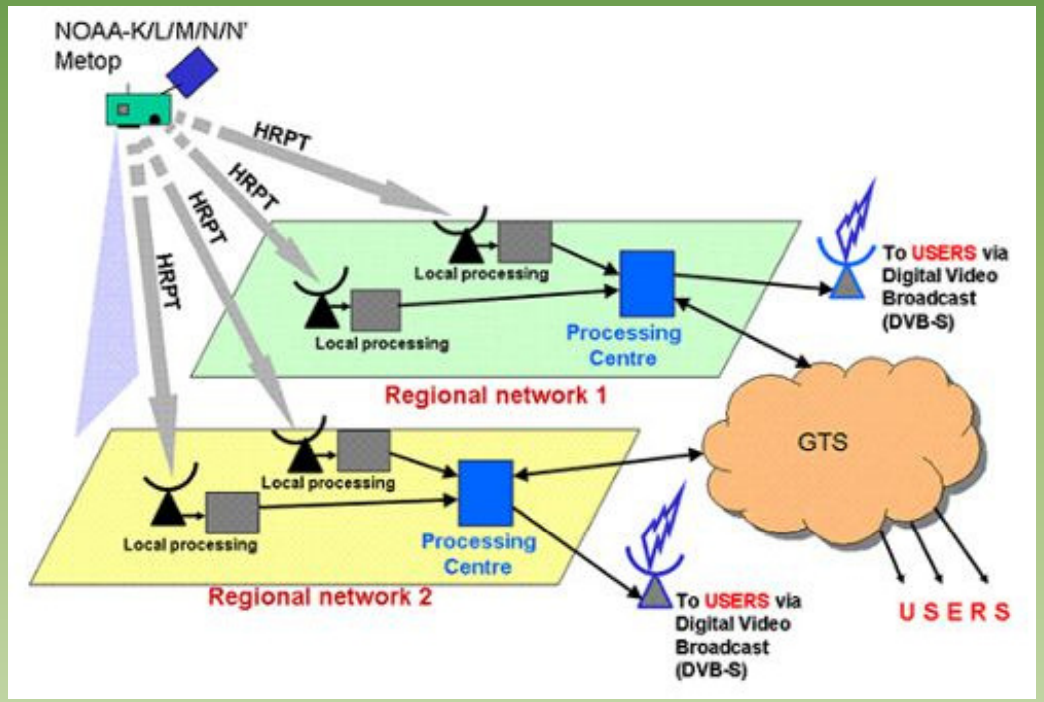




Environmental Monitoring

- MSS is host to ASEAN Specialised Meteorological Centre (ASMC)
  - Plays the role of regional fire and smoke haze monitoring
  - Hotspot detection carried out on a regular basis
  - Information is sent to NMCs and designated agencies

Our International Role

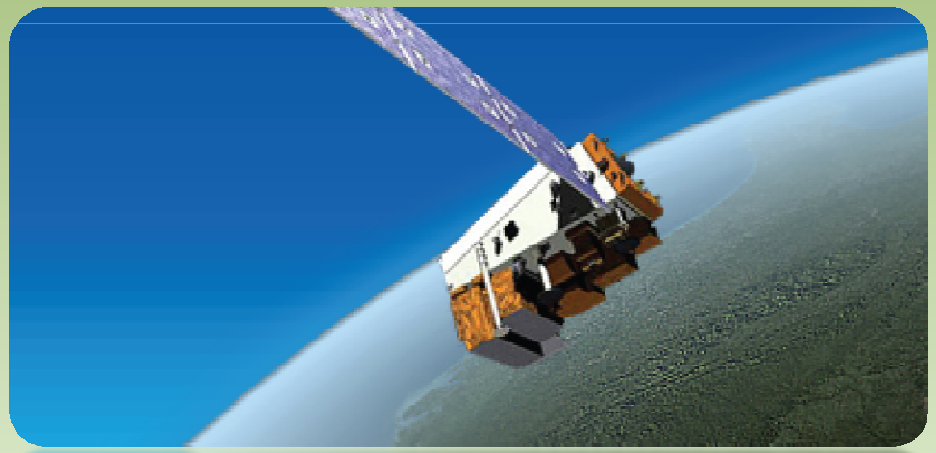


Concept of RARS

Regional Exchange

- Singapore contributes to the Regional ATOVS Retransmission Services (RARS)
- Part of the Regional ATOVS Retransmission Services for the Asia Pacific region
- Derived ATOVS data is disseminated to Melbourne for redistribution

Future Plans



- To receive and process data from
  - NPOESS Preparatory Project (NPP)
  - Upcoming next generation satellites such as Joint Polar Satellite System (JPSS) and FY3
- To use satellite data to assist in the development of a fire monitoring and prediction system
- To explore satellite data assimilation in NWP

Thank you

National Environment Agency

Our Environment - Sustain and Enjoy