The 5th Meeting of the Coordinating Group
of the RA II WIGOS Satellite Project
21 October, Vladivostok city, Russky Island, Russia
Far Eastern Federal University

(Country Report)
(Sultanate of Oman)

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Introduction: Country Overview

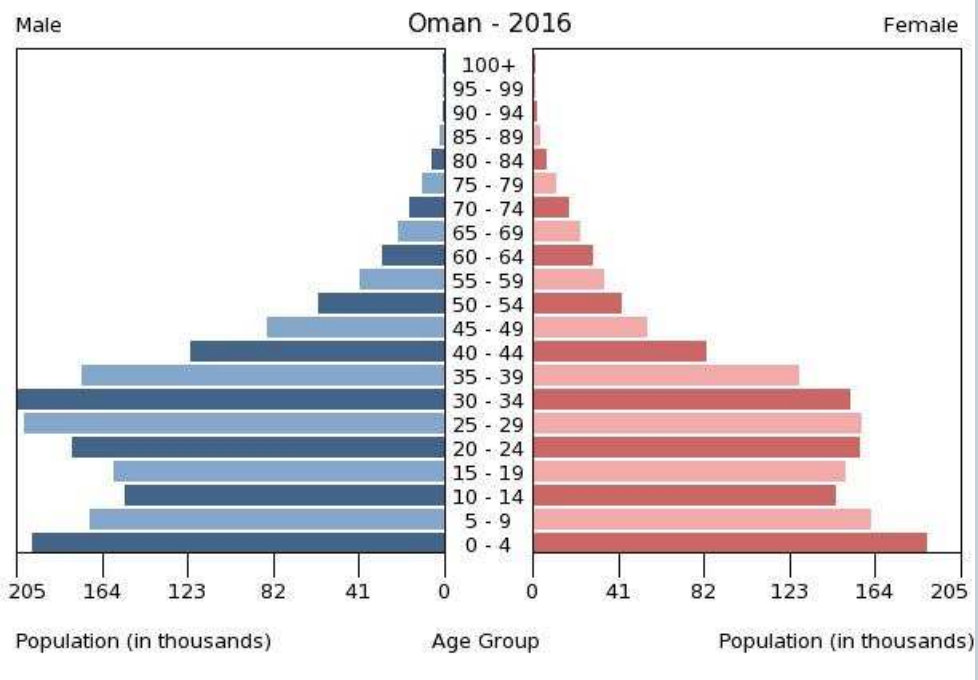
- Geography

Oman (officially the **Sultanate of Oman)** lies between latitudes 16° and 27° N, and longitudes 52° and 60° E. Is an Arab country on the south-eastern coast of the Arabian Peninsula. Having land borders with the United Arab Emirates to the northwest, Saudi Arabia to the west, and Yemen to the southwest, and shares marine borders with Iran and Pakistan. With a total area of 309,500 km^2 and with highest peak of about 3300 m above sea level (Jabal Shams) and Coastline of 3,165 km.

Country Overview

- Population:

Oman populated by about 4.4 accordions to 2016 estimate.



Country Overview

- Climate

Like most of the Arabian Peninsula Oman characterized by arid and semi-arid climate . However , Oman experiences two broad seasons in which summer extends from May to September and the winter from November to April . The verity of topography along with vast extant of the country provide different types of precipitation . Seasonal chances of Arabian Sea tropical storms and cyclones are highly considered during pre and post Indian monsoon period. Dust storm is also one of the hazardous weather that can take place over the region and Oman is extremely affected.

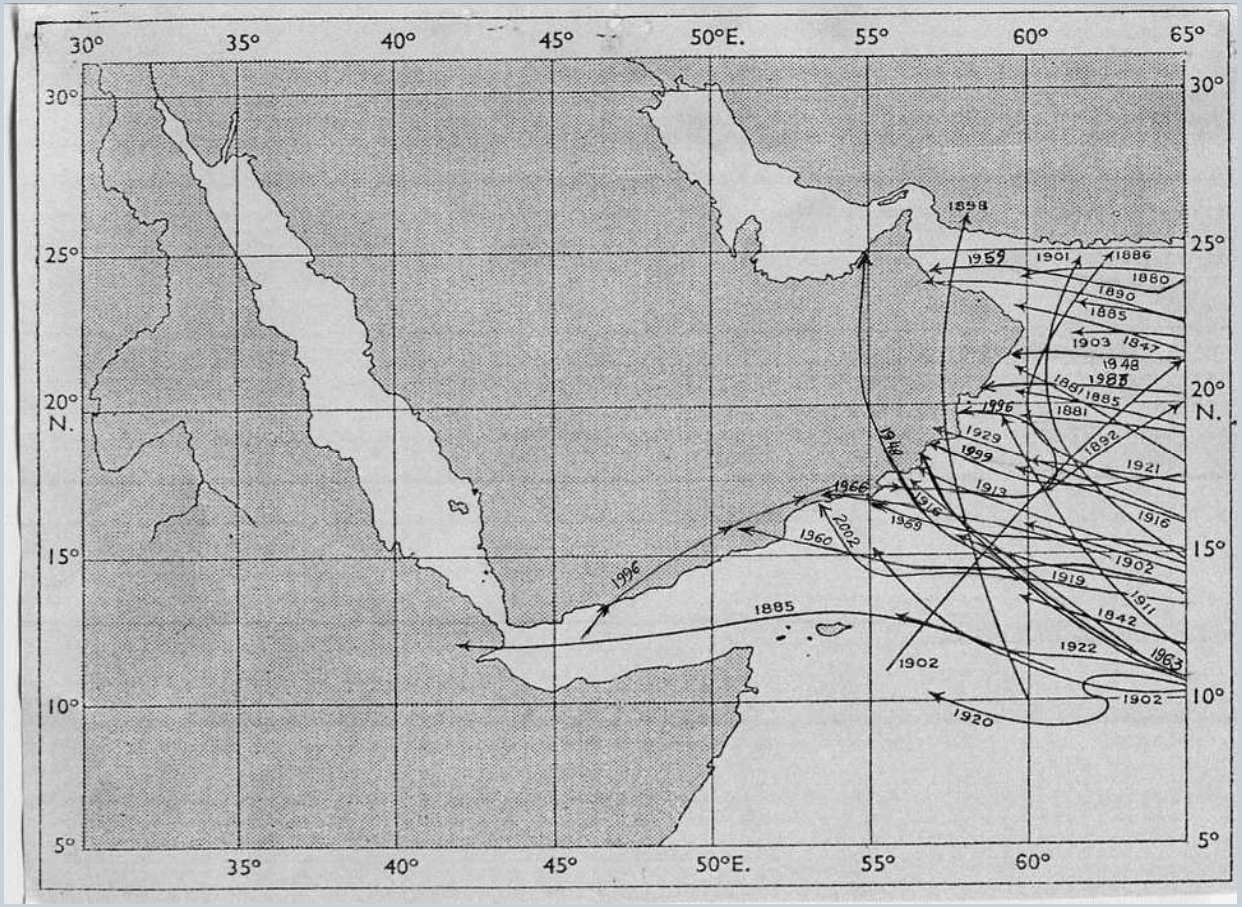
The natural hazard in Oman

1. Tropical Cyclone
2. Tsunami
3. Flash Flood.
4. Dust Storms

Major historical hydrometeorological disasters

- Tropical Cyclone.

Historically :
Oman is affected by tropical storms and cyclones from Arabian Sea



Major historical hydrometeorological disasters
Tropical Cyclone Gonu

Formed June 1, 2007
Dissipated June 7, 2007

Highest winds
3-minute sustained 235 km/h (145 m
1-minute sustained 270 km/h (165 mph)

Fatalities 78 total (50 in Oman)
Damage : $4.2 billion in damage (2007 USD) in Oman

Areas affected Oman, United Arab Emirates, Iran, Pakistan

Super cyclonic storm (IMD scale)
Category 5 (Saffir–Simpson scale)

Major historical hydrometeorological disasters Tropical Cyclone Phet

Formed May 31, 2010
Dissipated June 7, 2010

Highest winds
3-minute sustained : 155 km/h
1-minute sustained : 230 km/h

Lowest pressure964 hPa (mbar); 28.47 inHg

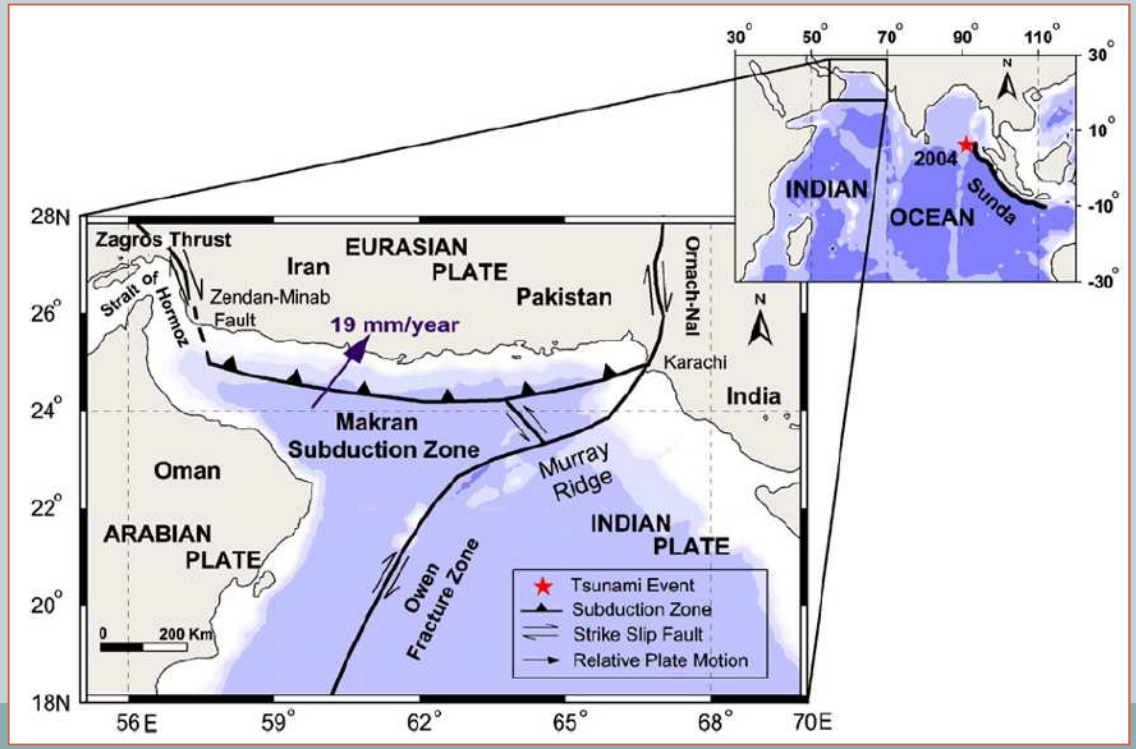
Fatalities 47 total (24 in Oman)

Damage was estimated at US$ 780 million.
Areas affected Oman, Pakistan, India

Very severe cyclonic storm (IMD scale)
Category 4 (Saffir–Simpson scale)

Major historical hydrometeorological disasters

- Tsunami 1945 Makran Subduction Zone/ Earth Quake and Tsunami
- Sumatra Tsunami 2004



Flash Flood

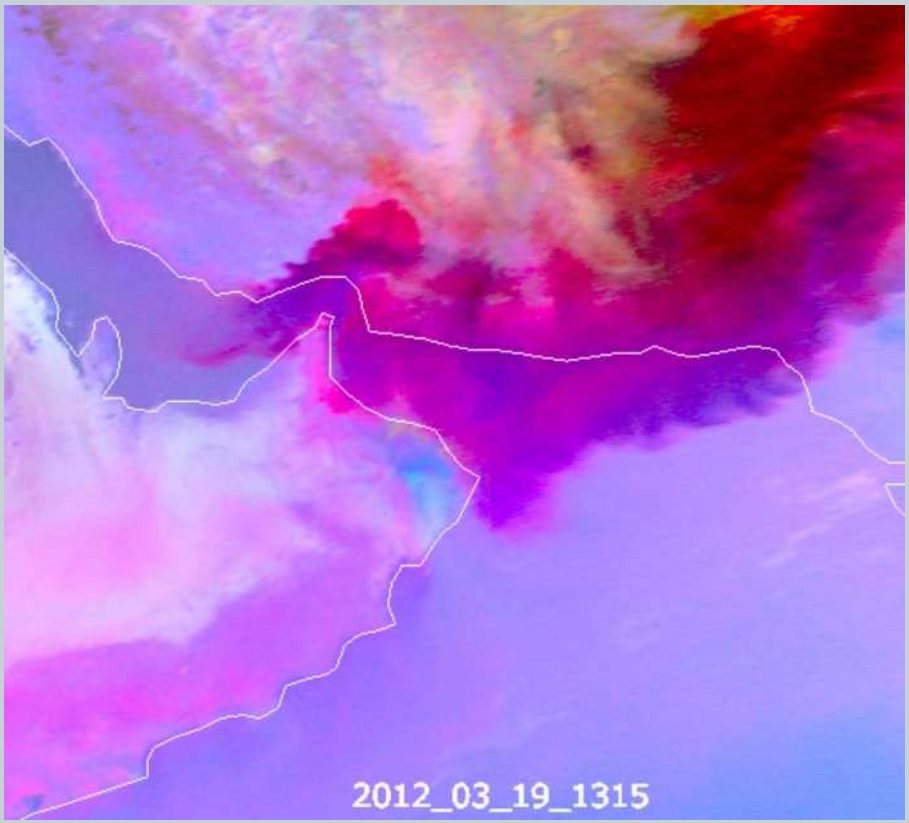
(Mostly Mountainous Areas)

Dust Storms

- Massive Dust Storm 19 March 2012

Every year number of dust storms can affect Oman and some of them can be very heavy storms

The visibility in this case was reduced below 400 m in the northern of Oman



Dust RGB / Eumetsat

Major national economic sectors relying on NMHSs

- Authorities of Civil Defence and Public Aviation and Ministry of transportation are the most relying sectors

- Agriculture

Since agriculture contributes only about 1.2% to the GDP , the NMHS (DGMET) is relied only up on requirement .

Short Discription of NMHS Activity (Mission)

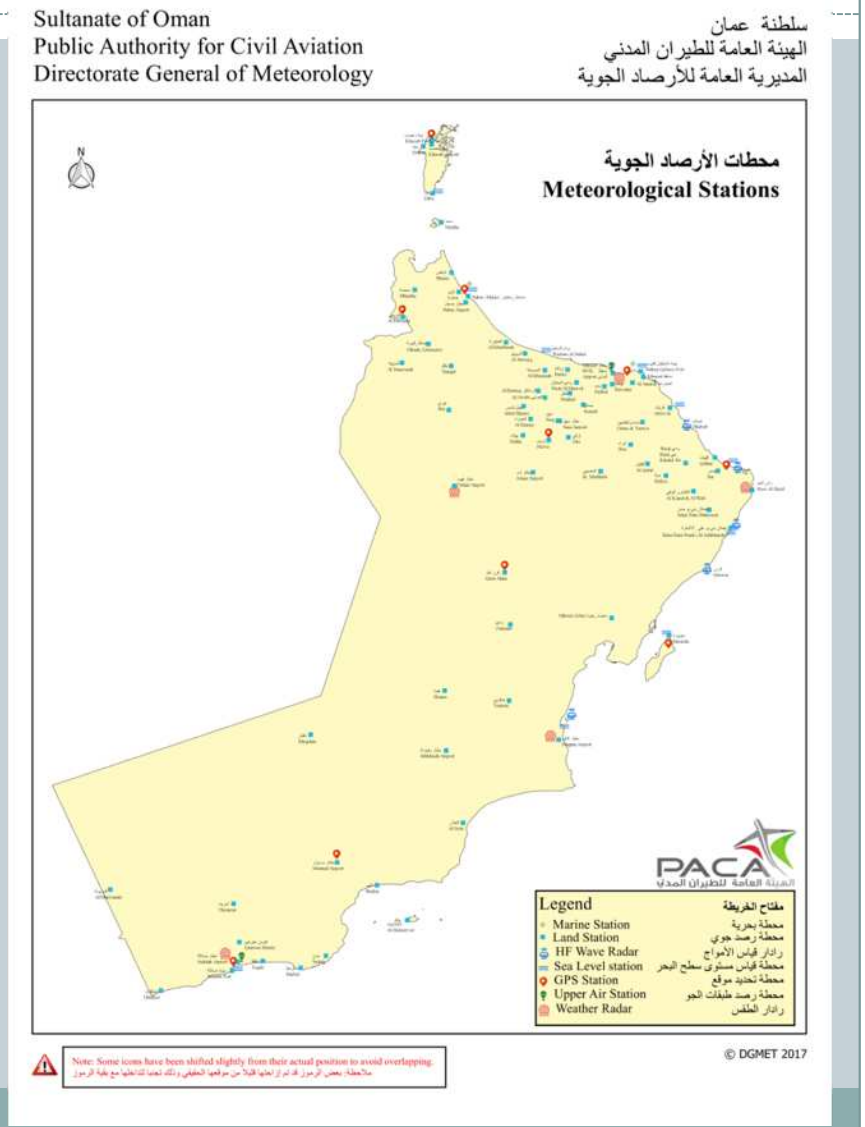
Oman Directorate General of Meteorology (DGMET) Mission is to provide high quality service that is compliant with WMO standards and considers global best practices in weather (for aviation , marine and general public services) and multi-hazard services using an integrated multi-hazard system in the National Multi-Hazard Early Warning System (NMHEWS) lunched 23rd March 2015.

Recently , climate services became highly considered in DGMET activities in terms of observation and studies . Extra general services in hydrological, environment and air pollution are also partially included in DGMET activities .

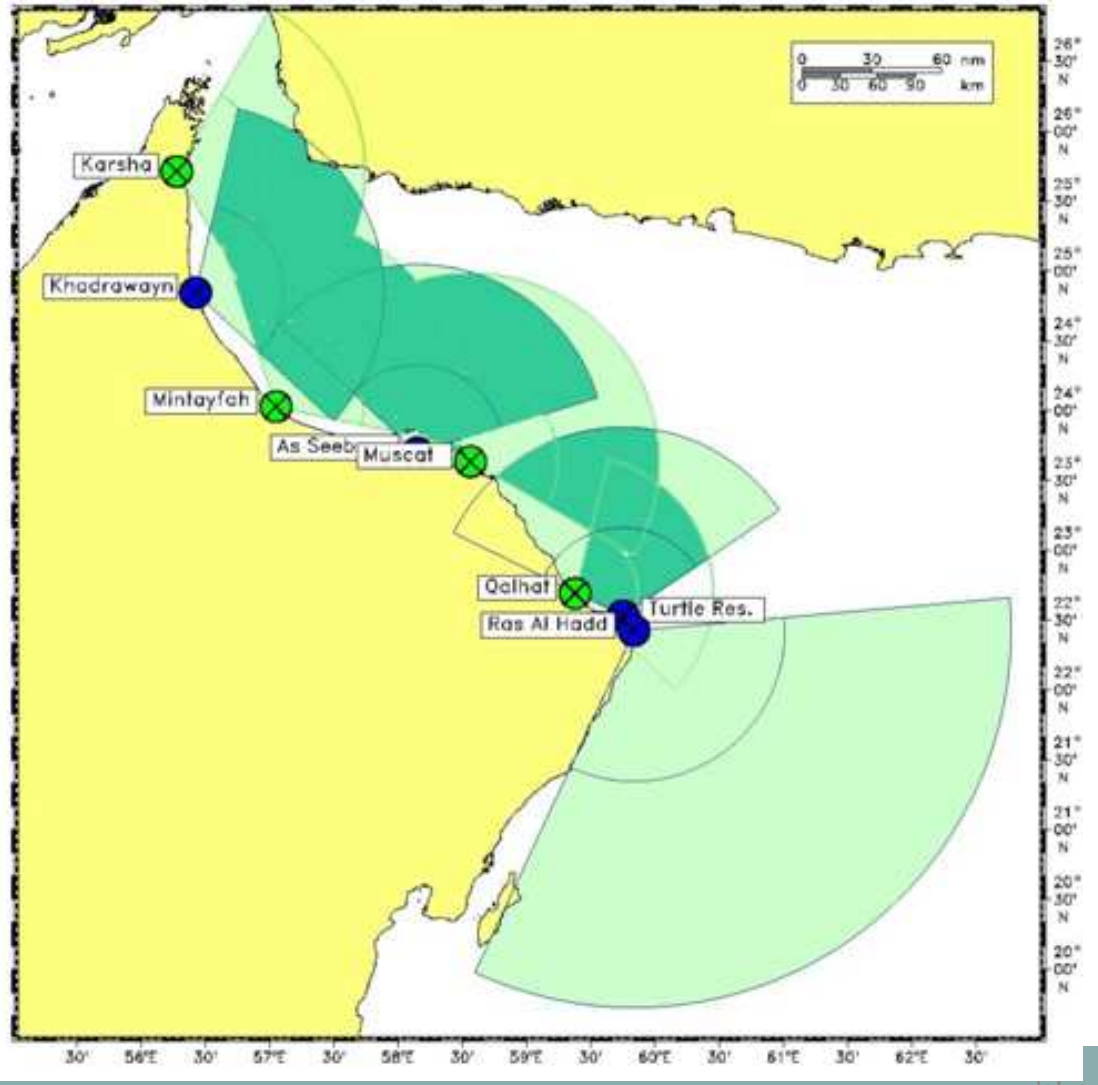
Current Observational System Overview

- Observation System

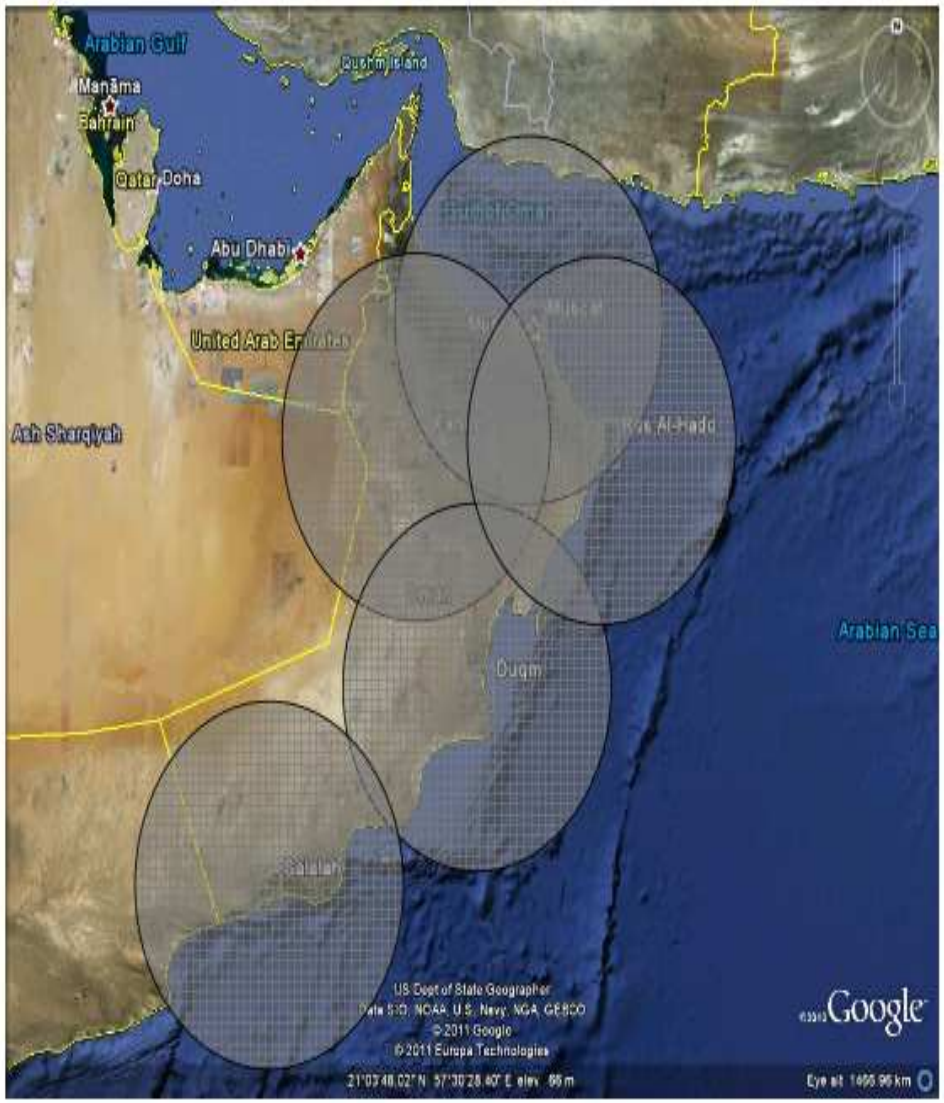
4	Marin Weather Station
73	Ground Weather Station
5	Sea Wave Radar
10	Sea level Station
10	GPS Station
2	Upper Air Weather Station
4	Weather Radar

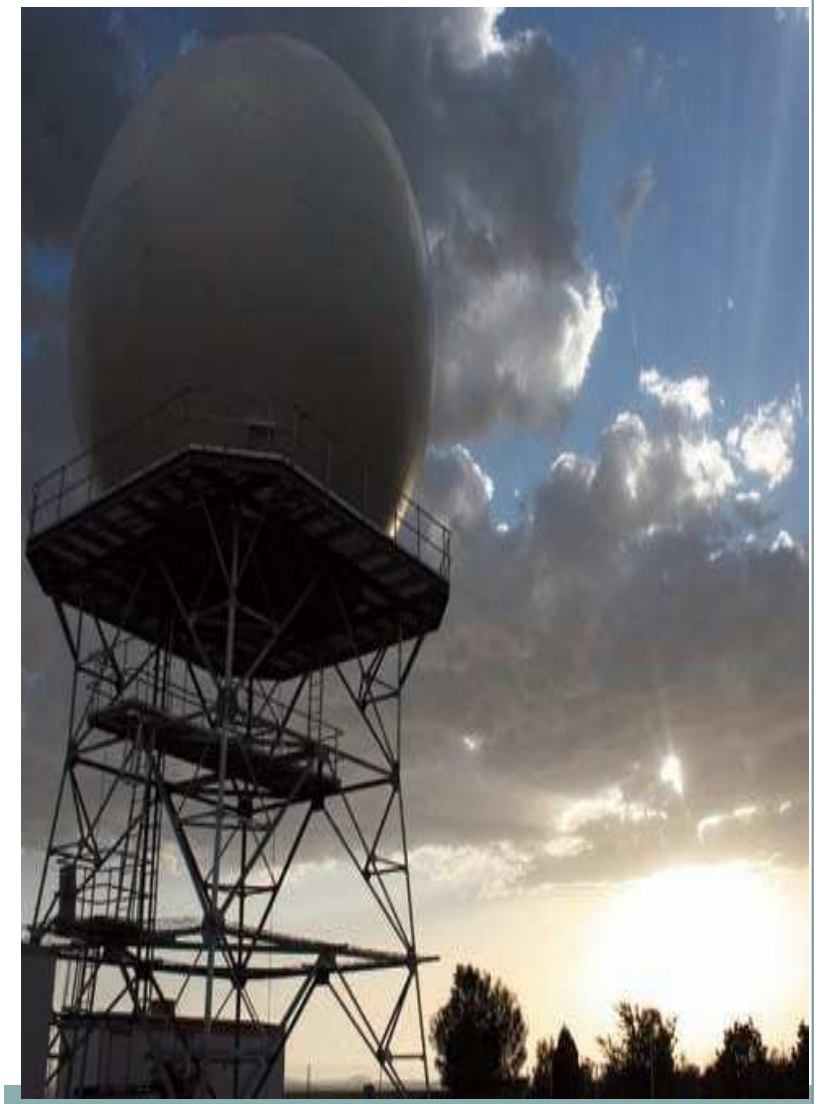


Wave Radar network and coverage

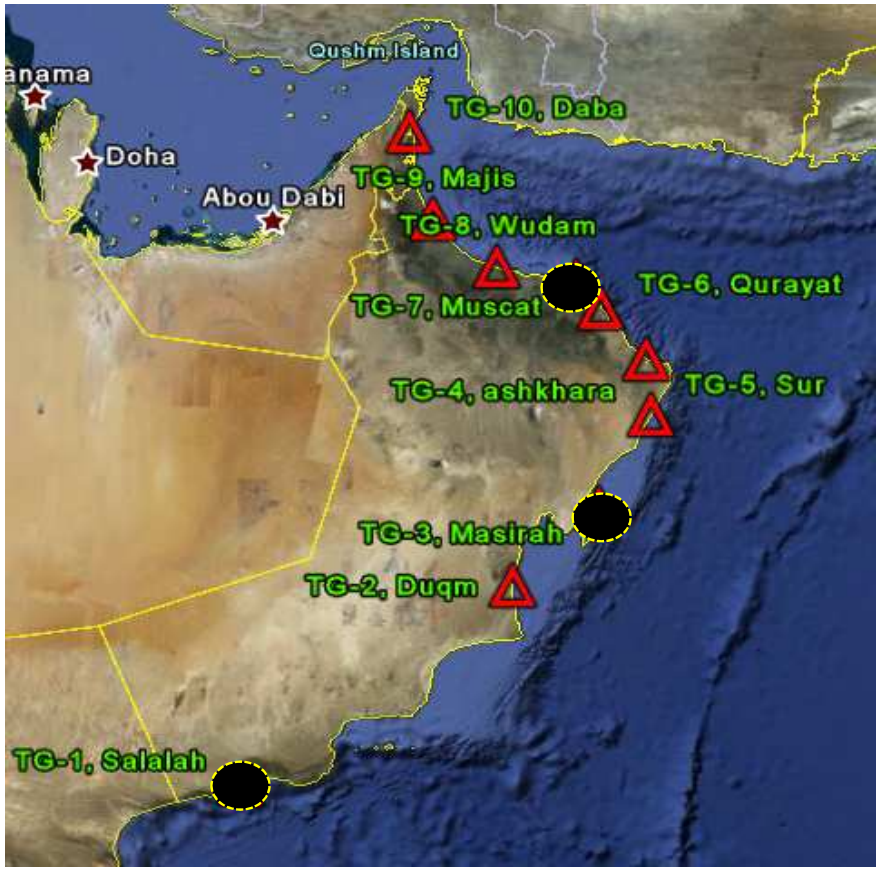


5 Weather Radar





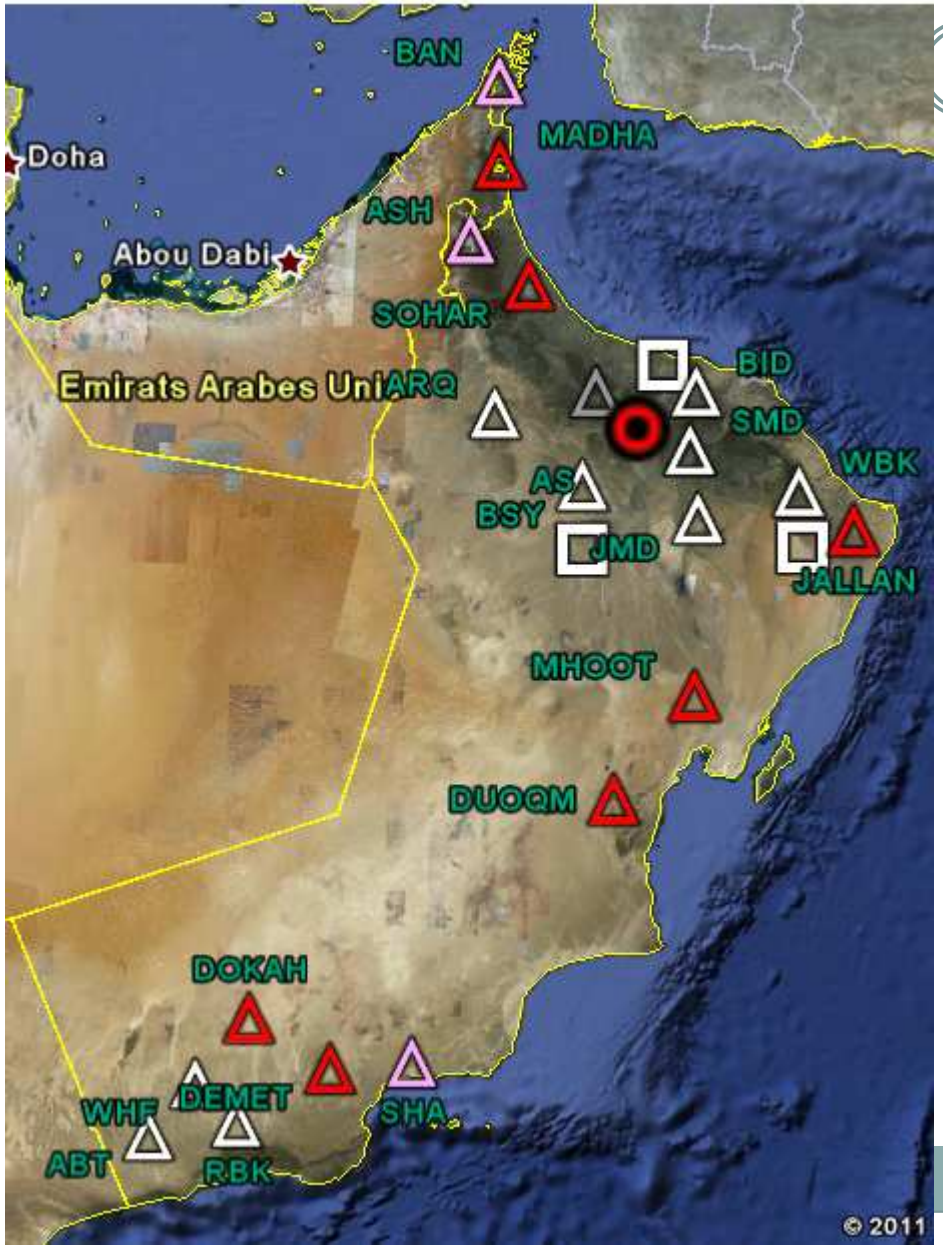
Network of coastal sea level gauges, tsunameters and sea level measurement



Description of the project	
Consultant	UNESCO
Content	Procurement of 7 set for new station Installation and integration
Function	Monitoring tsunami Monitoring sea level
Period of execution	10 months

- Develop 7 new stations
- Access 3 current stations

Network of seismic sensors

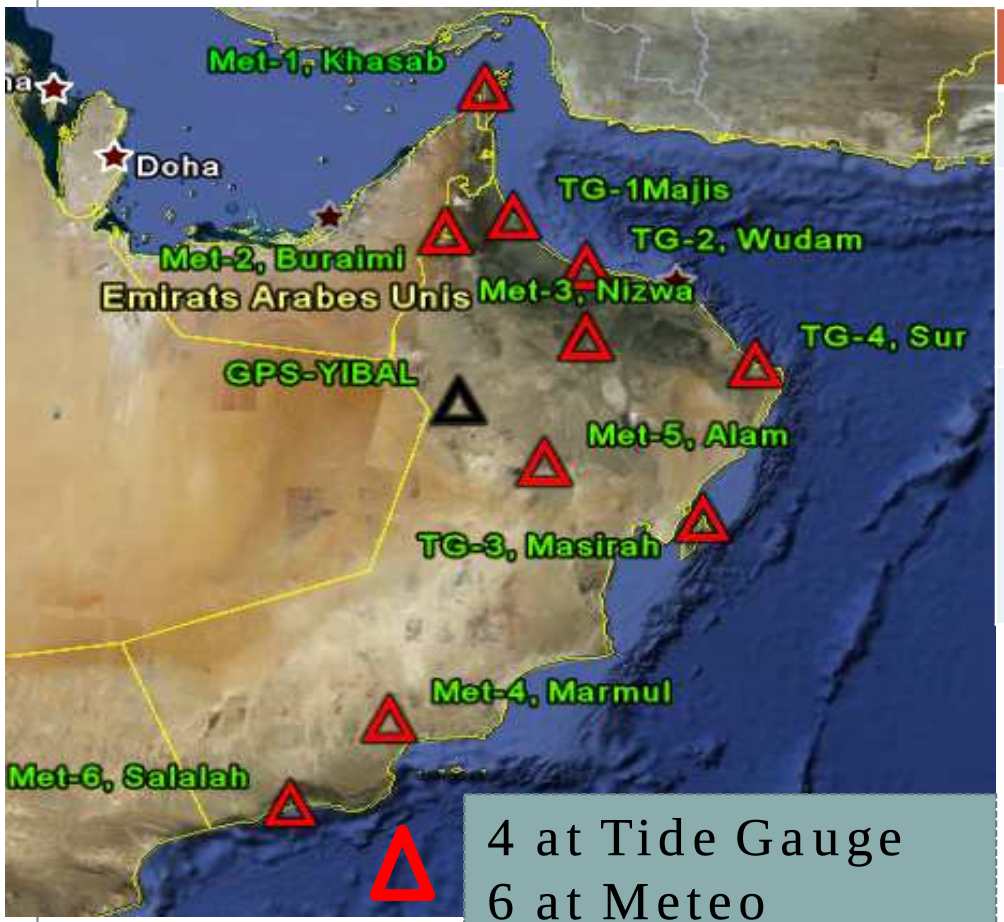


Description	Seismic network
Consultant	UNESCO
Content	Procurement, installation and integration
Function	Monitoring earthquake activity in Oman and its surrounding region

21 Broadband stations

- 7 established by EMC (SQU)
- 10 upgraded through P-3, complete set of broadband
- 3 upgraded through P-3, broadband sensors
- 3 acccelerograph through P-3
- 1 CTBTO stations, (Comprehensive nuclear Test Ban Treaty Organization)

GPS Network

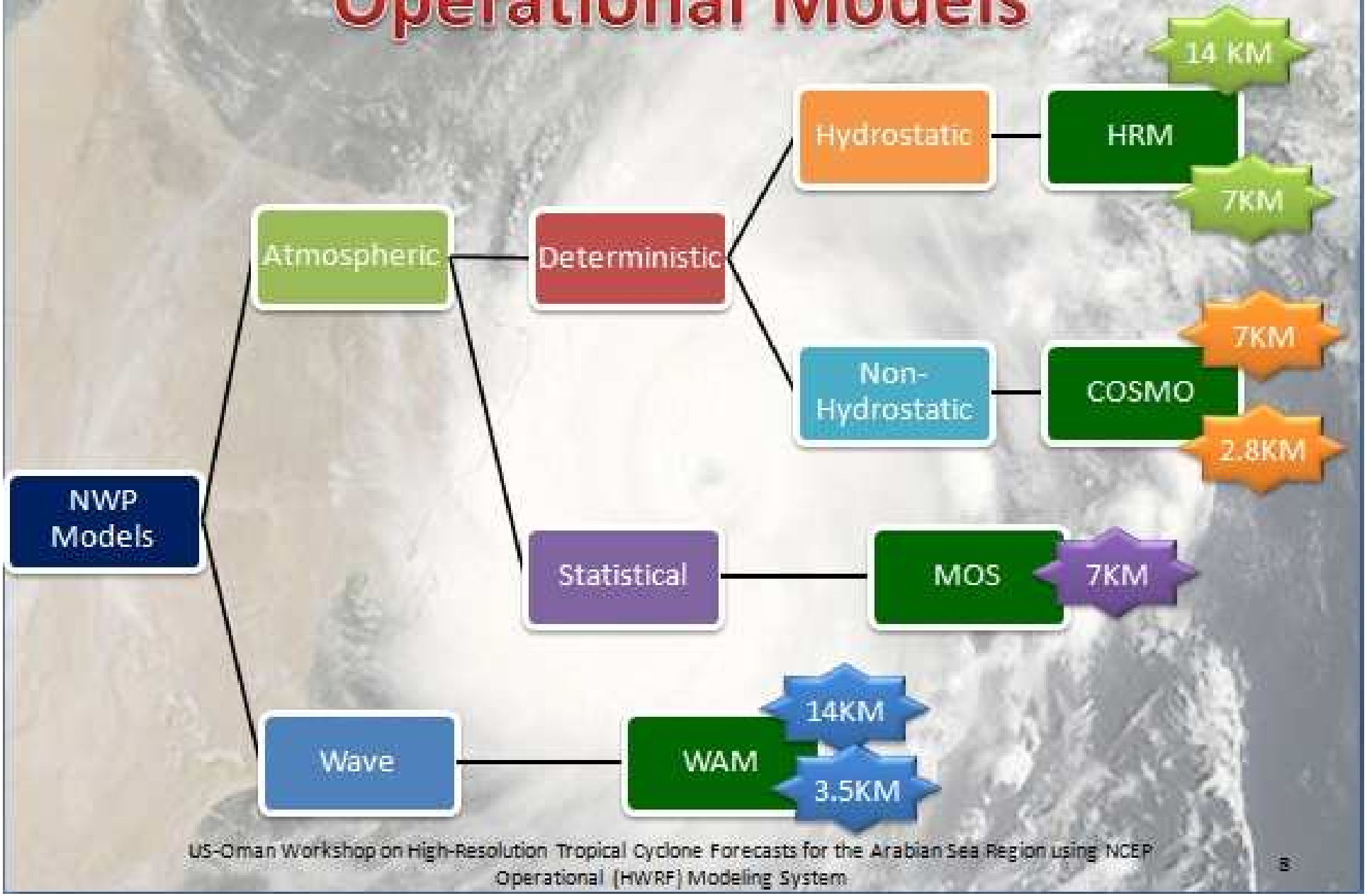


Description	GPS network
Consultant	UNESCO
Content	Procurement, installation and integration
Function	Monitoring slow or quick deformation of the earth Facilitate data for high accuracy of mapping

Running Our Own NWP and Tsunami Models

For local and Regional Weather and Tsunami

Operational Models



Collection, Processing and Utilization of Satellite Data and Products

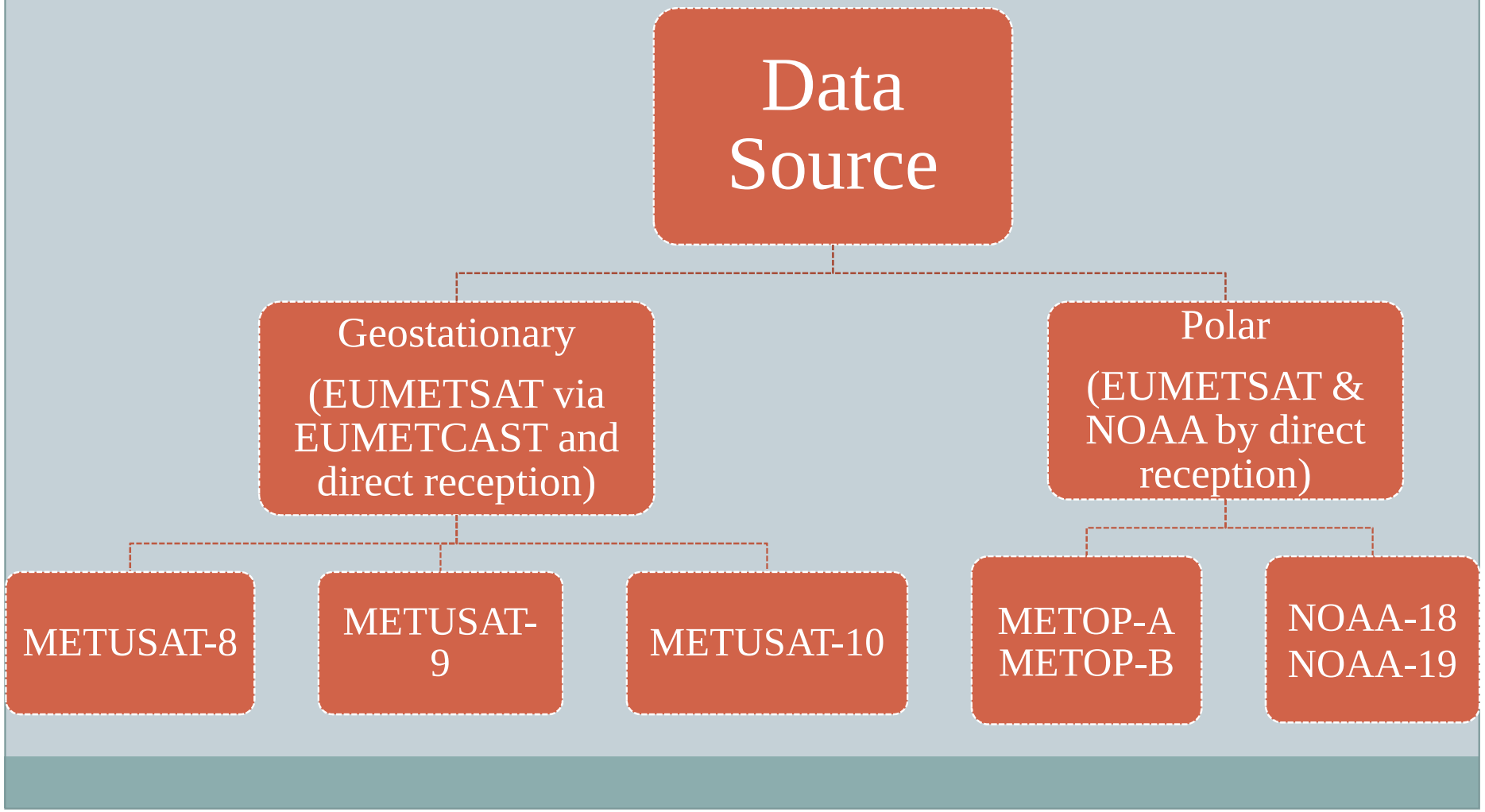
- Satellites/instruments currently used operationally:

-Meteosat 8
Meteosat 9
Meteosat 10

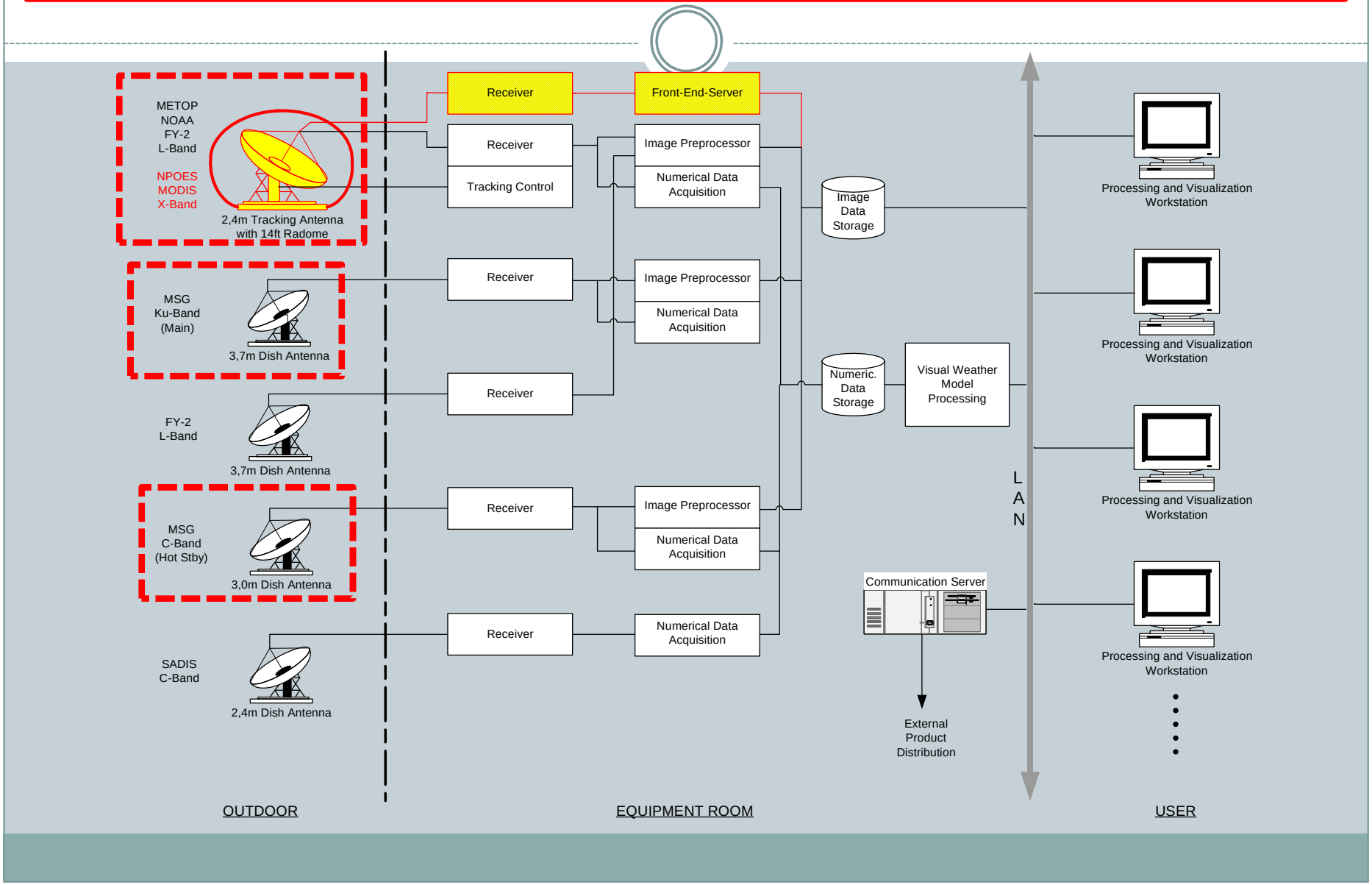
with the instrument (SEVERI)
More importantly, Meteosat 8 after its is movement to 41.5 E for IODC coverage and it is the main satellite for the daily operational uses.

-METOP A
, METOP B
, Terra ,
Aqua and Suomi NPP

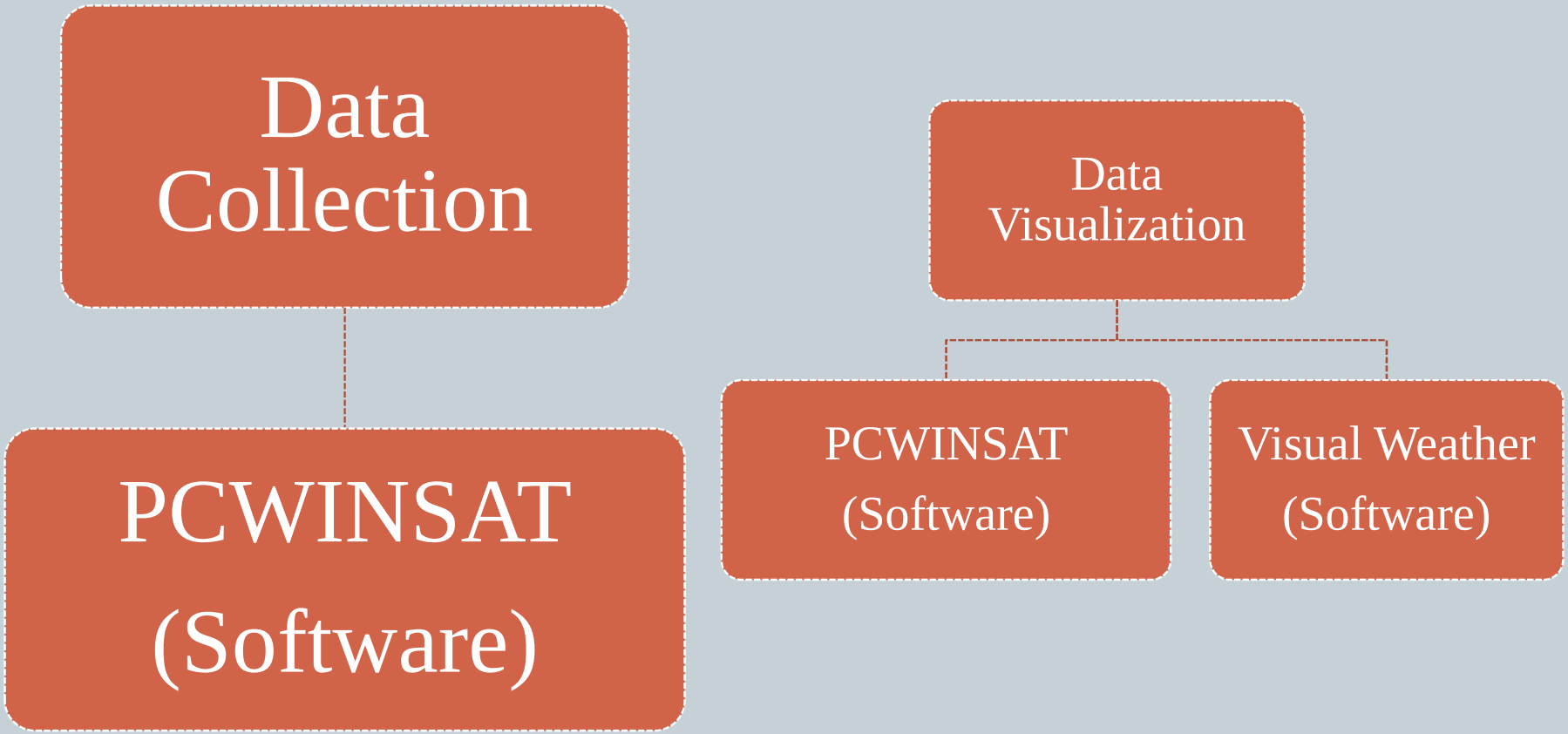
Satellite data collection and processing capabilities.



Currently Used Antenna and Data Receiving and Processing



Satellite data collection and processing capabilities.



Satellite Data to address Regional Challenges

Before the movement of Meteosat 8 to 41.5 E (very suitable for Oman,) the main weather satellite was used is meteosat 7 with 3 channels IR Vis and WV.

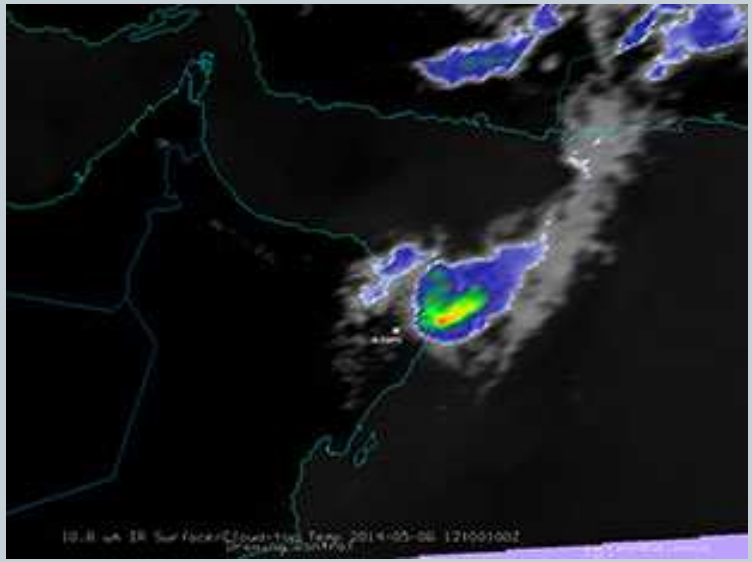
Now we can used 12 active channels of Meteosat 8 with very good view and resolution which extremely improved our operational work .

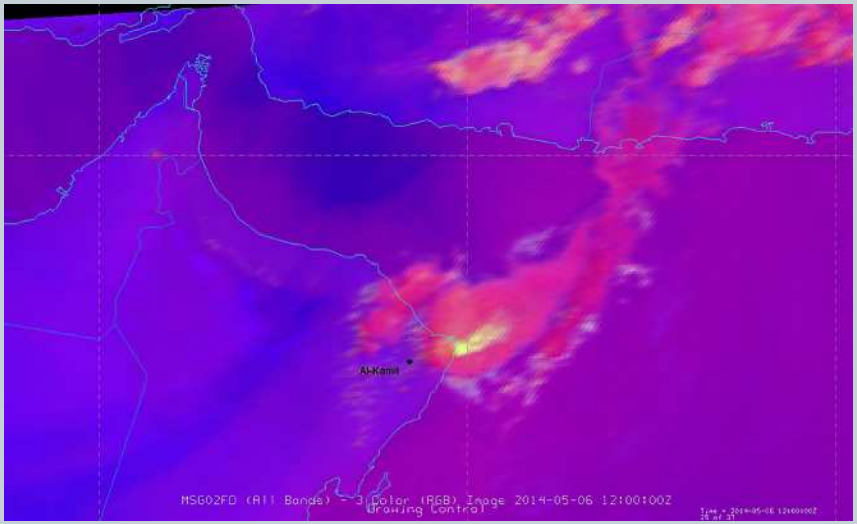
However , Meteosat 8 going to die 2019 and the alternative is still not known for the IODC .

Strong Parallax Shift extremely minimized by 41.5E Meteosat 8

Severe convective storms produced unusually large hailstones over Oman in early May 2014.

Date 6 May 2014
Satellites Meteosat-9
Channels/Products IR10.8, Severe convection RGB, A





Defining the TC center/eye has improved by the new position of meteosat 8

In early June Tropical Cyclone Ashobaa formed over the Indian Ocean, then headed towards Oman
06 June 2015

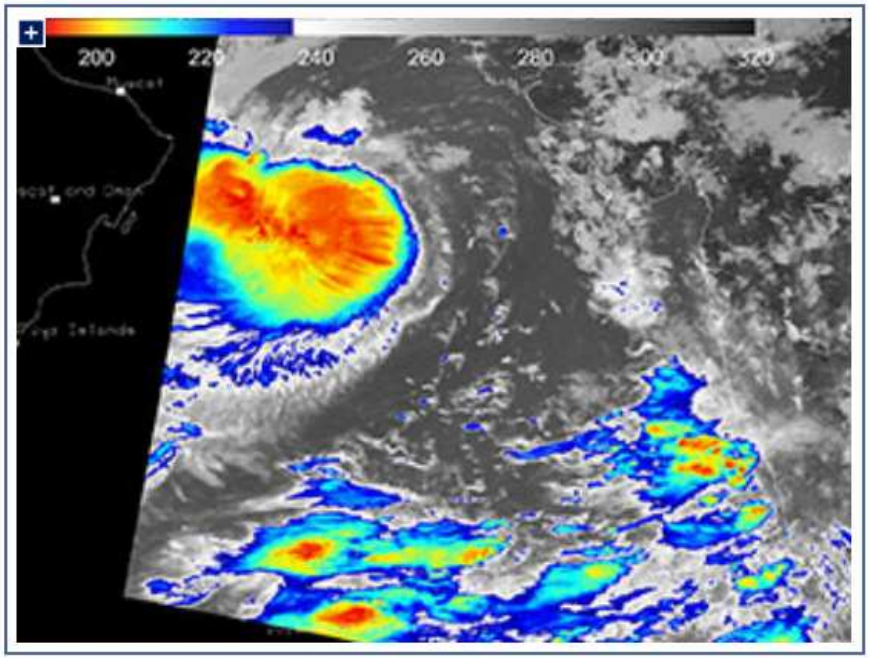


Figure 6: Metop-B, 09 June 2015, 04:49 UTC
IR10.8

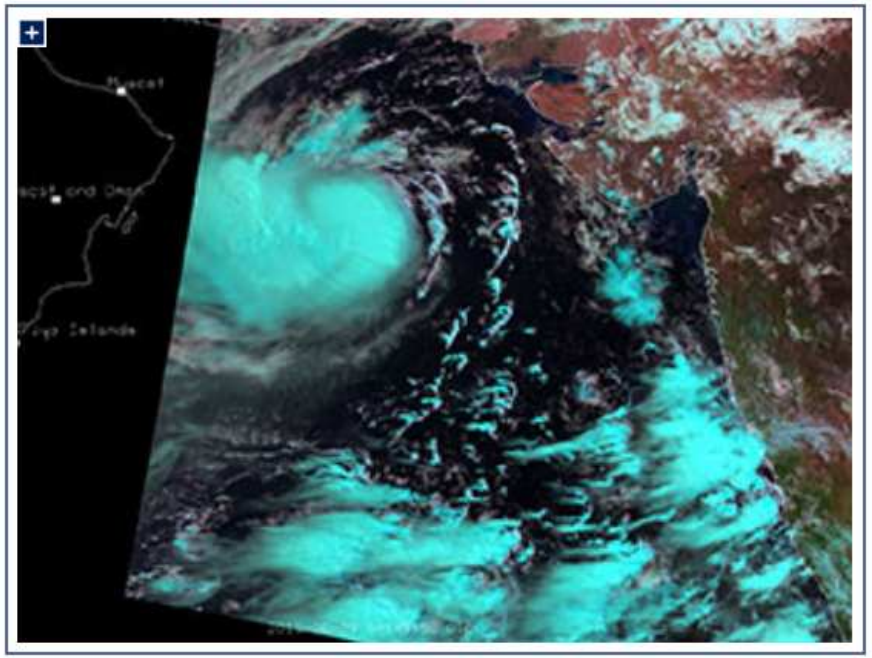
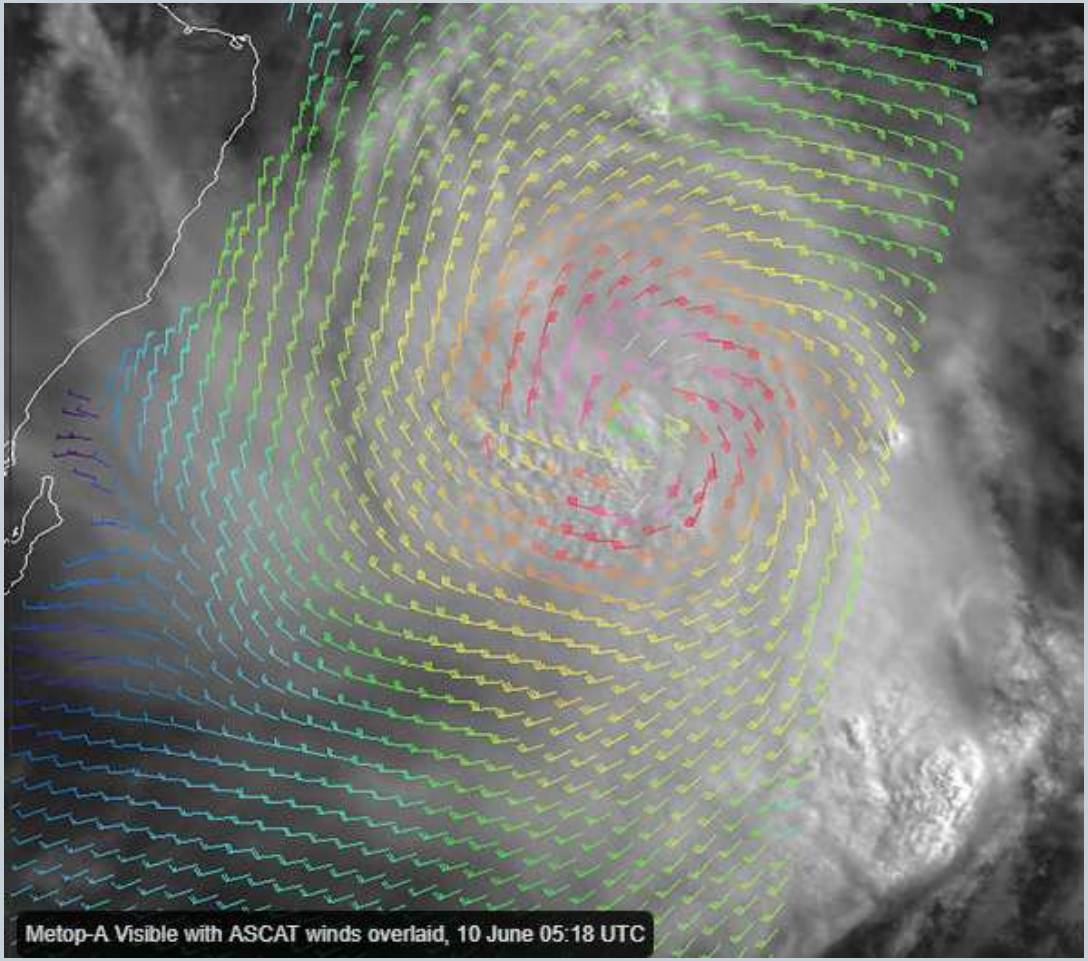
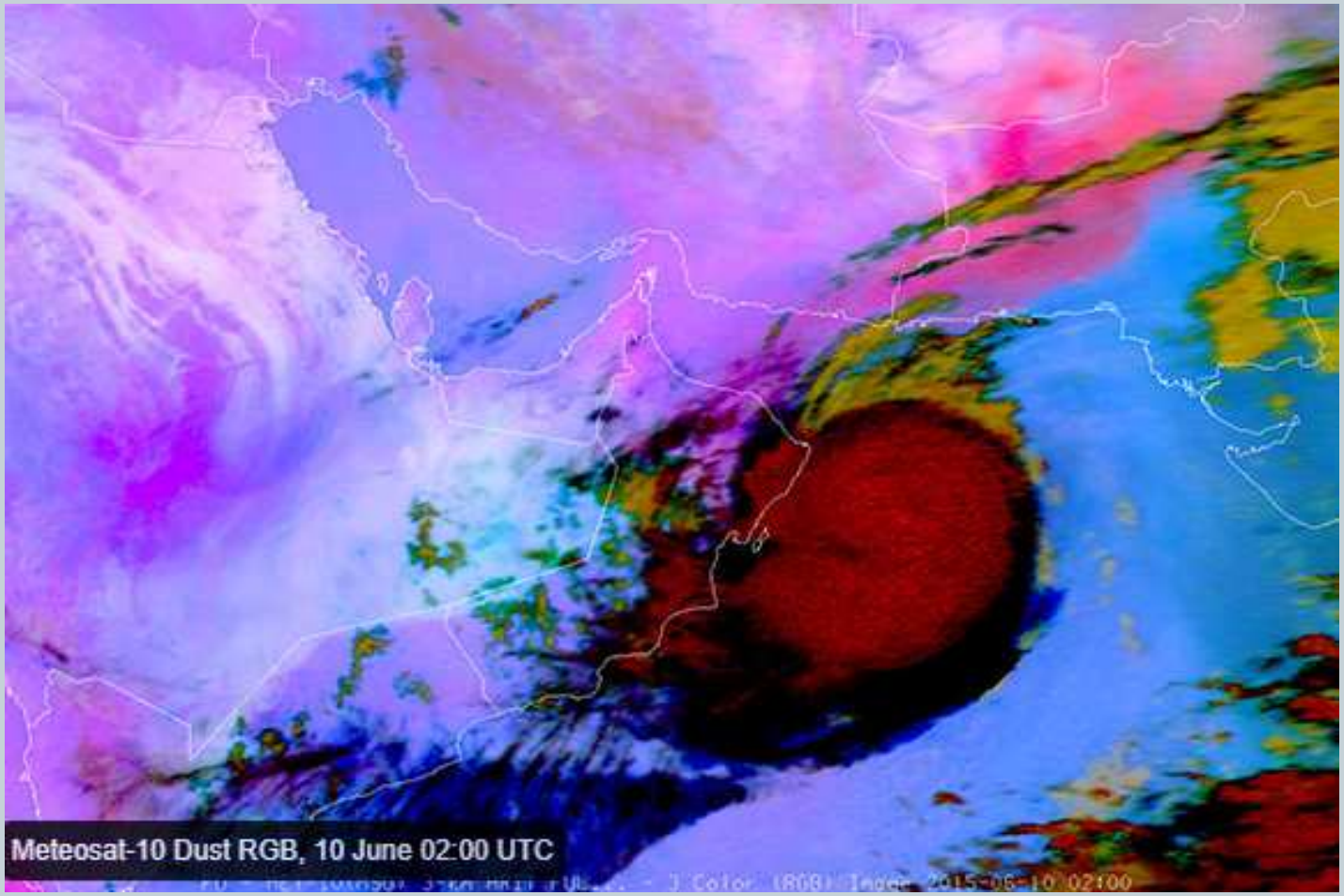


Figure 7: Metop-B, 09 June 2015, 04:49 UTC
Natural Colour RGB

Metop A ASCAT + VIS



Dust RGB



Thank You