



Sentinel applications and products for Atmosphere and Climate monitoring: the importance of the Azores

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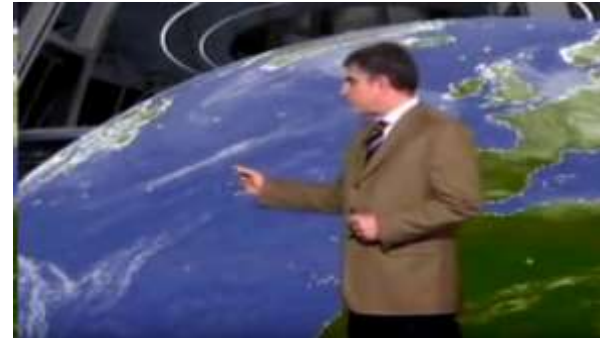


Sentinel Applications

Weather services were one of the very **first users** of satellite imagery.

Satellite weather images are one of the **most popular** products on TV weather reports.

Satellite data is also the **major source** of information for operational weather forecasts.



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Sentinel Applications

Sentinel missions will provide a set of products that can be used in applications on:

- Atmospheric monitoring
- Climate Change

Ozone O₃:

- Total Column
- Profile
- Tropospheric Column

Nitrogen Dioxide NO₂:

- Total Column
- Tropospheric Column

Sulfure Dioxide SO₂:

- Total Column

Formaldehyde HCHO:

- Total Column

Carbon Monoxide CO

- Total Column

Methane CH₄:

- Total Column

Aerosols :

- Aerosol optical depth
- Aerosol Index
- Aerosol Layer Height

Total Suspended Matter Concentration

Clouds

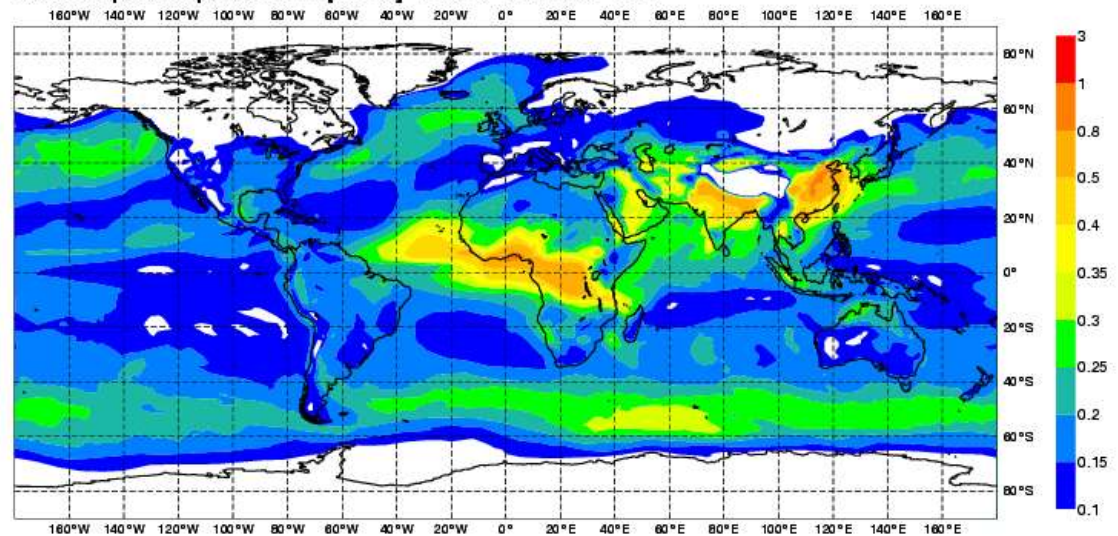
- Cloud Information (e.g. cloud top height and cloud fraction)

Water Vapor

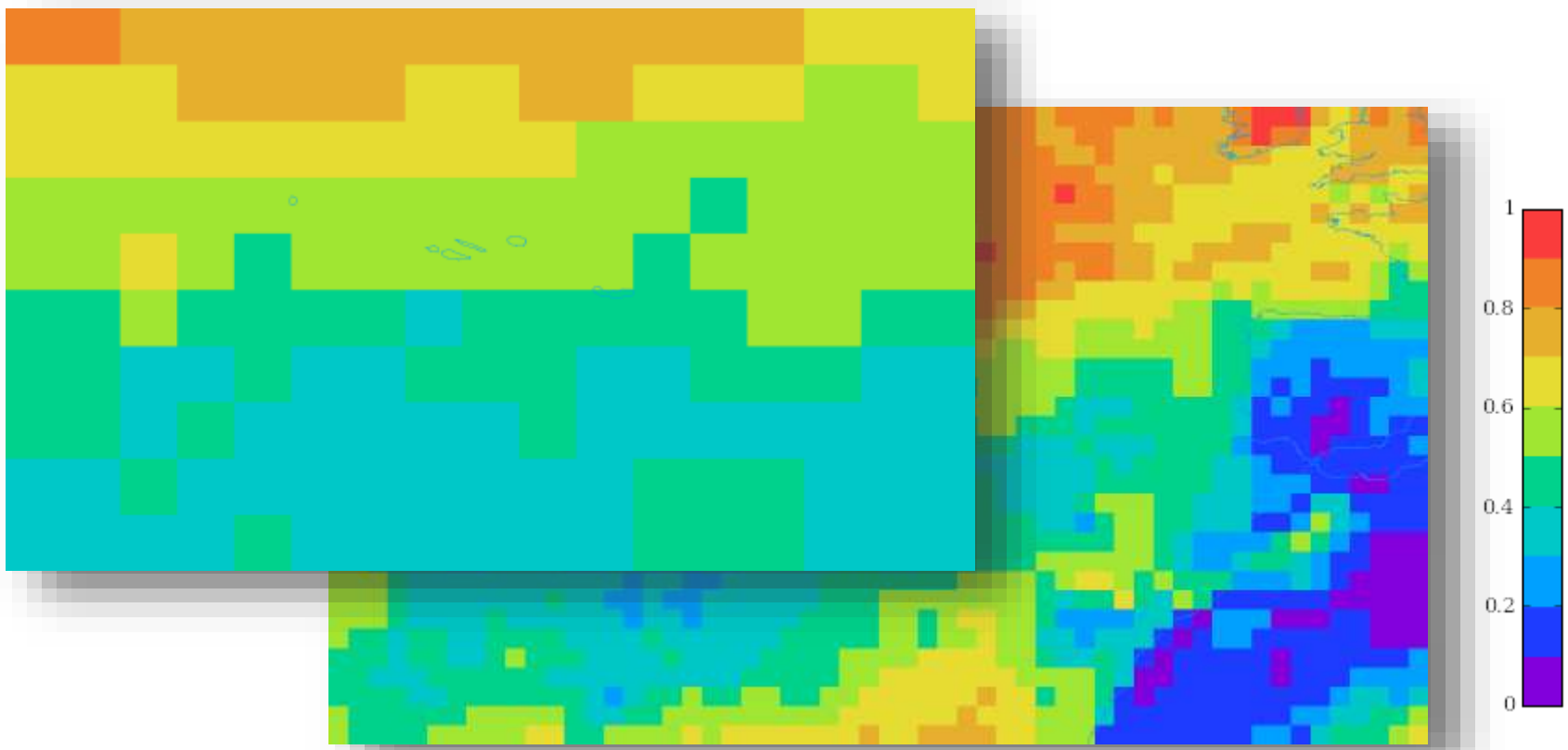
- Total column

MACC Reanalysis Global Monthly Mean January 2012

Aerosol Optical Depth at 550nm [None] mean: 0.15 max: 0.89



Atmospheric monitoring

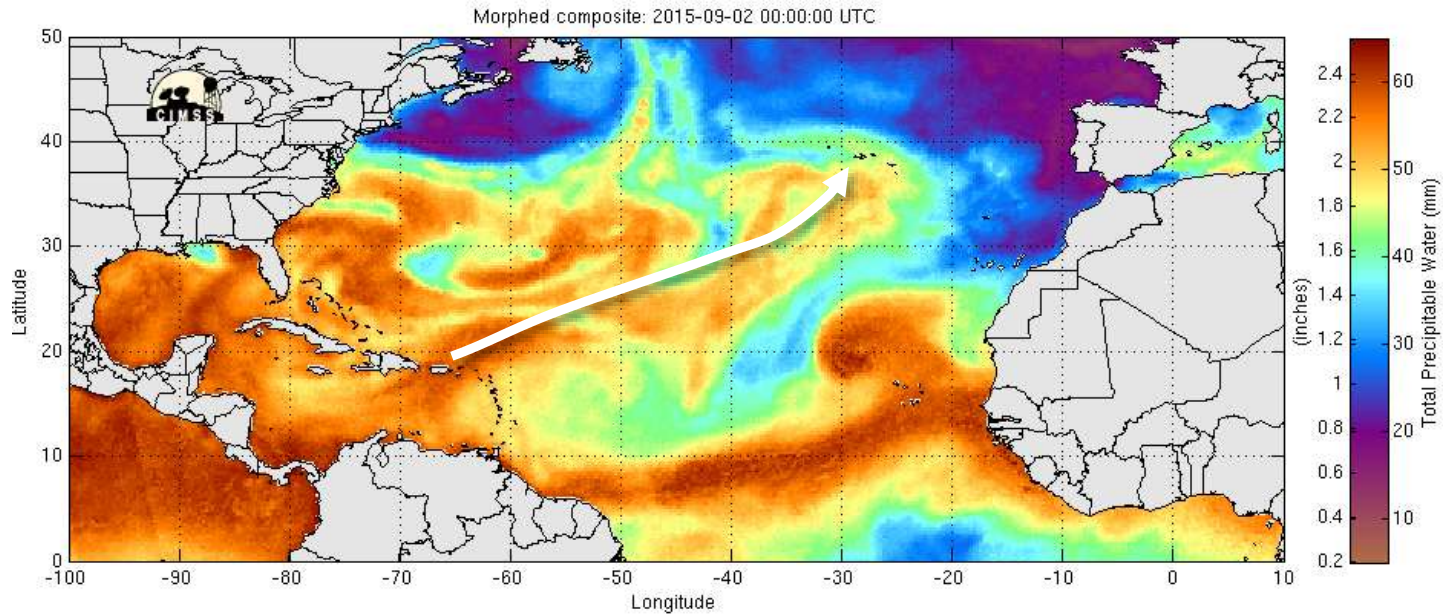


Aqua/MODIS MYD08_M3 Monthly Mean Daytime Cloud Fraction - July 2015



Atmospheric monitoring

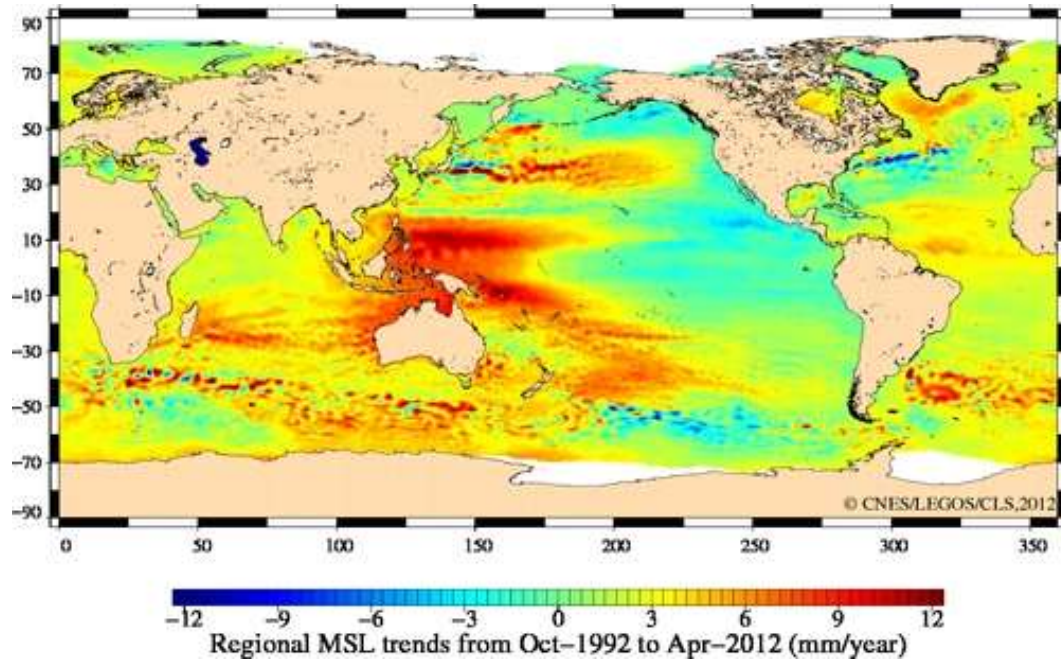
- Integrated Water Vapour column:



Morphed Integrated Microwave Imagery at CIMSS - Total Precipitable Water (MIMIC-TPW)

Climate Change

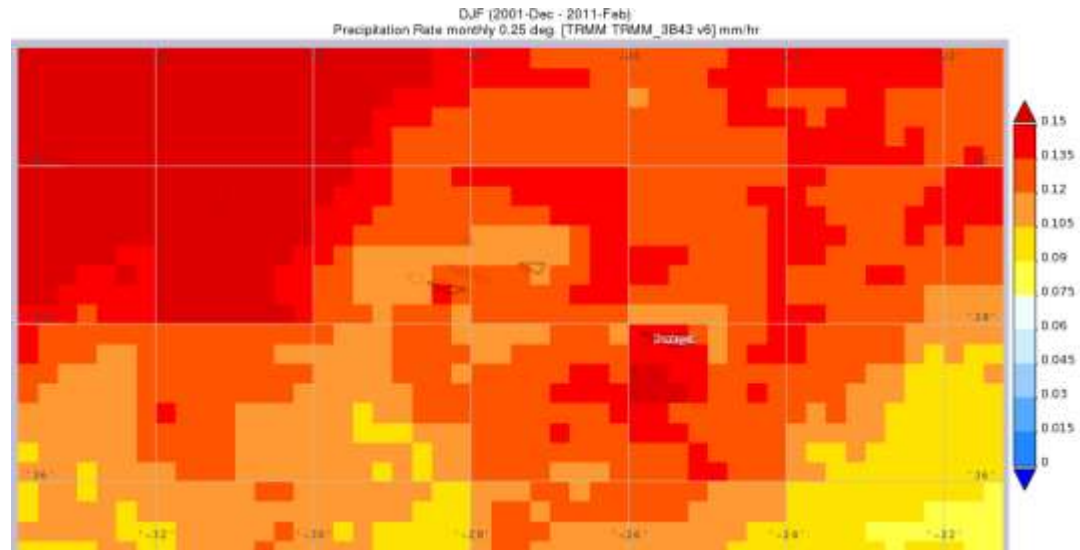
The main application of SENTINEL-3 in relation to climate is in determining mean sea level rise due to global warming. As the ocean warms in response to global warming, sea waters expand and, as a result, sea level rises.



Regional Mean Sea Level Trends from October 1992 to April 2012 (Credit: CNES/LEGOS/CLS)

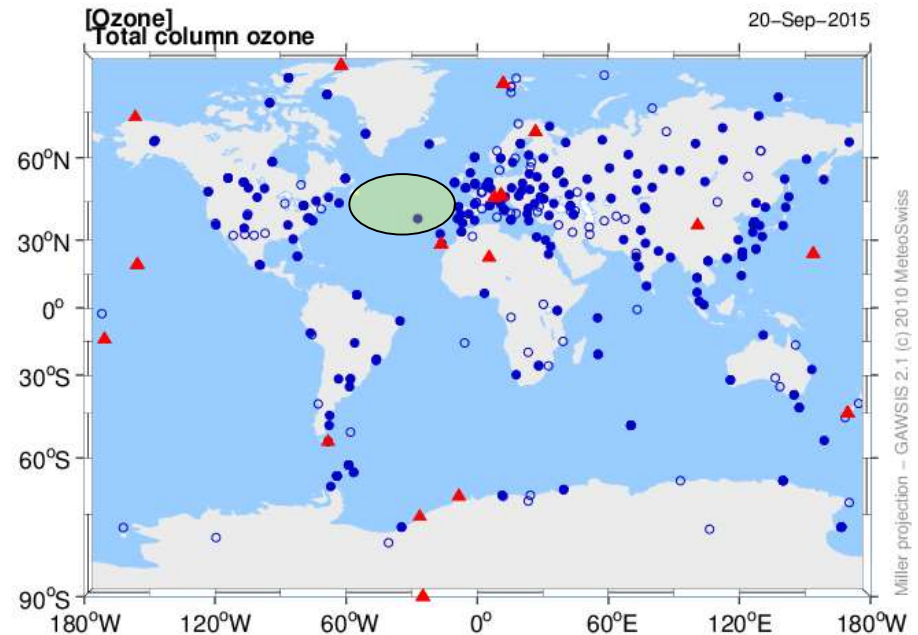
Other **climate** related products over oceans:

- Ocean Wind Field
- Ocean Wave Spectra
- Surface Radial Velocity
- Snow Density and Depth
- Significant Wave Height
- Tide Height
- Sea ice concentration
- Sea ice freeboard
- Sea Surface Wind Speed
- Sea Surface Temperature
- **Rain Rate**



The importance of the Azores

- Satellite remote sensing products need to be **validated** against direct measurements at the ground.
- **Ocean** areas have a lack of monitoring stations
- Small islands like **Azores** can provide geographical conditions for satellite products validations for a significant area of the North Atlantic.



▲ GAW Global Station ● GAW Regional Station
Open symbols denote closed or inactive stations.



The importance of the Azores

- During the last decade, a set of **observational facilities** have developed in the Azores under the scope of different observational programs.



Observatório José Agostinho (Terceira Is.)

- Total O₃ column
- Total SO₂ column
- UV spectral irradiance (290-320 nm)
- Downwelling short wave irradiance
- Downwelling shortwave diffuse irradiance
- Downwelling Longwave irradiance
- Direct solar irradiances
- Aerosol Optical Depth
- CO₂ concentration (Serreta)



The importance of the Azores

Pico-NARE station (Pico Is.)



- Ozone concentration
- CO concentration
- NO₂ and NO concentrations
- Black Carbon concentration
- Aerosol concentration (PM>0.3 μ m, PM>0.4 μ m)
- Aerosol scattering coefficient



The importance of the Azores

East North Atlantic ARM station (Graciosa Is.)



- Downwelling short wave irradiance
- Downwelling shortwave diffuse irradiance
- Downwelling Longwave irradiance
- Direct solar irradiances
- Aerosol Optical Depth
- CO₂ concentration
- O₃ concentration
- Aerosol scattering coefficients
- Aerosol vertical profiles
- Cloud height, cover
- Liquid precipitation content
- Vertical profiles, etc



**THANK YOU
FOR YOUR ATTENTION**

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