Singapore's Meteorological Observation Facilities

Lesley Choo

Director, Meteorological Systems Dept
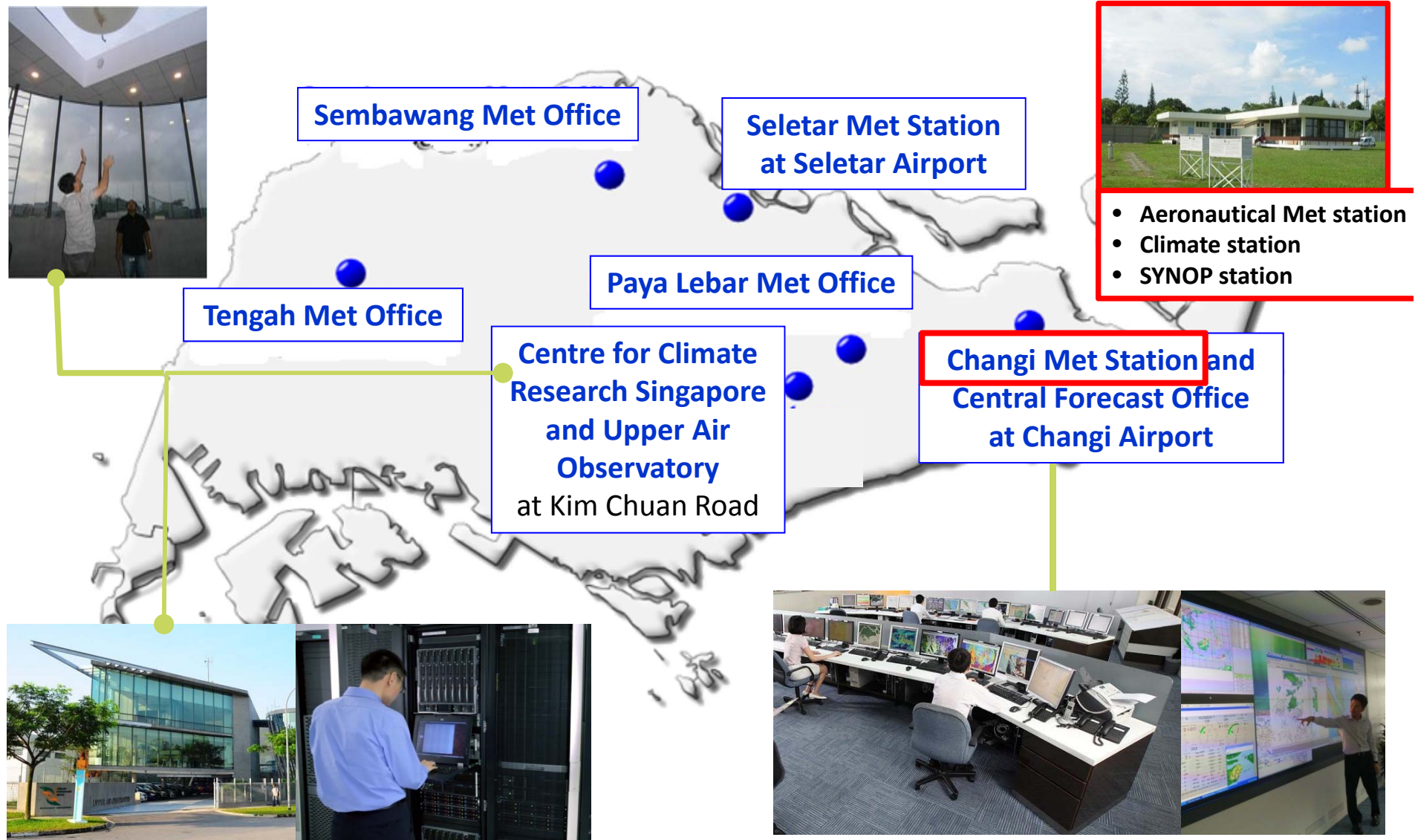
29 JAN 2015

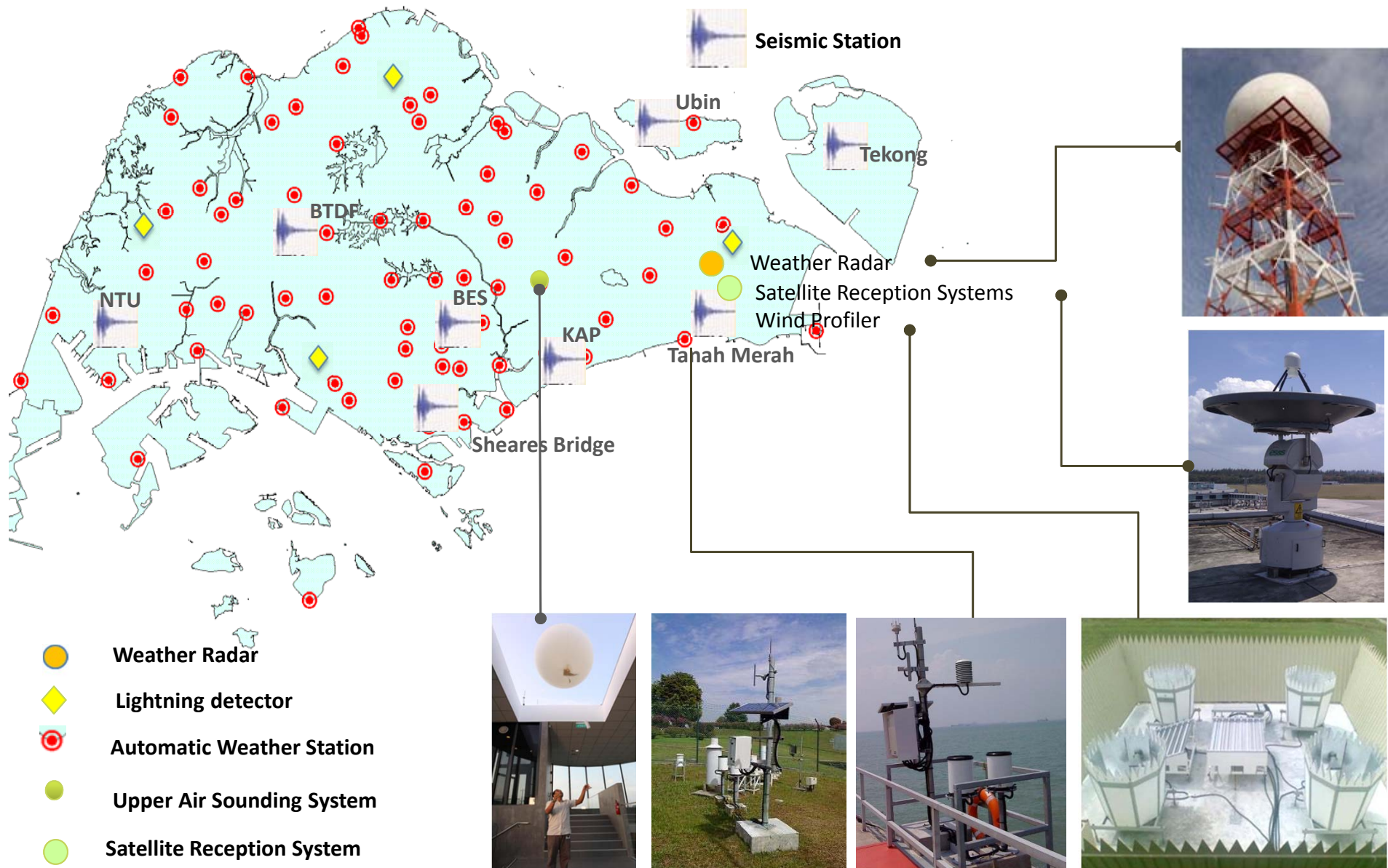# Outline

- Manned Facilities

- In situ observations

- Remote Sensing Systems

Manned Stations

Sembawang Met Office

Seletar Met Station at Seletar Airport

- **Aeronautical Met station**
- **Climate station**
- **SYNOP station**

Tengah Met Office

Paya Lebar Met Office

Centre for Climate Research Singapore and Upper Air Observatory at Kim Chuan Road

Changi Met Station and Central Forecast Office at Changi Airport

Automated Observations

Seismic Station

Ubin

Tekong

BTDF

NTU

BES

KAP

Tanah Merah

Sheares Bridge

Weather Radar
Satellite Reception Systems
Wind Profiler

Weather Radar

Lightning detector

Automatic Weather Station

Upper Air Sounding System

Satellite Reception System

On-Line Weather Monitoring Network

- Prior to 2008, network comprised 25 Automatic Weather Stations (AWS); Between 2008 and 2011, network was expanded to 64 stations

- All 64 stations measure rainfall; About 20 stations also measure temperature, relative humidity, pressure, wind

- The Changi Climate Station includes sensors to measure UV, radiation (global, diffused, net), sunshine, evaporation, visibility, cloud base etc

- Data is received in real-time, used to support forecasting operations, made available to agencies (e.g., for flood monitoring) and the public (through website/ apps), and for climatological purposes

AWS at Changi Met Station
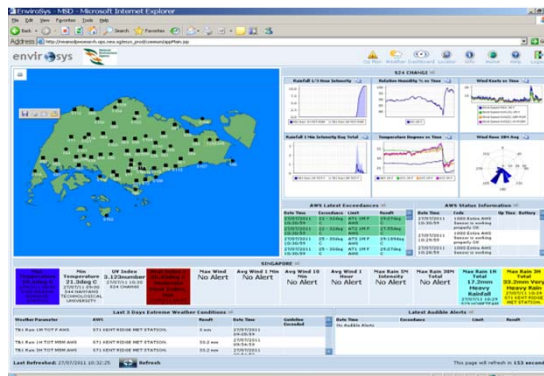
Sensors at the Changi Met Station (UV, Radiation etc)

On-Line Weather Monitoring Network
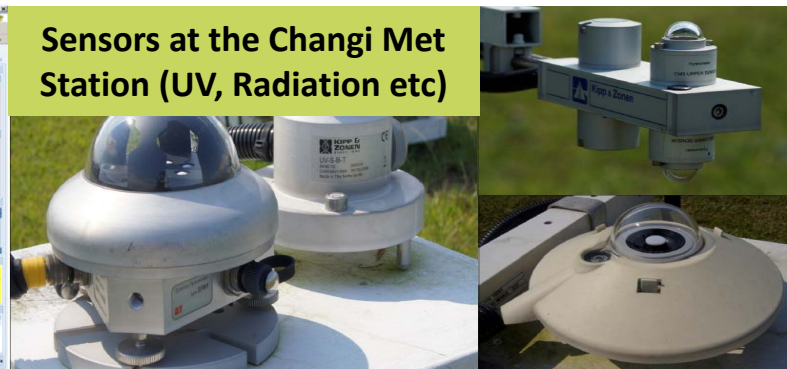
Isohyets (Rain Isolines)

Temperature and Relative Humidity

Wind vectors: Useful for detecting localized areas of convergence

1500hrs Sea Breeze pushes inland from the Southeast and West

1630hrs Sea Breeze confluence in central, northern, southern Singapore

Weather Radar

- **S-band** Dual-Polarization Weather Radar installed in 2010

- Full suite of products from the Selex-Rainbow software package

- Reflectivity and velocity modes used for weather monitoring (precipitation and wind), operational forecasting, provided to end-users (e.g., Air Traffic Control) and for climatological purposes

- Plans to install a **C-band** Dual Polarization Weather Radar by 1H 2016 (to provide for redundancy and to enhance monitoring network through better composite reflectivity and velocity products)
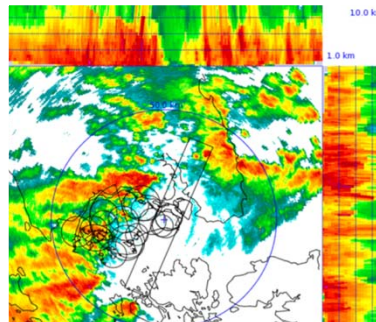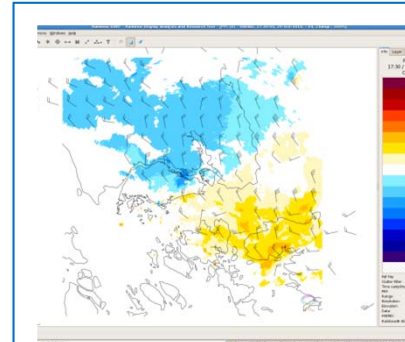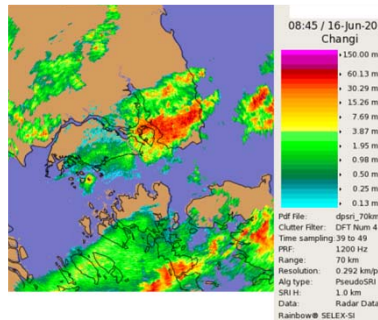
Weather Radar

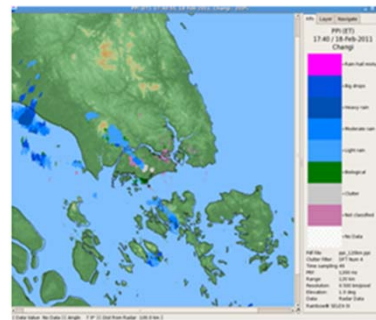- **Typical/commonly used products:**
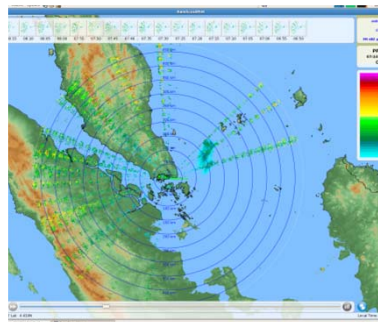
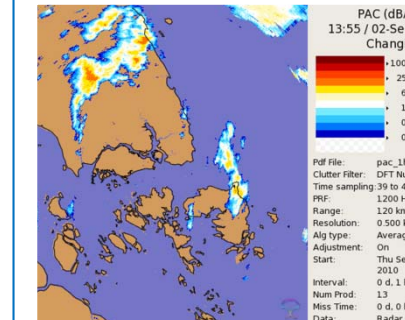**Azimuth Scan (~ 500 km)**

Max Mode

Horizontal Velocity


PPI Scan (various ranges)

Echo Type Classification

Rainfall Accumulation

Wind Profiler

- The twice daily **radiosonde** releases are complemented with a **Wind Profiler** installed at Changi Airport
- Update frequency is about 5 min, with measurement heights reaching 5 km or higher (under moist atmospheric conditions) at intervals of 150 m
- Wind Profiler includes a RASS which measures temperature to heights of about 1.2 km or higher (sounding every 30 min)
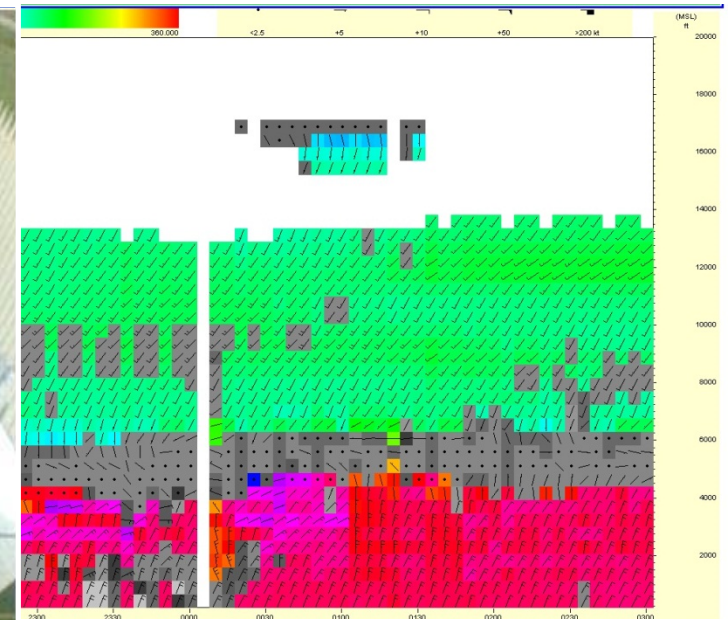
Lightning Detection System

- Lightning network comprises 4 sensors
- Based on Low Frequency magnetic direction finding and TOA + Very High Frequency interferometry
- Detects Cloud-to-Cloud discharges and Cloud-to-Ground lightning
- Data from the LDS is used for operational forecasting and provided to the public via the website/apps

Archive of lightning strike locations
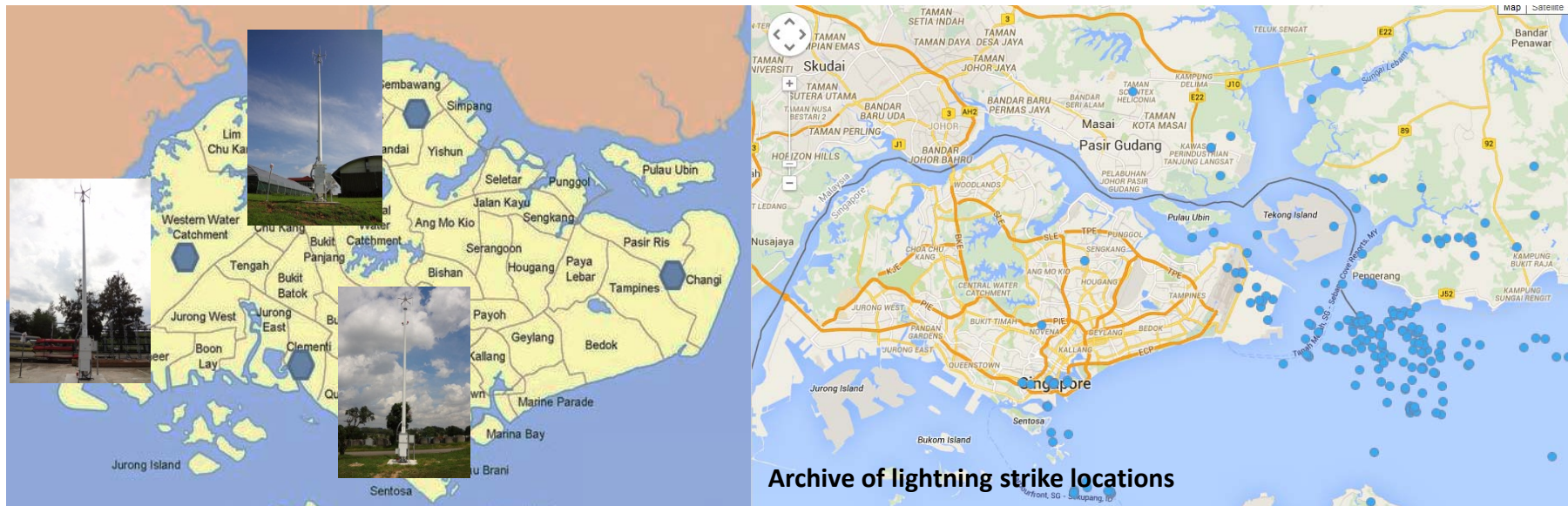
Satellite Reception Systems

- Reception Systems receive and process data from the geostationary weather satellites (MTSAT-2, FY) as well as the polar orbiting environmental satellites (NOAA, Terra, Aqua)
- Plan to process the Himawari Standard Data and enhance processing of NPP data

Image Produced by Meteorological Service Singapore

Reception Systems	
Tracking Antenna	Stationary Antenna
3 tracking antennas for reception of data from polar orbiting satellites	3 stationary antennas for reception of data from geostationary satellites