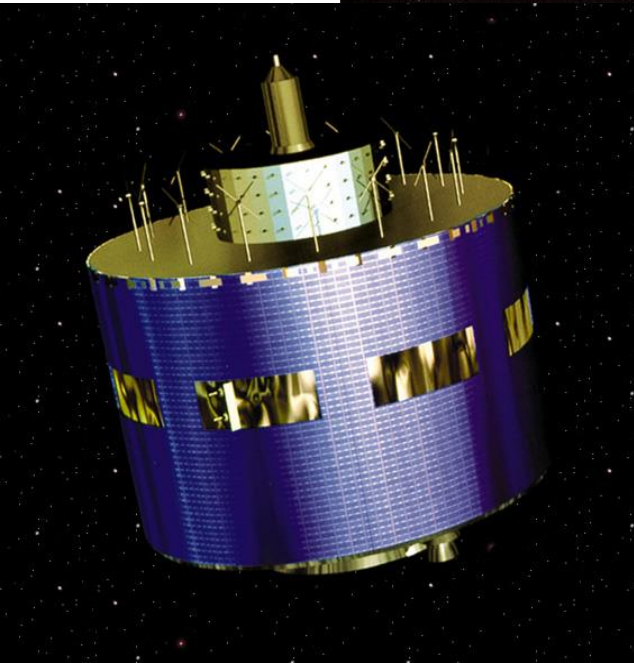# Atmospheric Applications of Low Orbiting Satellites
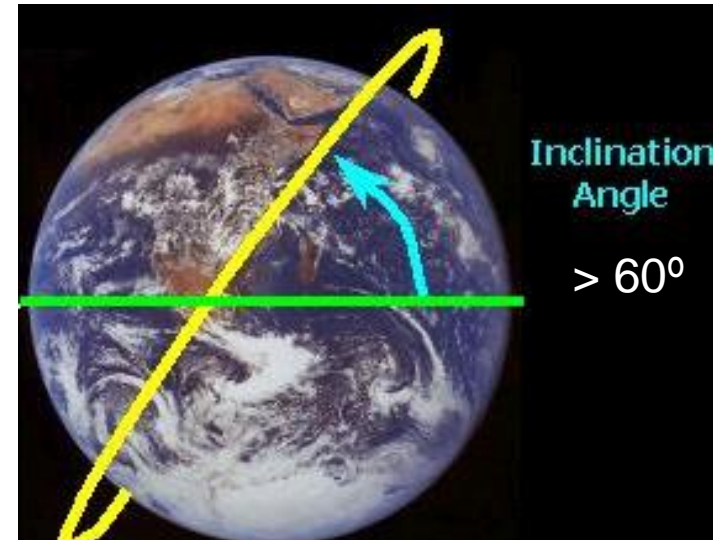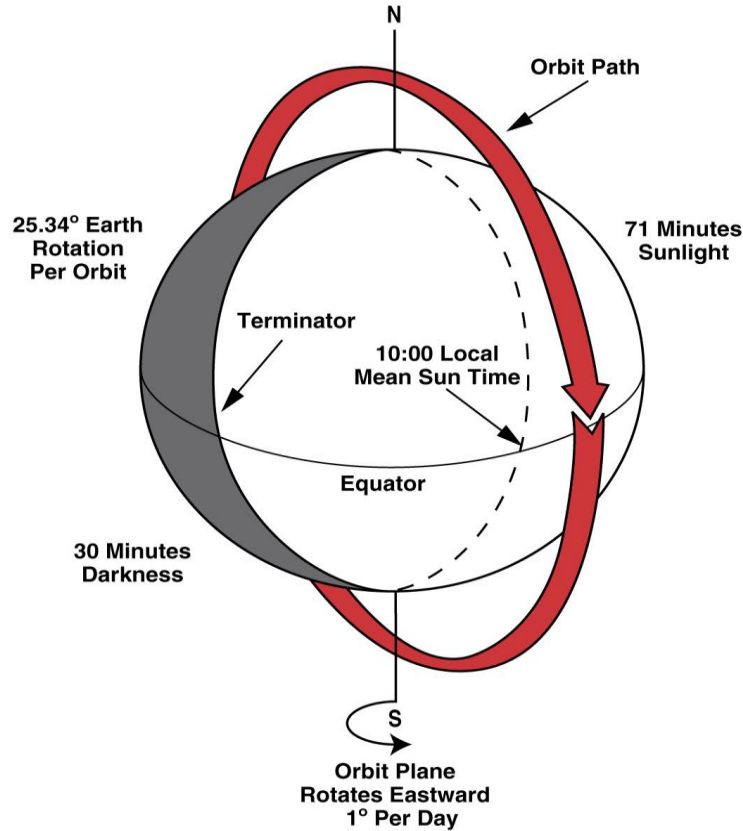
Humaid AlBadi
humaid.albadi@caa.gov.om
24 March 2022

Low Orbiting Satellites

Features

- **lower altitude of 500 to 2000 km.**

- **orbit from pole to pole in about 90 minutes.**

- **more detailed but less frequent images.**

Low Orbiting Satellites

How many Low Earth Orbiting satellites are currently operational?

https://space.oscar.wmo.int/satellites

Low Orbiting Satellites

Daily routine used products for early warning from Low Orbiting Satellites

https://weatherlink.blogspot.com

Precipitation Monitoring

Precipitation Monitoring

Multi-Sensor Precipitation Estimate

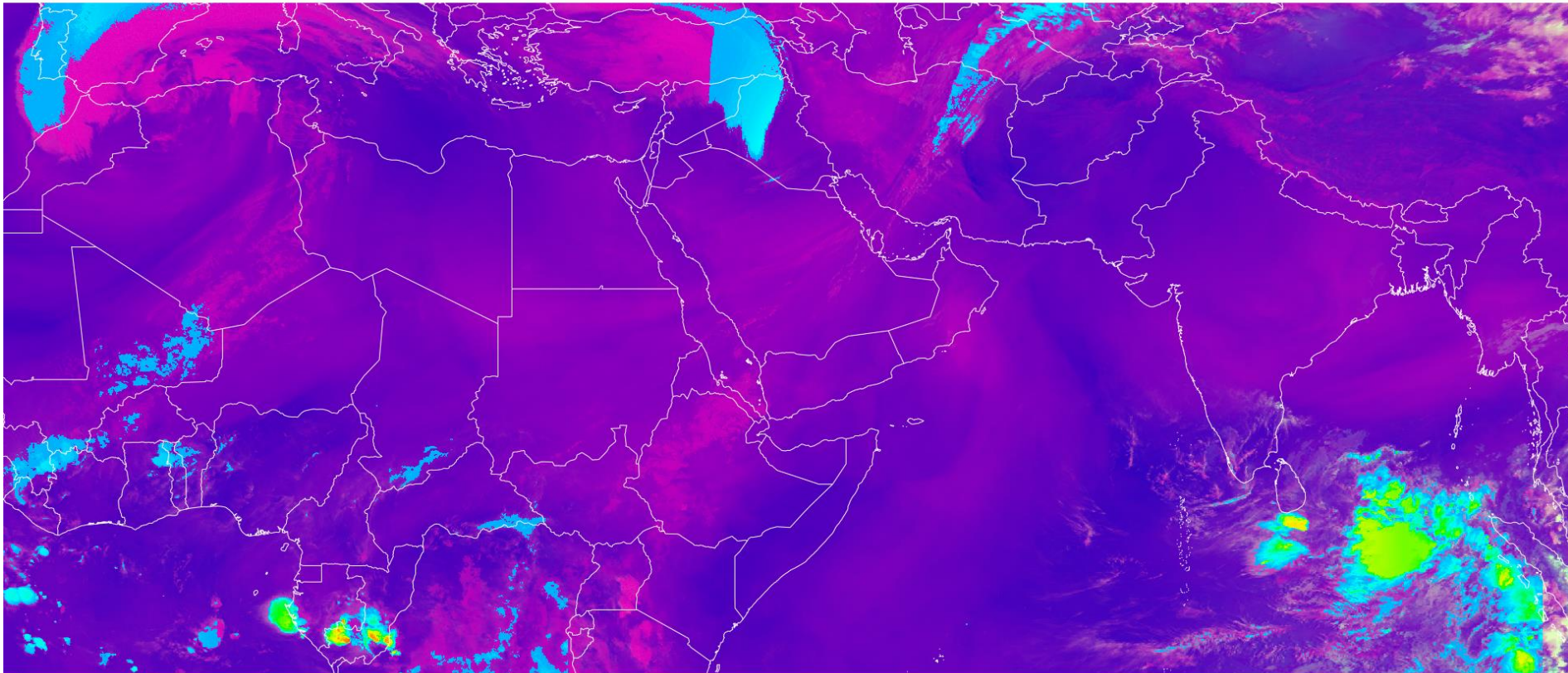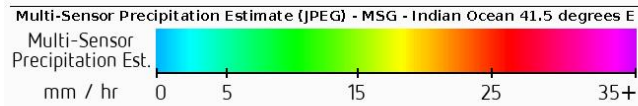Consists of the near-real-time rain rates in mm/hr.

The algorithm is based on the combination of Low Orbiting orbiter microwave measurements and images in the Meteosat IR channel.

The MPE is most suitable for convective precipitation.

Vey good for operational weather forecasting in areas with poor or no radar coverage.

Precipitation Monitoring

Multi-Sensor Precipitation Estimate

2022-03-17 03:15:00 UTC
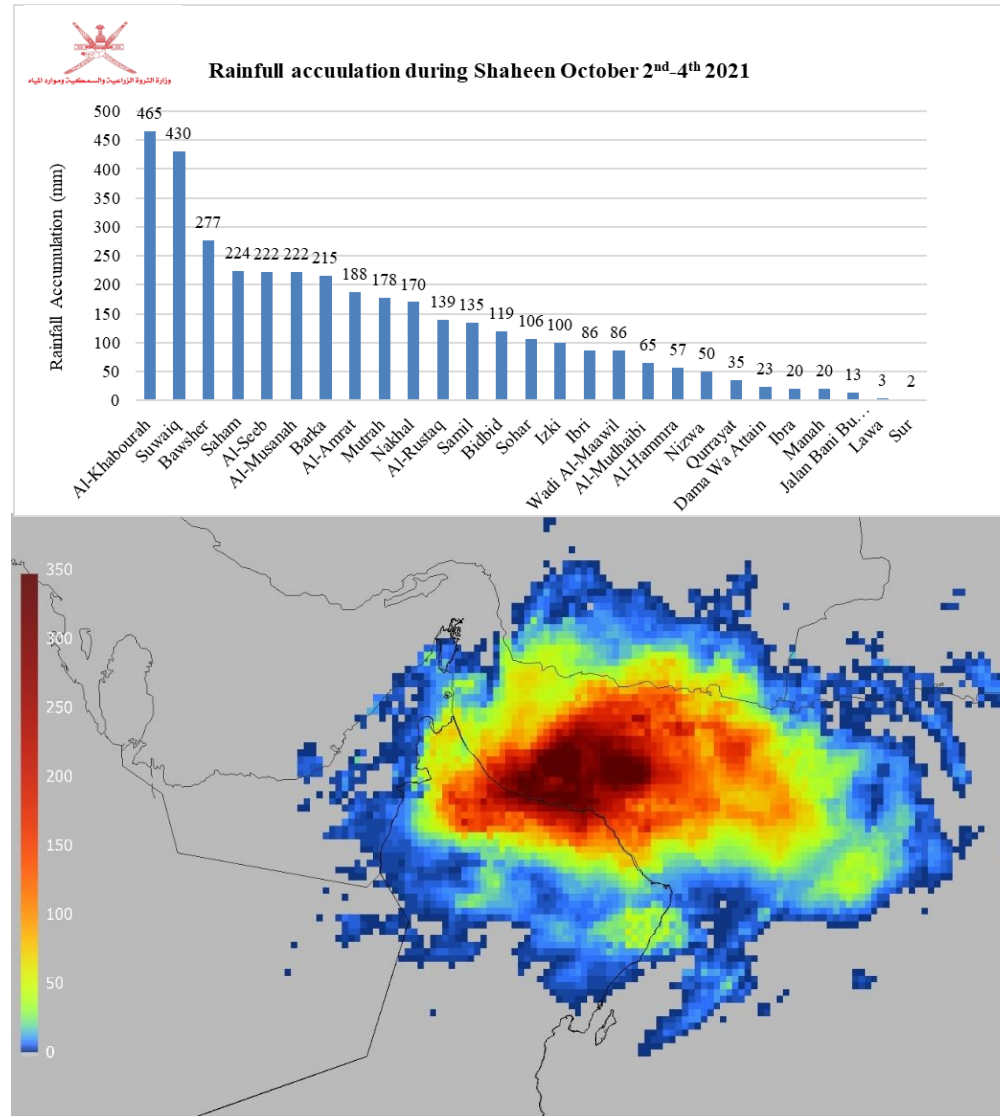
Precipitation Monitoring

Multi-Sensor Precipitation Estimate

https://weather.us

Precipitation Monitoring

Multi-Sensor Precipitation Estimate

https://giovanni.gsfc.nasa.gov/giovanni/

Rainfull accuulation during Shaheen October 2nd–4th 2021
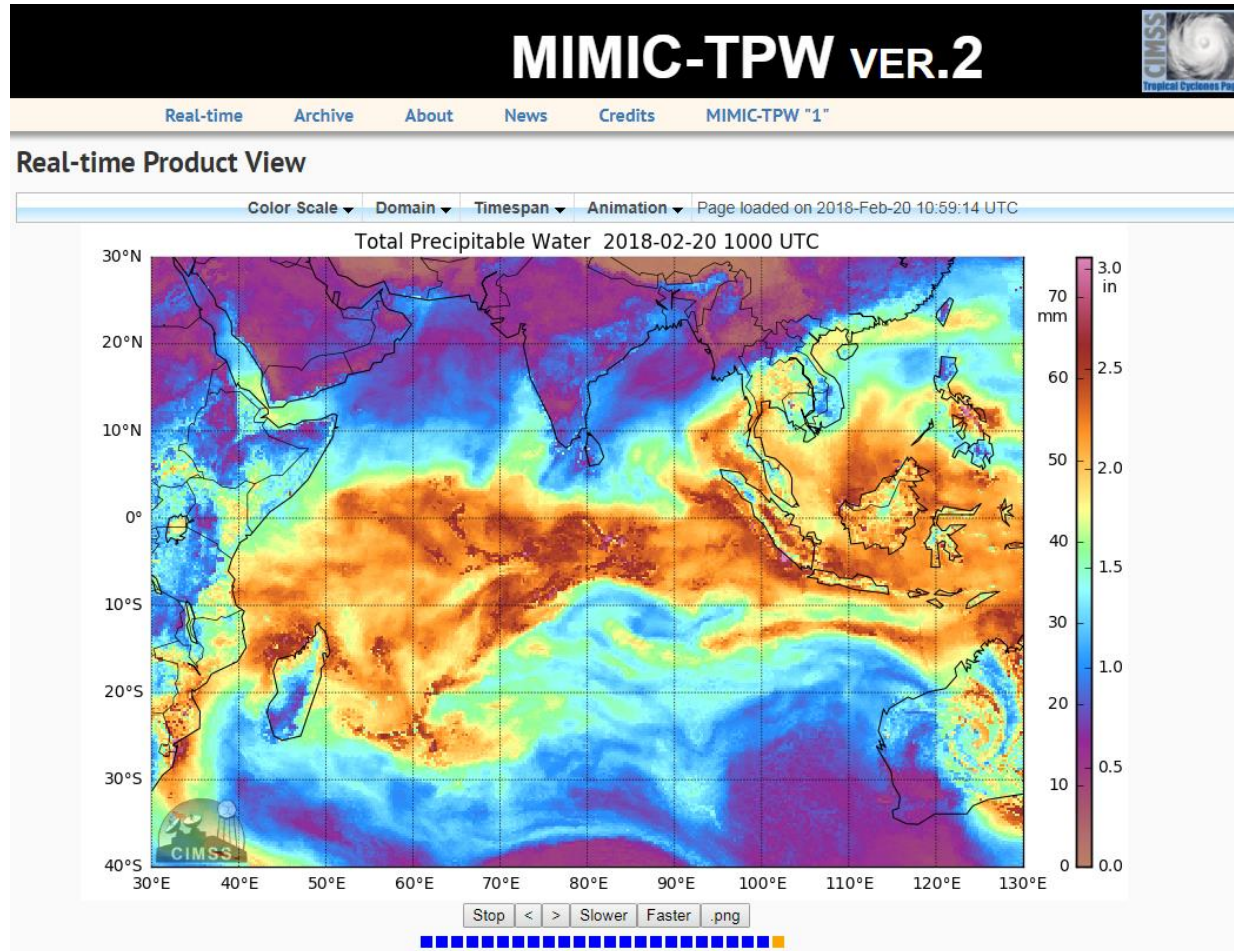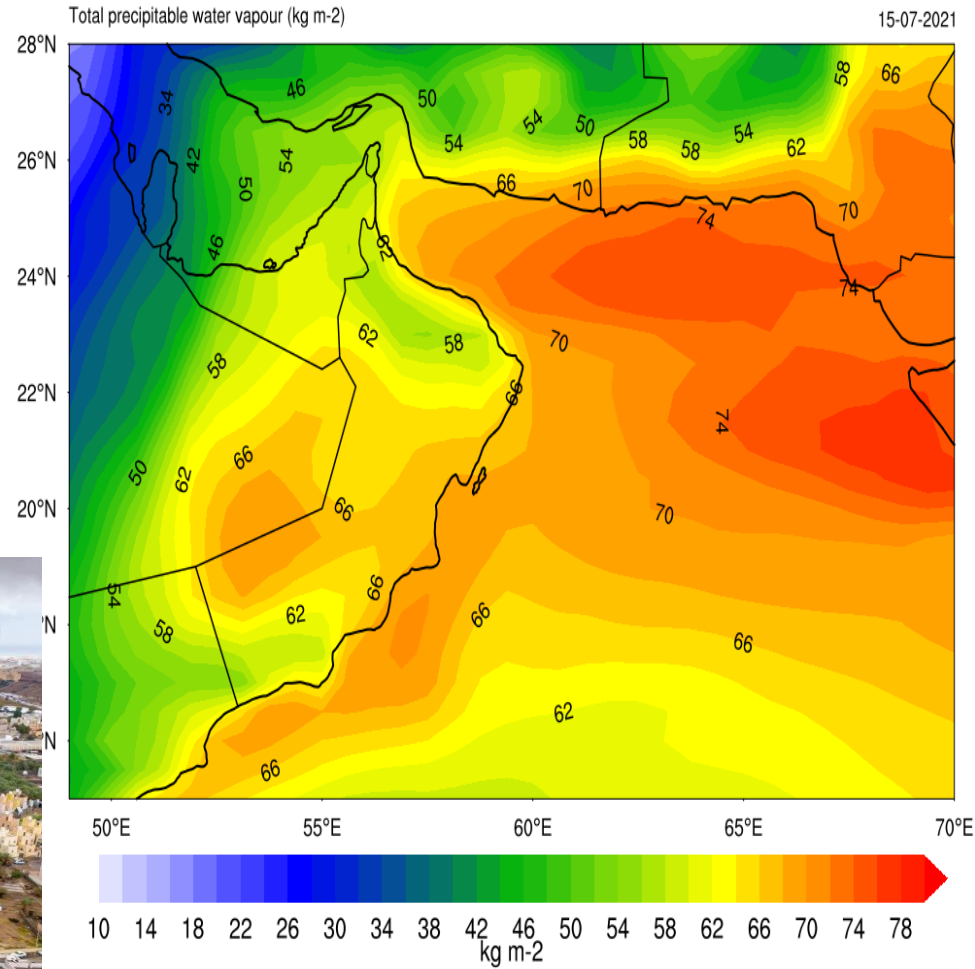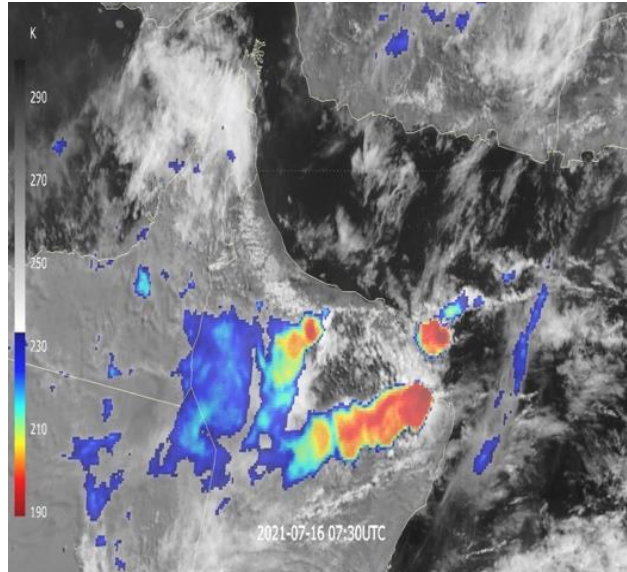
Precipitation Monitoring

Tropical rain NowCasting using Total precipitable water

http://tropic.ssec.wisc.edu/real-time/mtpw2/product.php?color_type=tpw_nrl_colors&prod=indo&timespan=24hrs&anim=html5

Precipitation Monitoring

Tropical rain NowCasting using Total precipitable water

https://ftp.ssec.wisc.edu/pub/mtpw2/data/202107/

Wind Satellite Observation

Wind Monitoring

ASCAT Instrument

The Advanced Scatterometer.

- accurate for wind below 50 kt

https://manati.star.nesdis.noaa.gov/datasets/ASCATBData.php

ASCAT: 20100602 06:30Z HIRLAM: 2010060200+6 lat lon: 17.50 60.20 IR: 06:30

(c) EUMETSAT/KNMI
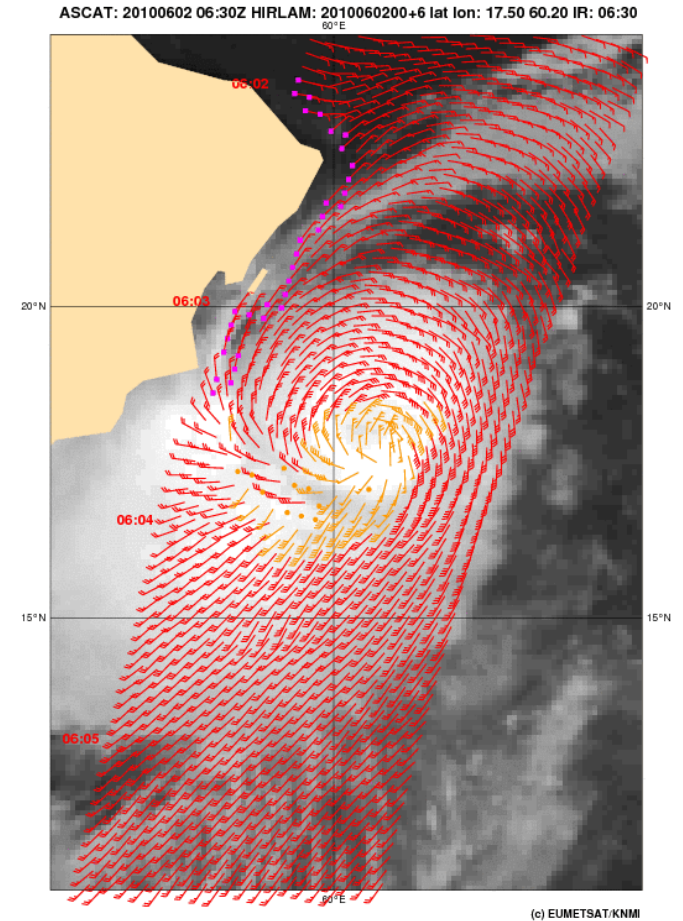
Wind Monitoring

ASCAT Instrument

The Advanced Scatterometer.

- accurate for wind below 50 kt
- Used to model Tropical cyclone wind.

Multiplatform Satellite Surface Wind Analysis

combines five wind data sources to create near 700 hPa wind. A very simple approach is used to adjust the wind to the Surface (10 Meter).

Our experience from 2018 to 2021
-    Accurate over the sea.
- Not Accurate over land

https://rammb-data.cira.colostate.edu/tc_realtime/

IO0321 SHAHEEN-GU 2021   3 Oct 06UTC
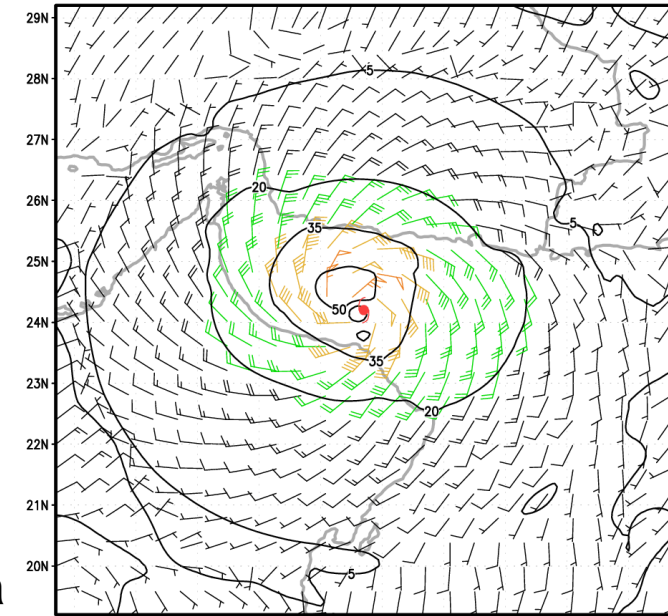
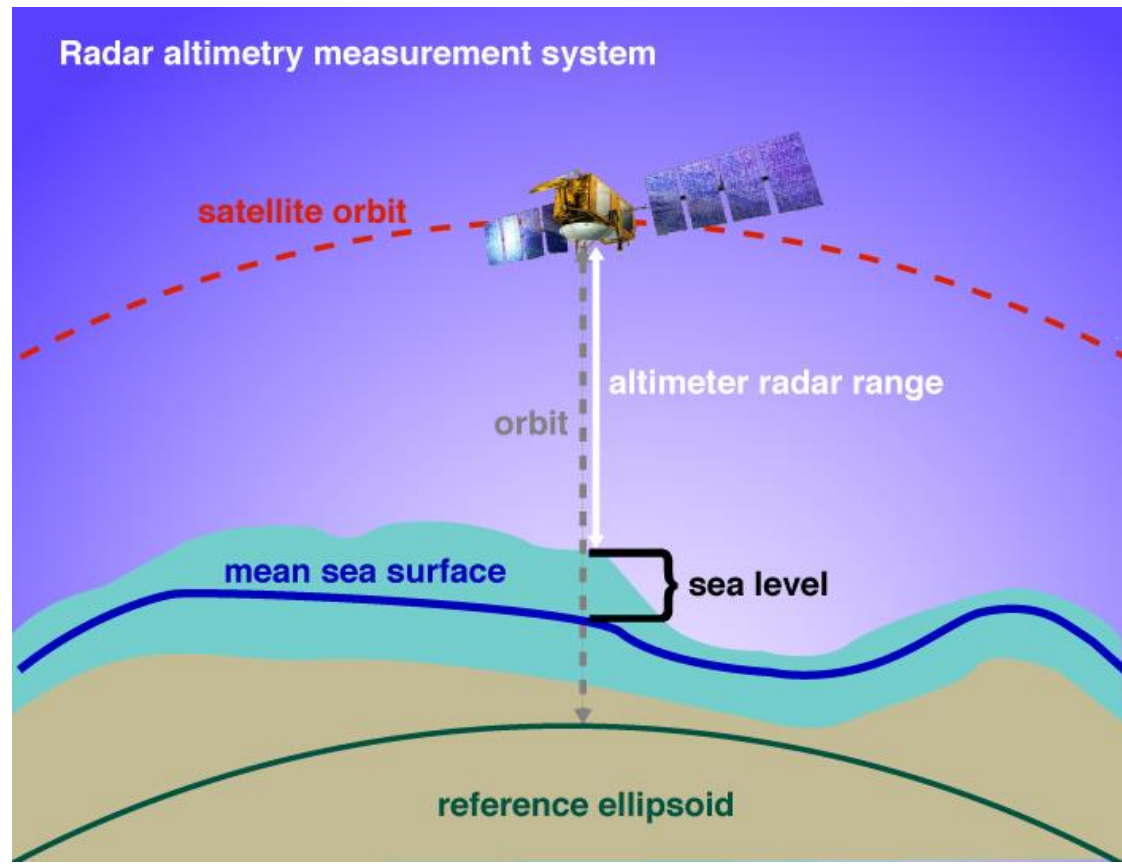| QUA | NE | SE | SW | NW | VMAX Input for IR Winds = 68 |
R34	80	55	80	100	
R50	35	25	25	55	VMAX = 71 kt MSLP = 983.6 hPa
R64	15	25	25	25	RMW = 25 nmi BEARING = 190 degrees

Wave Height

Wave Height

Satellite Altimeter

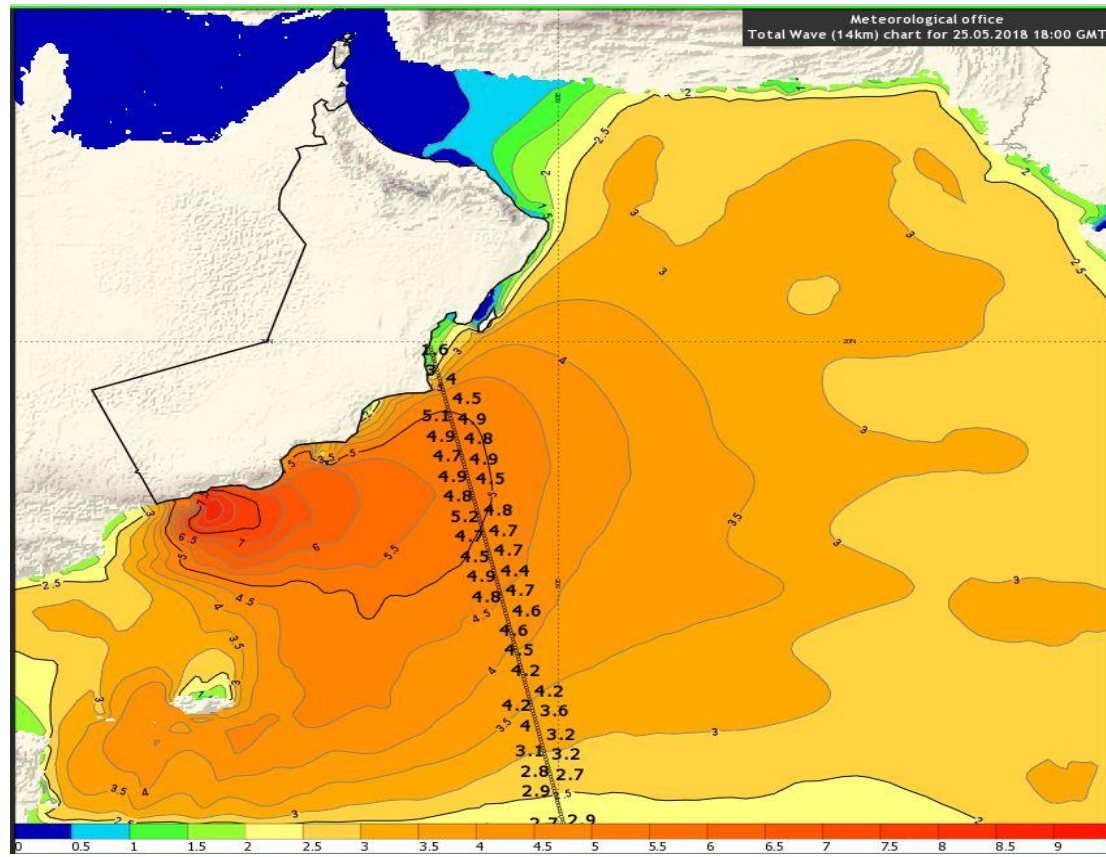Measures the height of the satellite above the planet's surface using the time travel of light pulses

https://manati.star.nesdis.noaa.gov/datasets/ASCATBData.php

Wave Height

Measures the height of the satellite above the planet's surface using the time travel of light pulses

https://manati.star.nesdis.noaa.gov/datasets/ASCATBData.php

Sea Surface Temperature

Sea Surface Temperature

Practical

Ekman Pumping

Go to https://worldview.earthdata.nasa.gov/

- For 01/06/2007 12 UTC and 06/06/2007
  - add layer -> Sea Surface Temperature (*Multi-mission / GHRSST)*

  - Compare Oman Sea Surface Temperature for the two days. Which is higher? What do you think is the cause of the difference?