Consiglio Nazionale delle Ricerche

InDust
Dust observations – an overview

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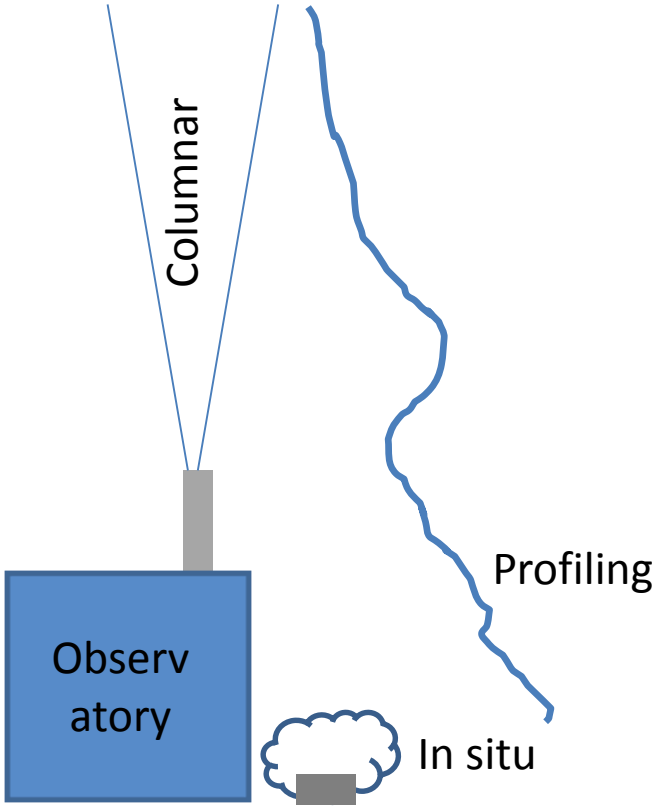
ICAP 2018, 6-8 June 2018

Observations of atmospheric aerosol

Atmospheric aerosol presence and properties can be inferred through a **plethora of techniques** mounted on **different platforms**



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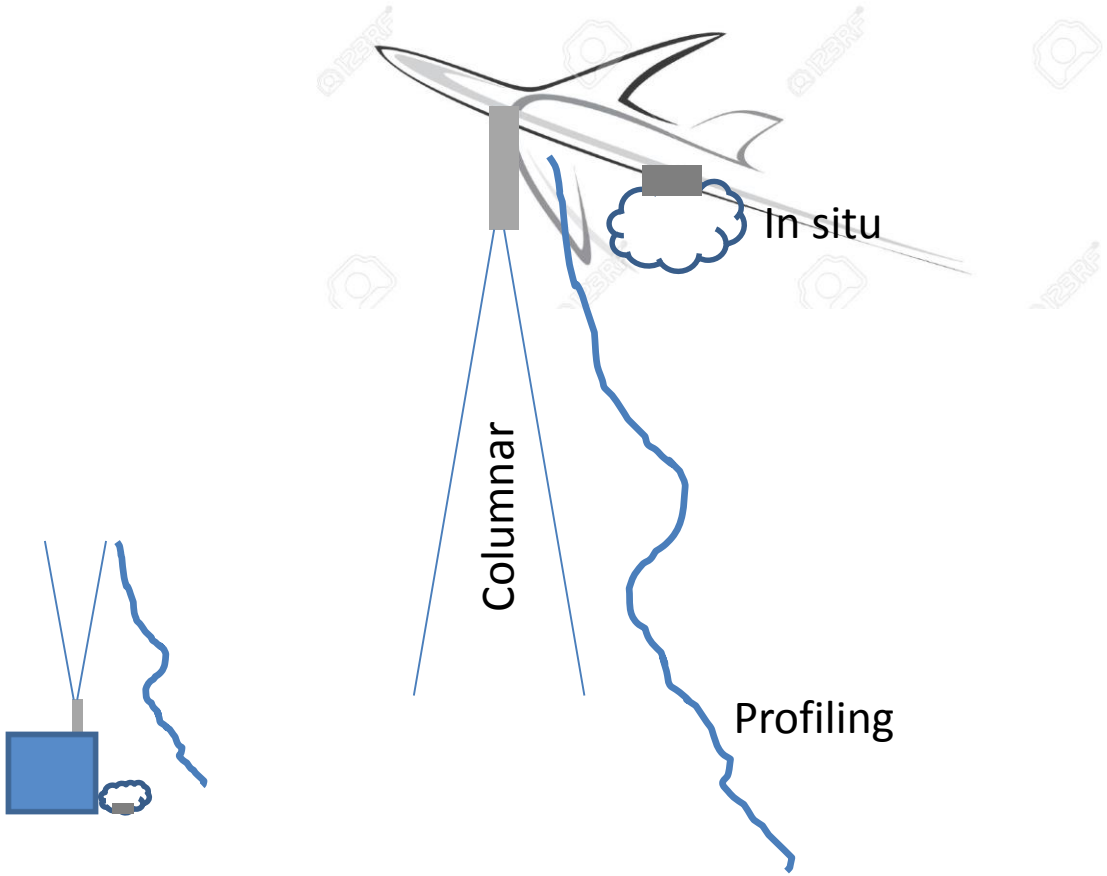
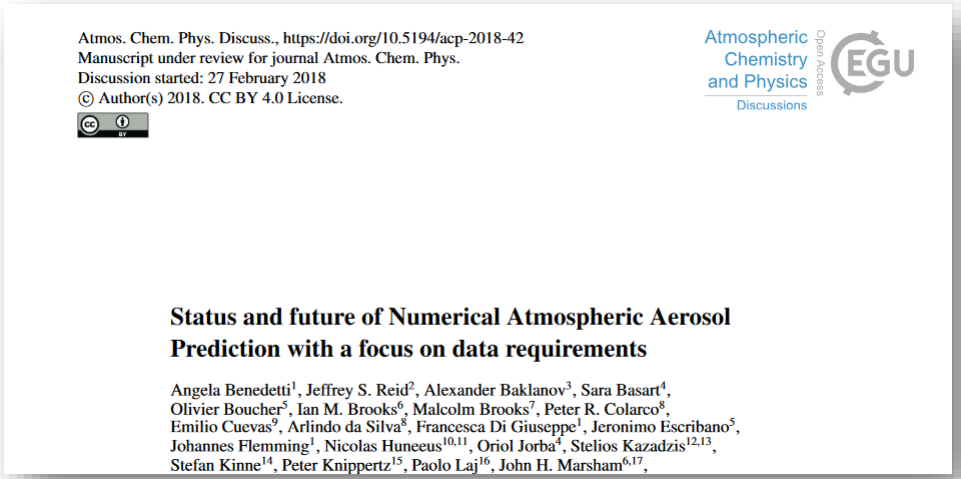


Observations of atmospheric aerosol

Atmospheric aerosol presence and properties can be inferred through a **plethora of techniques** mounted on **different platforms**

Main issue

Discriminating and quantifying the dust contribution to the total aerosol content



Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-42
Manuscript under review for journal Atmos. Chem. Phys.
Discussion started: 27 February 2018

Atmospheric Chemistry and Physics Discussions

Status and future of Numerical Atmospheric Aerosol Prediction with a focus on data requirements

Angela Benedetti[1], Jeffrey S. Reid[2], Alexander Baklanov[3], Sara Basart[4], Olivier Boucher[5], Ian M. Brooks[6], Malcolm Brooks[7], Peter R. Colarco[8], Emilio Cuevas[9], Arlindo da Silva[8], Francesca Di Giuseppe[1], Jeronimo Escribano[5], Johannes Flemming[1], Nicolas Huneeus[10,11], Oriol Jorba[4], Stelios Kazadzis[12,13], Stefan Kinne[14], Peter Knippertz[15], Paolo Laj[16], John H. Marsham[6,17],

*The problem of constraining the **aerosol species** in the model has become more important with user demand of products related to single aerosol types…..*

*Wherever **direct speciation measurements** are possible, those would be the **best suited to be used** to correct model prediction of a given aerosol species.*

Starting point

- World Data Center for Remote Sensing of the Atmosphere (WDC-RSAT, http://wdc.dlr.de/data_products/)

- WMO Observing Systems Capability Analysis and Review tool (OSCAR) database (https://www.wmo-sat.info/oscar/satellites)

- Recent efforts of the scientific community in this direction for addressing specific problems

Catalogue of DESERT DUST observations

EUNADICS-AV

The project **EUNADICS-AV** undertakes to develop and test a unique system to **provide consistent and coherent information to aviation authorities, airlines and pilots** in the event of a natural disaster affecting the airspace.

Inventory of available information within the consortium for **Ash**, **Desert Dust**, **Forest fires** and **nuclide particles**

Catalogue of DESERT DUST observations

DustClim will produce and deliver and assess an advanced dust regional model reanalysis for Northern Africa, Middle East and Europe and will develop dust-related services tailored to specific socio-economic sectors.

Review Dust observations suitable for **assimilation** and **evaluation** of the model reanalysis.

Catalogue of DESERT DUST observations

Building on this, InDust aims to provide a comprehensive catalogue of Desert Dust observations on Global Scale.

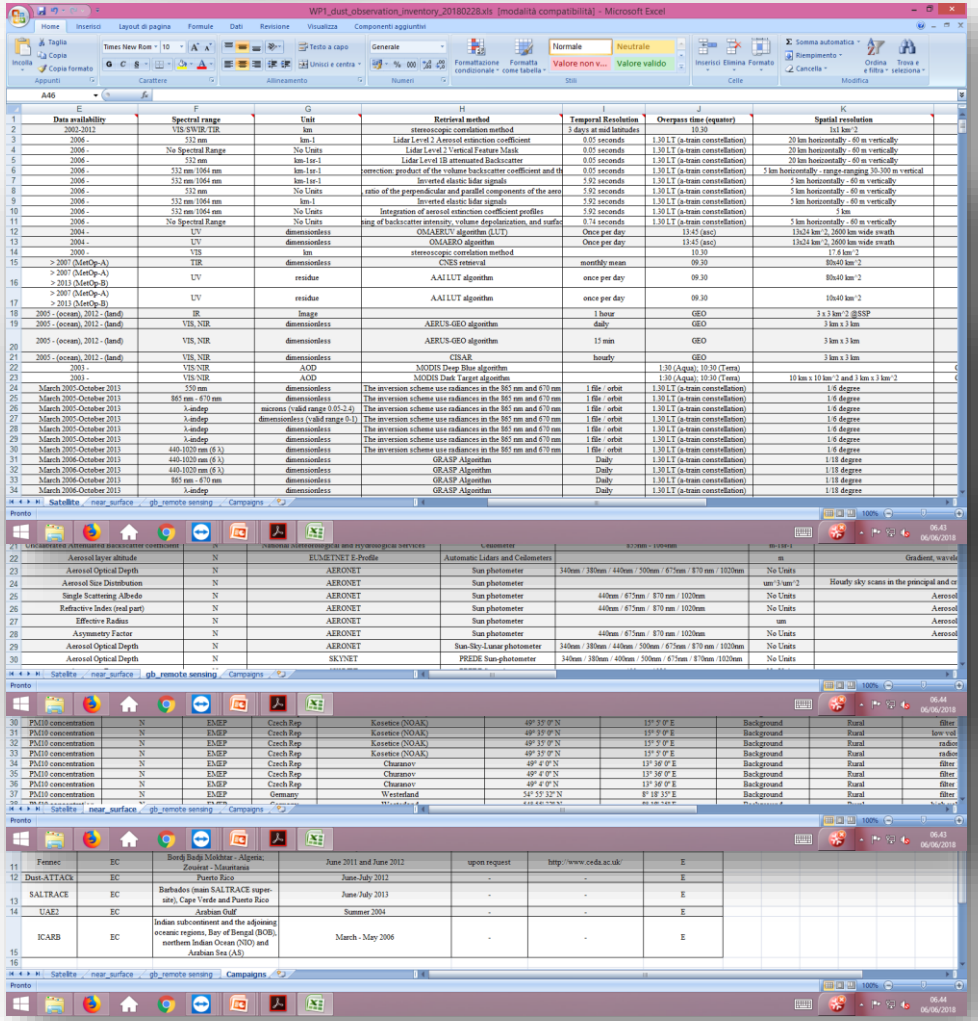
The idea is to realize a **dynamical catalogue** which can be easily updated and that will reply to the expressed need of *speciated* measurements for Dust particles.

A **White Paper on Dust Observations** is in preparation reflecting this work (to be published on BAMS 2019)

The Dust Catalogue

How is it organized?

- Satellite
- Ground based remote sensing
- Near surface
- Airborne/campaign



Which information ?

Extensive list of information for replying to the different “users” needs.

Basic info

- Name of the platform (instrument/network/campaign)
- Measured Parameter
- Responsible institution
- Data period availability
- Spatial coverage
- Spectral range
- Unit
- Measurements schedule
- Collocation with other instruments
- Literature reference
- Link to product overview

Resolution and uncertainty

- Retrieval method
- Accuracy
- Detection limit
- Errors due to clouds
- Other limitations
- Temporal resolution
- Overpass time
- Spatial resolution
- Vertical resolution
- Comments on errors
- QA programs

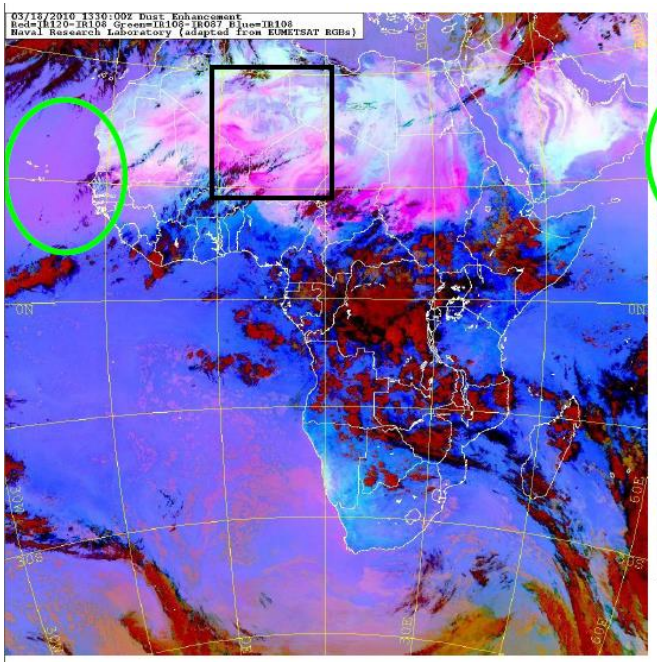
Data Accessibility

- Time delay for delivery
- Offline data available for validation (Yes/No)
- Data availability
- Data format
- Open data? (Yes/No)
- Dissemination via / Link to data
- Data repository

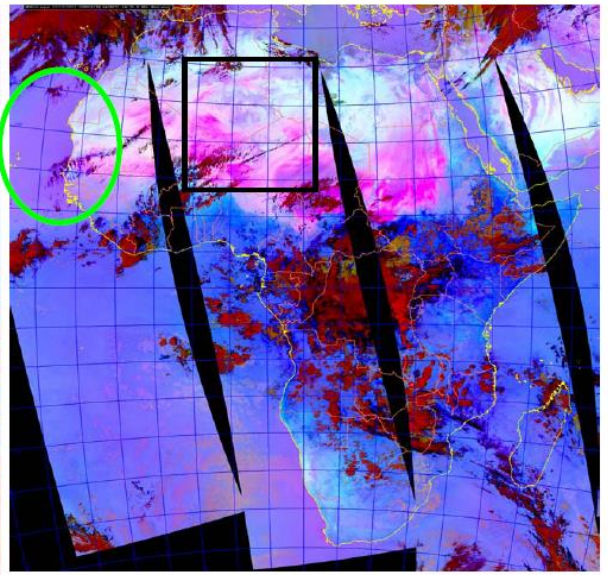
Some HIGHLIGHTS - Satellite

SEVIRI

- 15 min/5 min temporal resolution
- Coverage
- Dust product: IR8.7, IR10.8 and IR12.0
- Available NRT



MSG 13:30 GMT

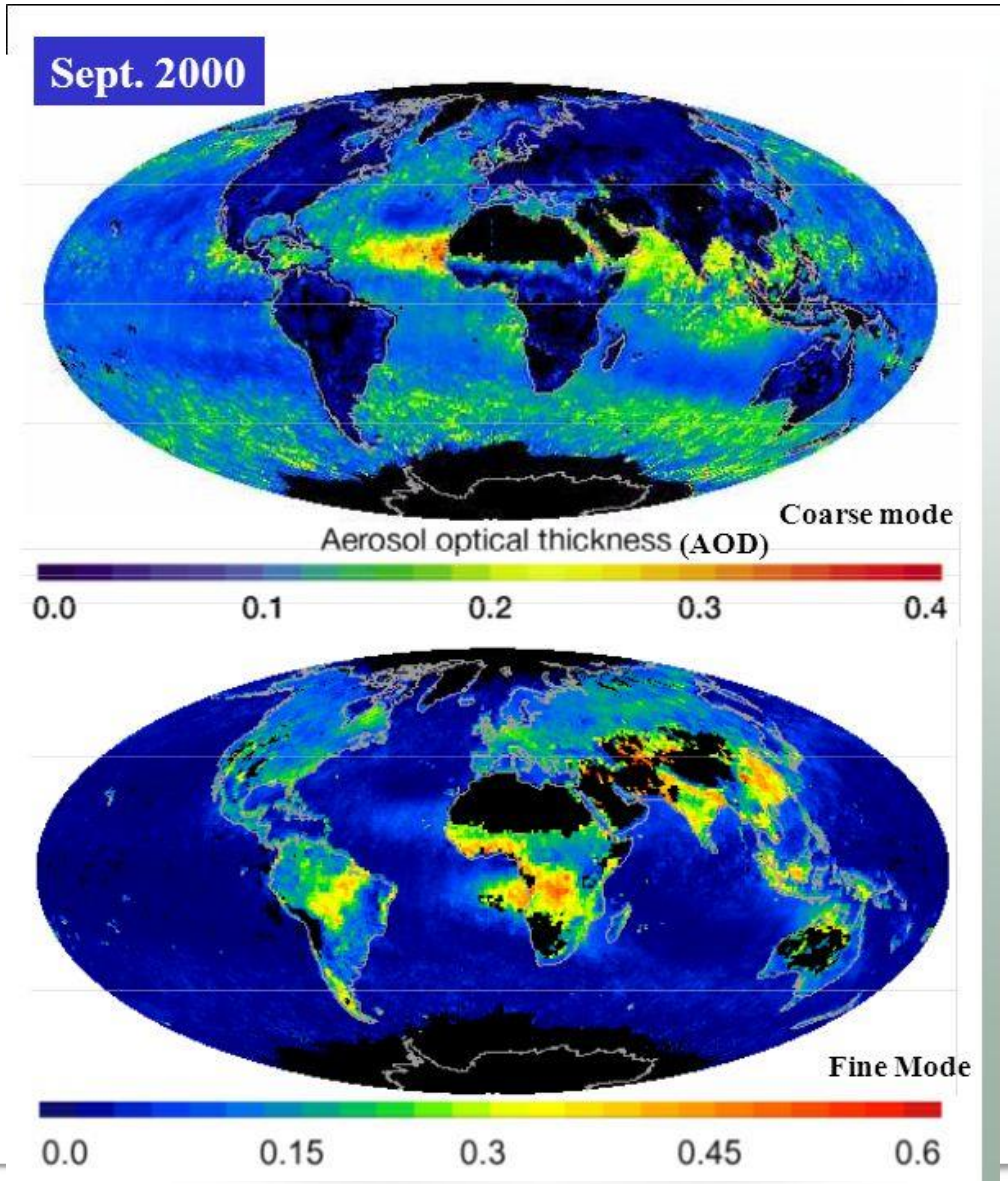


14:00 – 14:35Z 12:40 – 13:00Z 11:00 – 11:25Z

Aqua composite: 5 min granules

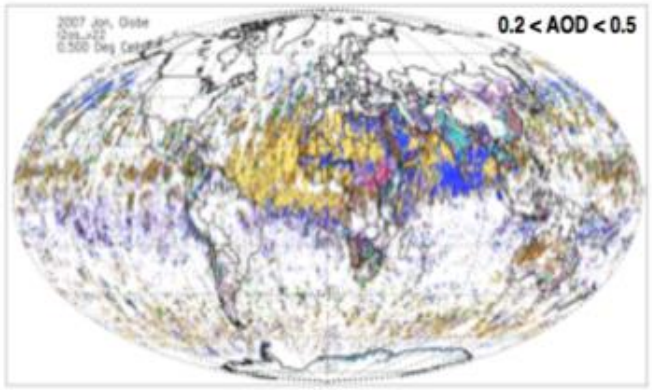
Some HIGHLIGHTS - Satellite

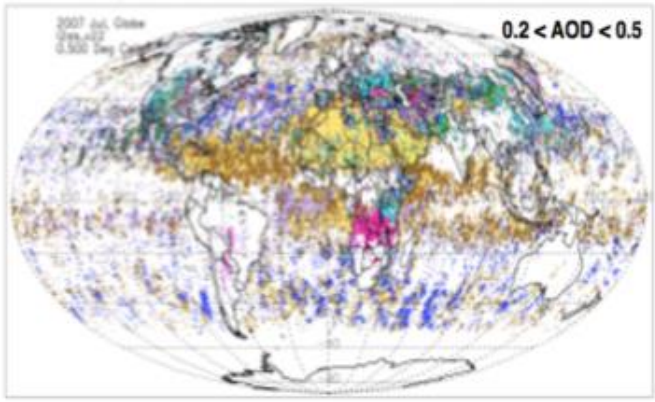
MODIS



Some HIGHLIGHTS - Satellite

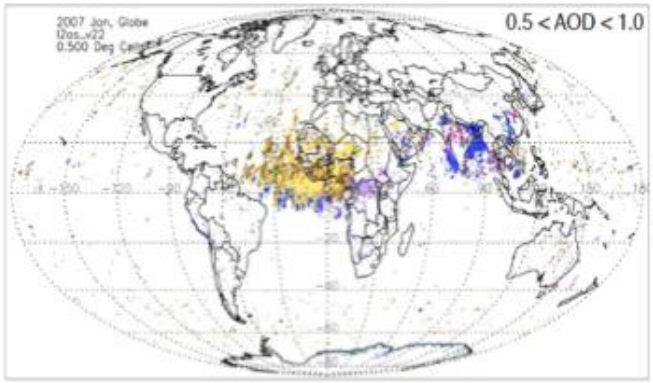
MISR

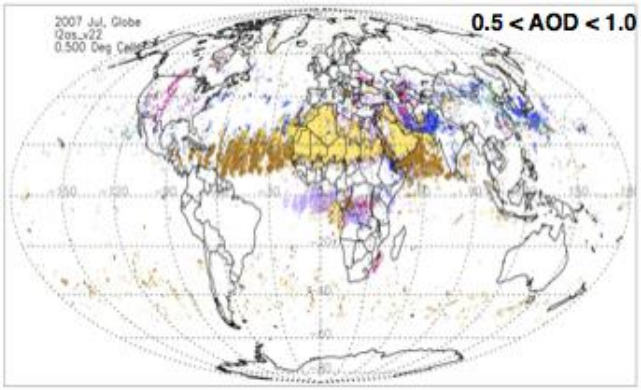




January 2007

July 2007



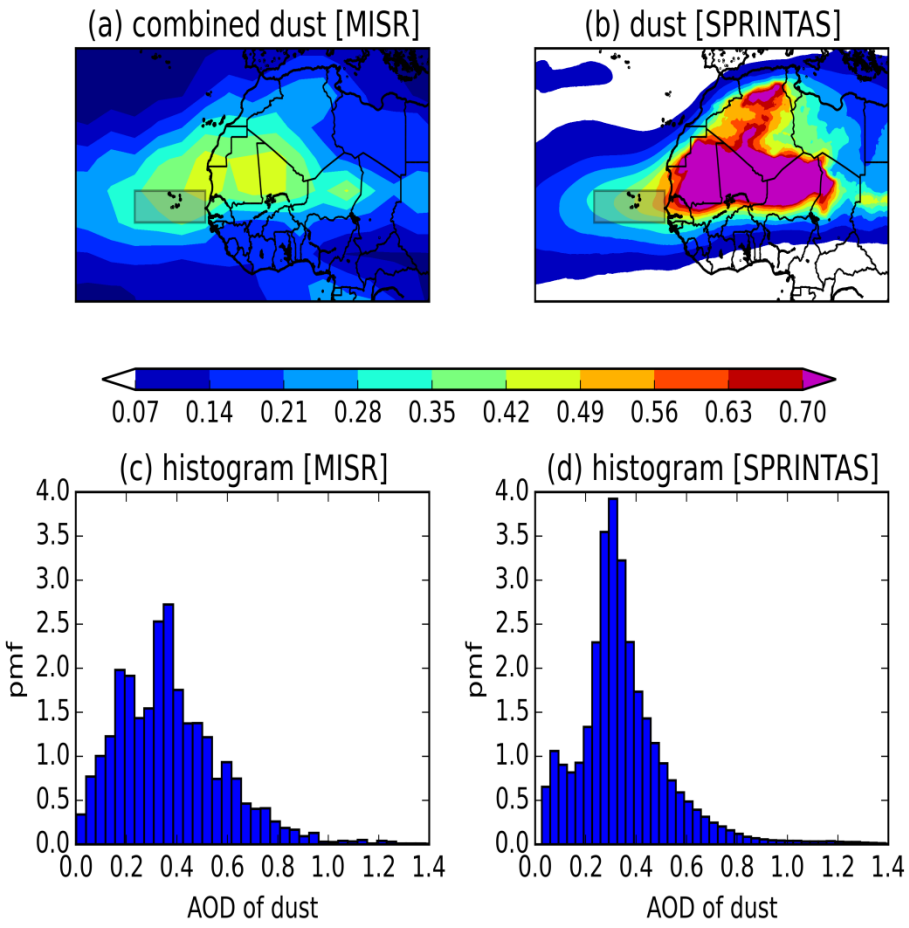


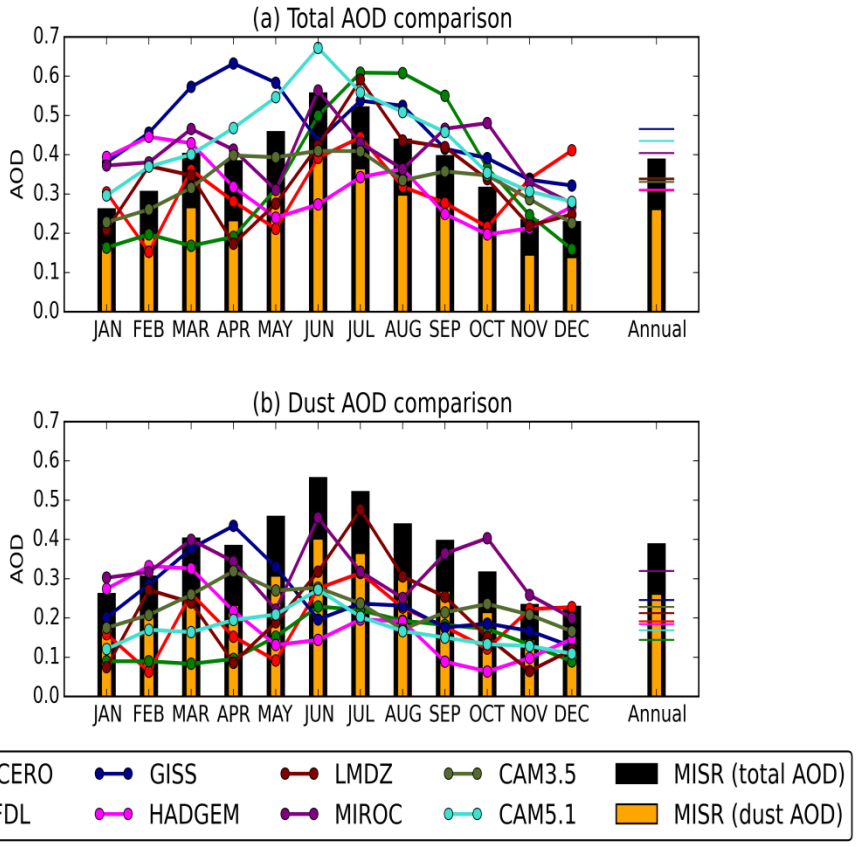
Kahn & Gaitley JGR 2015

Aerosol typing from AOD and absorbing properties

Some HIGHLIGHTS - Satellite

MISR Dust climatology

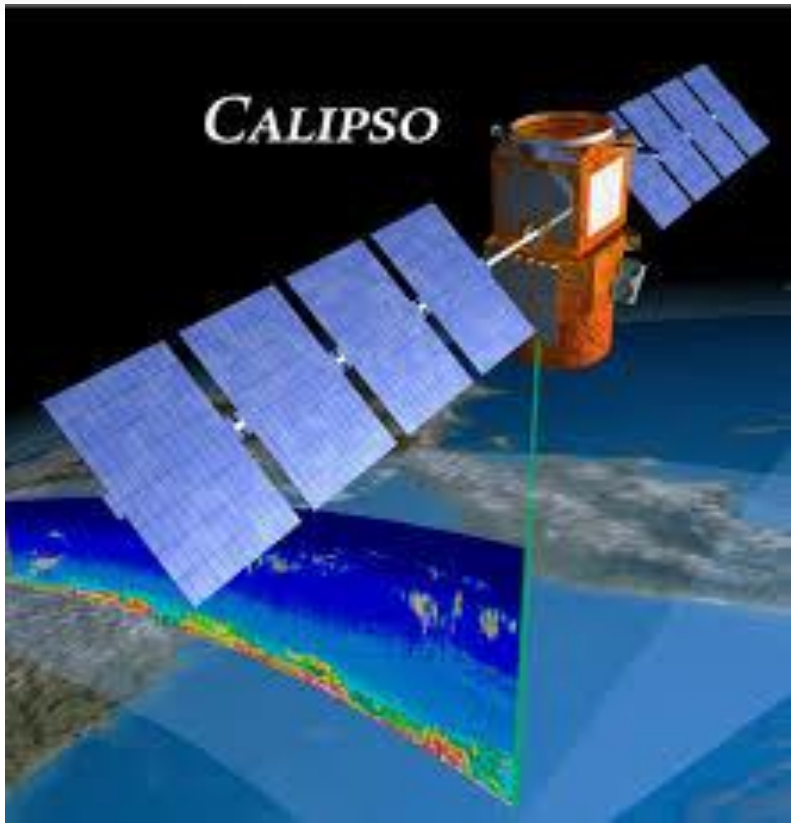




CALIPSO

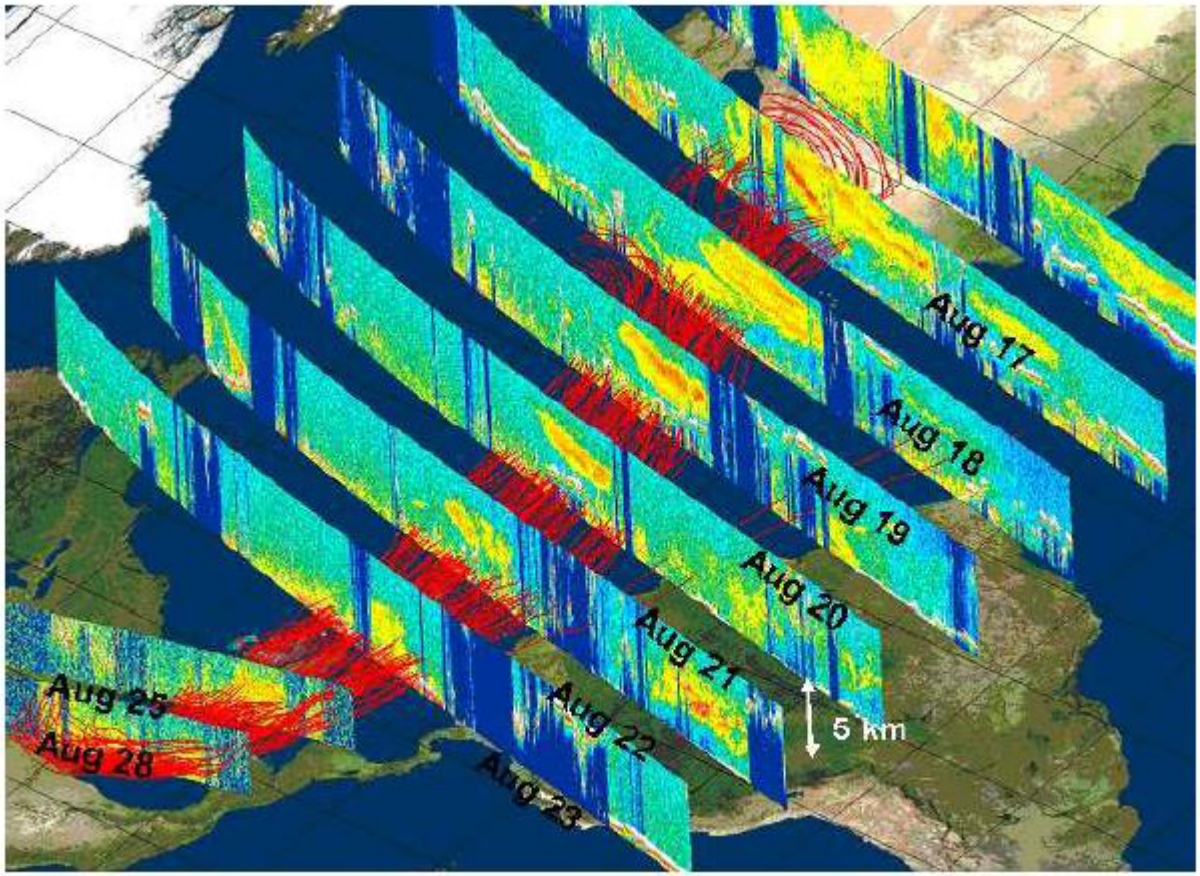
First lidar in space for studying aerosols.

It provides since 2006
Layering and vertical profiles of optical properties
+
typing



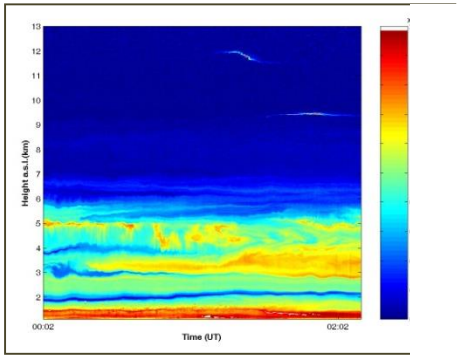
Some HIGHLIGHTS - Satellite

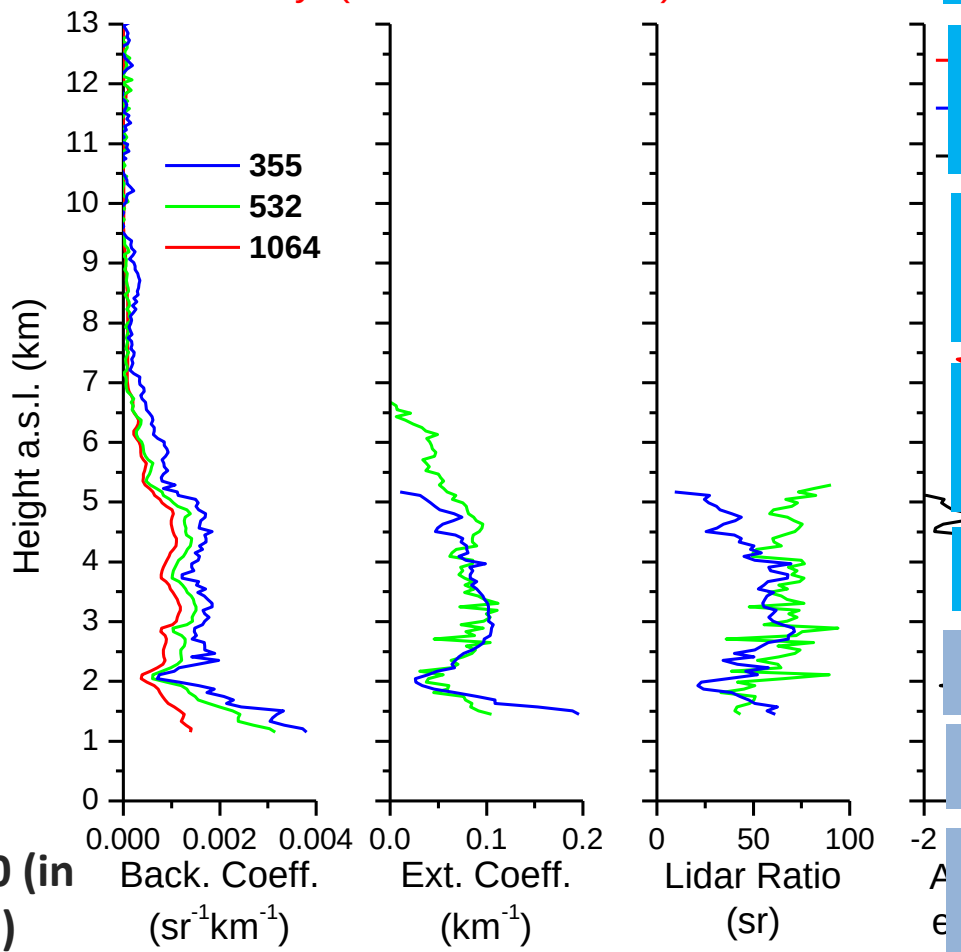
CALIPSO



Observing transport path into details

Some HIGHLIGHTS – Ground Based Lidar





Potenza, Lidar

AOD@532 nm = 0.30 (in the dust layer = 0.25)

AOD@355 nm = 0.33 (in the dust layer = 0.25)

Layer: top base CoM

Columnar integrated quantities (like AOD)

Mean values in the layers

Layer integrated quantities (like AOD)

Layer typing

Dust back and ext

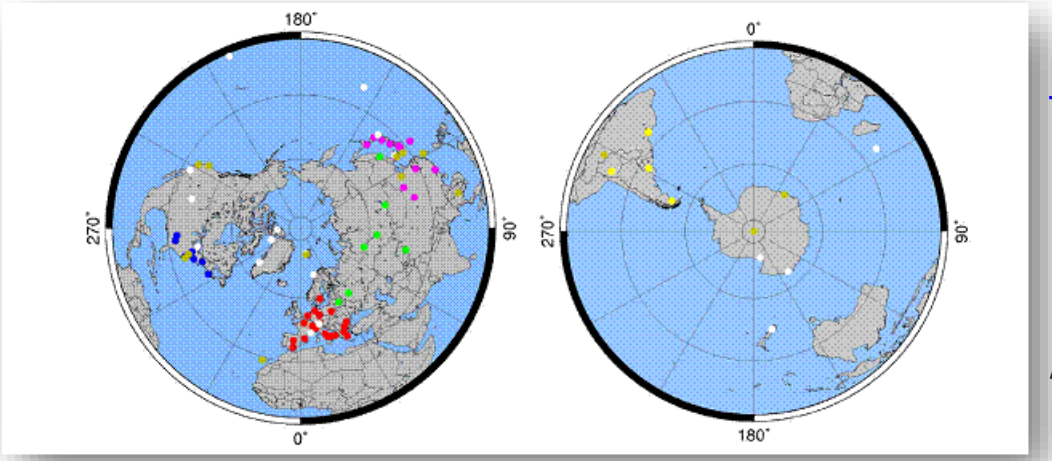
Dust concentration

Fine and mode concentration

IN concentration

Some HIGHLIGHTS – Ground Based Lidar

GALION is a federated network of existing lidar networks that Contributes to GAW initiative of WMO



Micropulse Lidar Network (MPL-Net) http://mplnet.gsfc.nasa.gov/

European Aerosol Research Lidar Network (EARLINET) www.earlinet.org

Asian Dust Network, (AD-Net) www-lidar.nies.go.jp/AsiaNet

Latin America Lidar Network (LALINET a.k.a ALINE) http://www.lalinet.org/

Cooperating networks

NOAA Cooperative Remote Sensing Science and Technology (CREST) Lidar network

Network for the Detection of Atmospheric Composition Change (NDACC)

Different techniques /approach working together for gaining better insight

Some HIGHLIGHTS – Ground Based Lidar

Global map of operational ceilometers www.dwd.de/ceilomap with colors corresponding to manufactures

Operative 24h system widely distributed

Eyja eruption showed ceilometer potentials in monitoring aerosol intense events

Needs for cross calibration with lidars

Integrated actions ongoing within EUNADICS_AV and ACTRIS

Thanks for your attention!

ACKNOWLEDGMENTS

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***InDust COST Action** CA16202*