Dust products

Some options

Athanasios Natsis

September 16, 2025

Polar Multi-sensor Aerosol product (PMAp)

Climate record 2007–2019 (PMAp CDR)

Output

- AOD (GOME-2)
- Aersool types and clouds (IASI, AVHRR)
- Dust as non operational product...
- PMAp (dust-dominated total AOD contribution from other aerosol types than dust)
- LEO

Aerosol types: ocean fine mode, ocean coarse mode, thick biomass burning, desert dust, volcanic ash/thick dust, volcanic ash with SO2, aerosol contaminated cloud, ash contaminated cloud, unclassified

Polar Multi-sensor Aerosol product (PMAp)

Inputs:

- GOME-2 Fundamental Data Record (FDR) Level 1C
- IASI FDR Level-1C (NRT)
- AVHRR Level 1B NRT

Polar Multi-sensor Aerosol product (PMAp)

Algorithm:

- cloud identification and correction using collocated AVHRR observations
- discrimination between aerosols and clouds
- preliminary classification of aerosols, including desert dust detection.
- AODs also for partly cloudy footprints,
- retrieval of estimated AOD using unpolarised GOME-2 reflectances and a Look-Up-Table
- set of AOD estimates is retrieved for each candidate aerosol model.
- find the best fit between the measured and modelled reflectances and Stokes fractions
- best model (LUTs from 9 models), for each aerosol, aerosol

Polar Multi-sensor Aerosol product (PMAp)

PMAp –> AODs @ 550nm

- not possible to define the dust fraction (or AOD related to dust particles only) from a PMAp total AOD
- Define the dust-dominated total AOD where the aerosol class is set to “desert dust” or “thick dust” for pixels which the assumed dominant aerosol type is dust

“total AOD” “dust-dominated total AOD”

WORKS but:

- for subset of data/domain
- against specially filtered AERONET data
- better describing dust occurrence and variation
- sensitive enough for high AOD cases involving dust
- PMAp observations cannot be used to define DAOD global variation

Thanos AOD retrieval (we need a nice name)

Inputs:

- Temperature @10.8 m (MSG –> update MTG)
- Land Surface Temperature (ERA5 –> update MTG[1])
- Humidity (ERA5)
- Constant from MODTRAN4 (more model runs)
- Cloud mask (MSG/MTG)

[1] pre-operational

Thanos AOD retrieval (we need a nice name)

Difficulties:

- Discrimination of dust from clouds
- Define/choose a rolling pristine sky
- ERA5 latency 5 days for preliminary, 2-3 months for final

Validation:

- AERONET
- Sentinel-3?

Upgrades:

- Automation
- Machine learning

Data visualization

Table 1: Summary Statistics

Mean_Speed	Mean_Distance	Correlation
15.4	42.98	0.8068949

–>