



Dust ground based observations

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Outline

- Dust component - typing**
- Why GB measurements**
- Measurements at the surface**
- Columnar measurements**
- Profiling measurements**

Dust component & aerosol typing

Take home message:

Talking about dust contribution is needed to pay attention to the meaning of dust word and the method used for the discrimination.

Why Ground Based measurements

Ground Based measurements are important and needed for:

- Satellite validation
- Satellite algorithm improvement
- Model evaluation
- New method developments

Why?

- Higher possibility to control the measurement
- Strictly QA&QC procedures can be performed
- Integration/synergy of instruments more feasible

Measurements at the surface

Particle size distribution

Organic matter

Brown/black carbon

OC/EC

Nitrate

Chloride

Sulfate

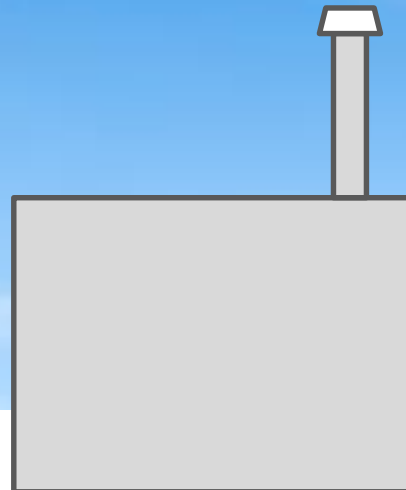
PM₁₀

PM_{2,5}

PM₁

Ammonium

VOC



Columnar remote sensing

How it works



Photometer points at Sun and measures radiance at different wavelengths.

Modelling the Solar radiation outside atmosphere and molecular absorption due to gases in atmosphere, observed differences are due to the aerosol presence.

The **Aerosol Optical Depth** is therefore retrieved (primary measurement).

Nowadays advanced instruments allow the measurements using Sun, Moon and Star radiation as reference.

Columnar remote sensing

Dust AOD (DOD)

- ❑ Angstrom below a certain threshold (and AOD higher than a threshold too)

(e.g. Basart et al., 2009; Todd et al., 2007)

- ❑ $DOD = AOD$ for the coarse mode (more appropriate for site distant from source)

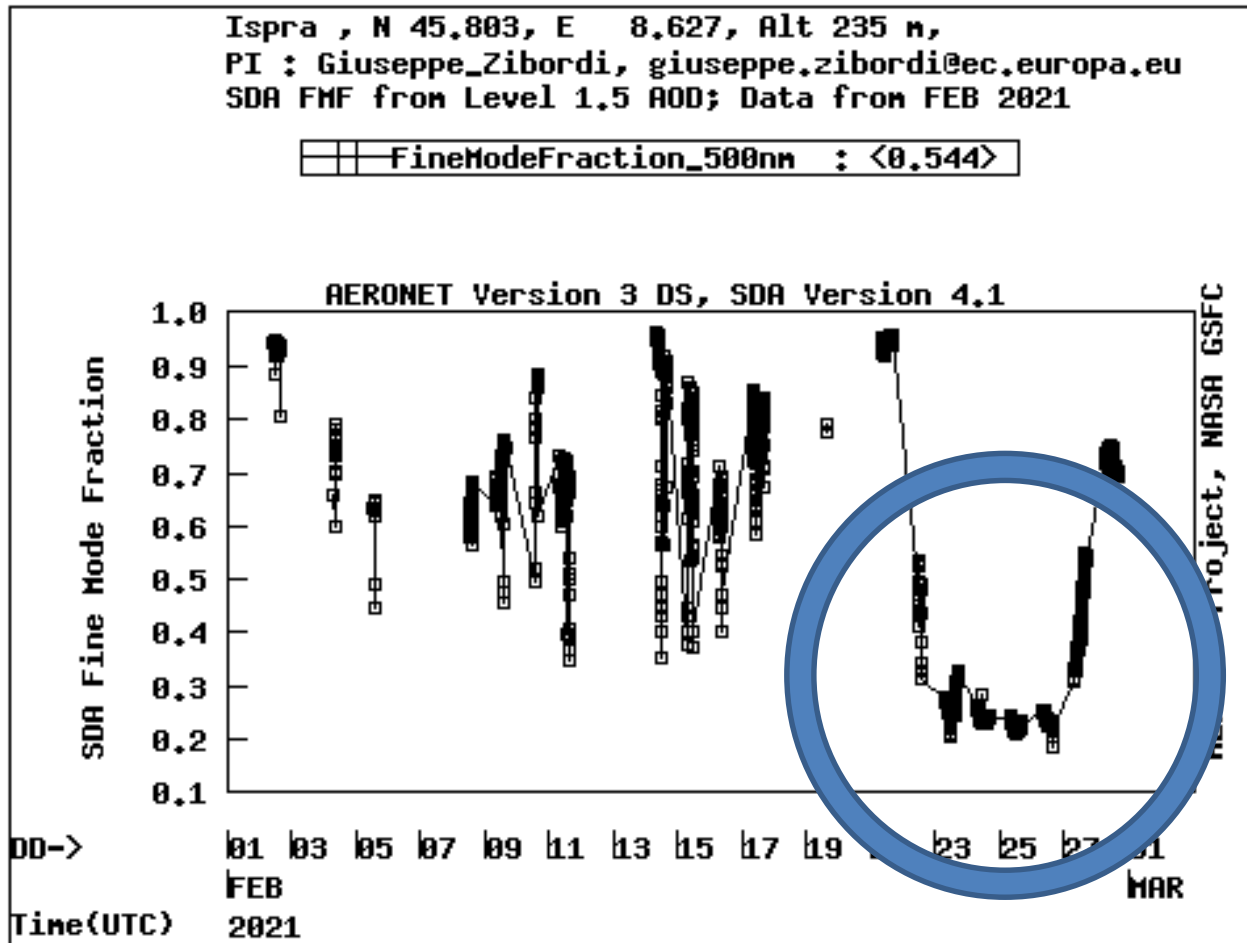
(O'Neill et al., 2003)

- ❑ Advanced lidar/photometer products provided fine and coarse mode concentration profiles (uncertainty non assessed)

(Dubovik et al., 2014)

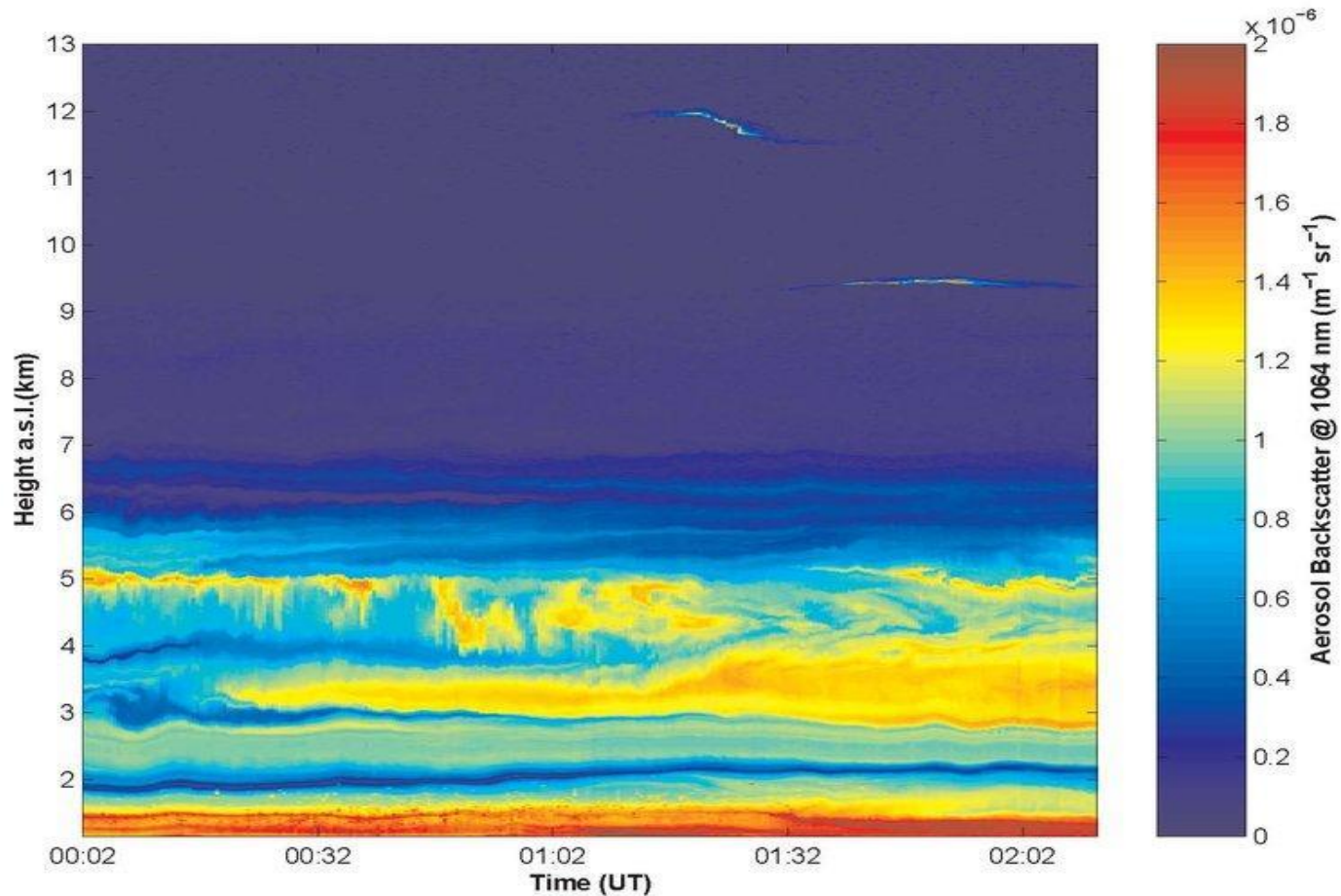
Columnar remote sensing

Example



Lidar remote sensing

Dust arrival example - 26 June 2006 Potenza IT

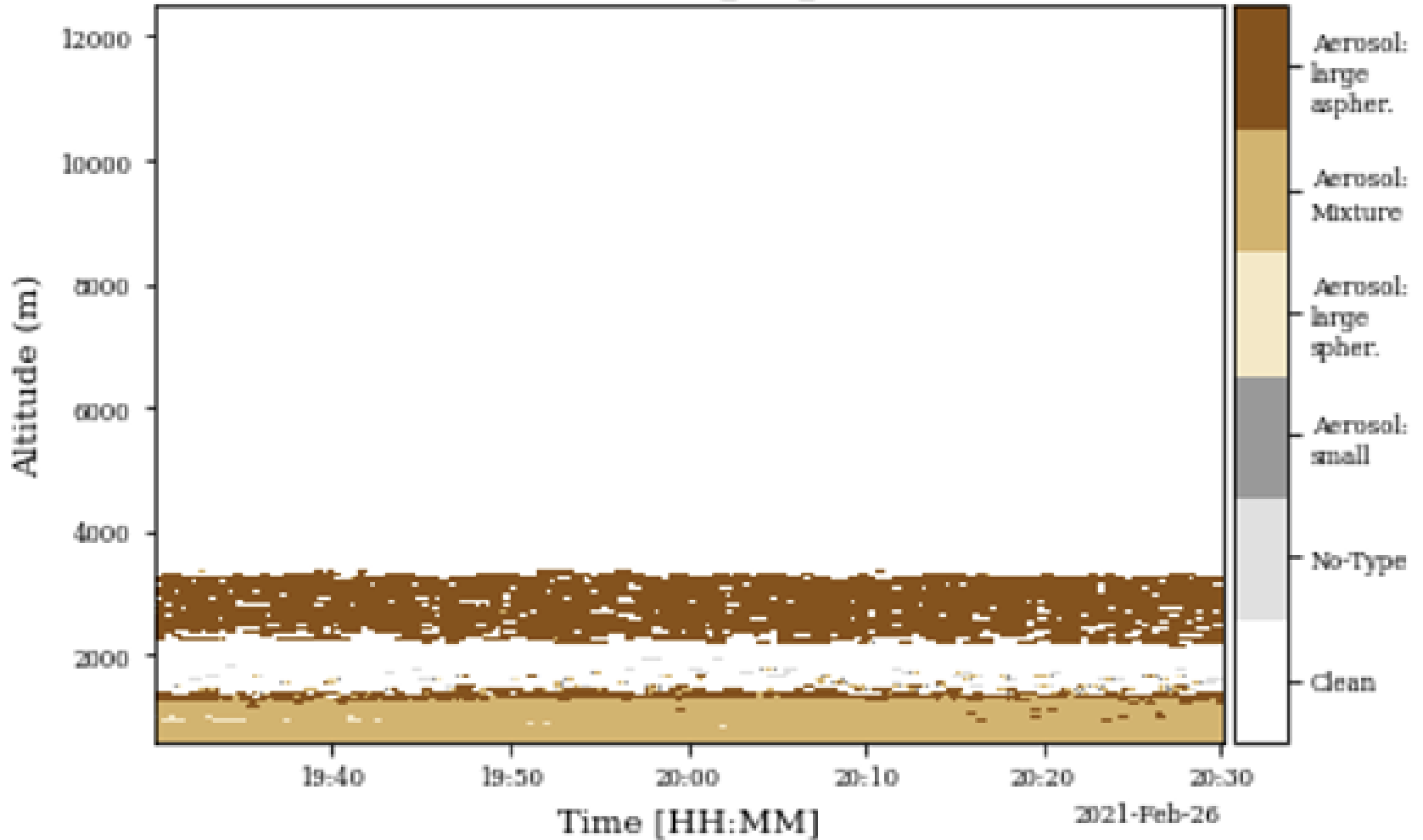


Promising dust lidar product

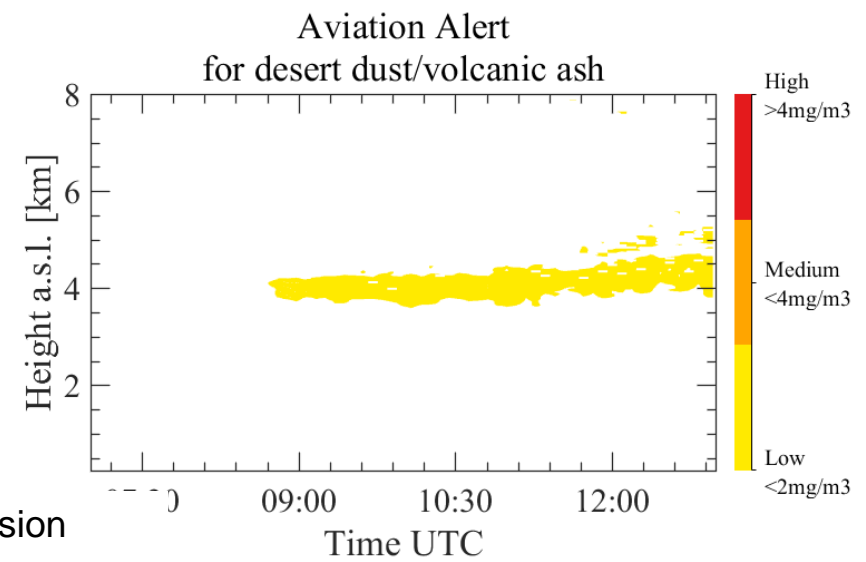
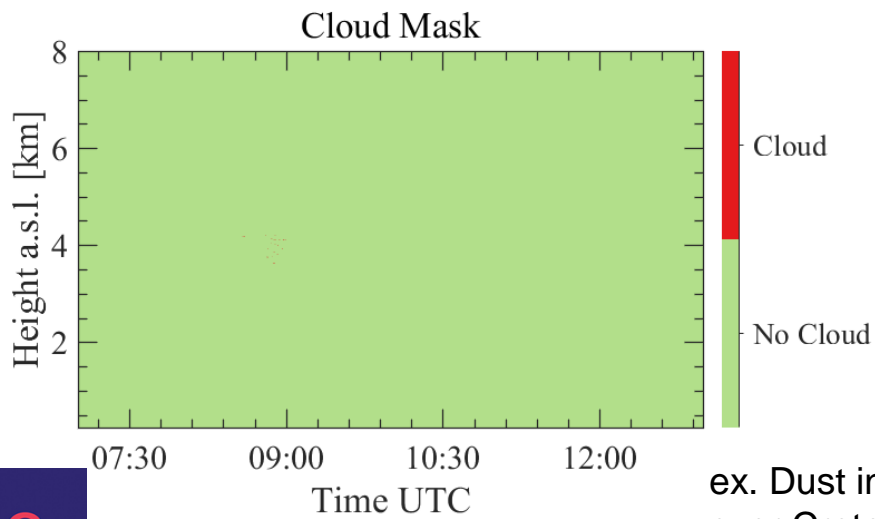
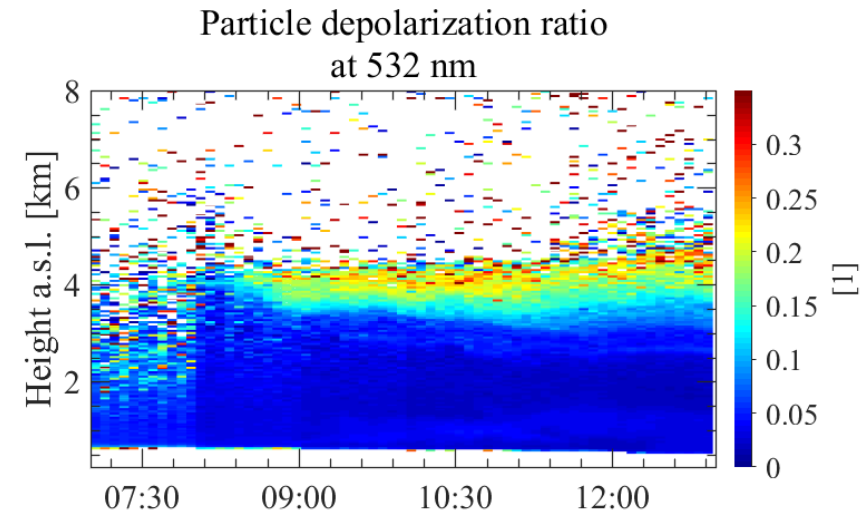
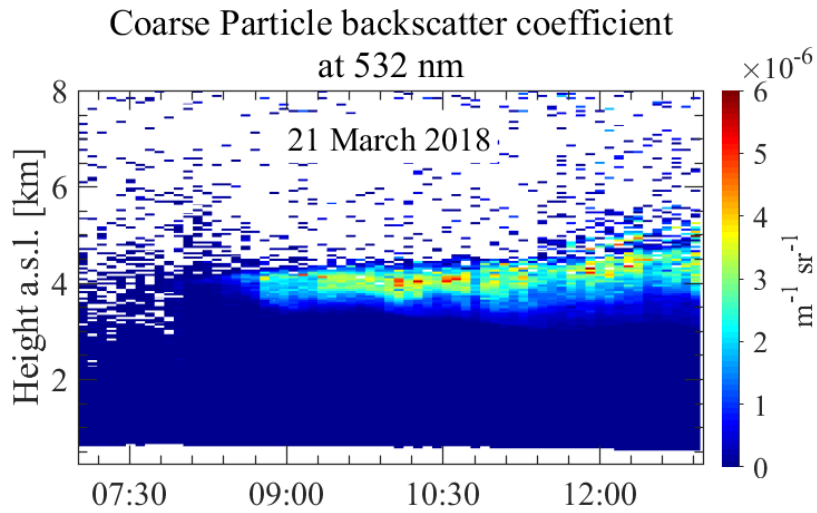


Target Classification

20210226cyc1930_elic_v5.2.0.nc



A lidar Early Warning System



ex. Dust intrusion
over Crete
(Papagiannopoulos et
al., 2020)



Take home message

- ❑ Dust contribution can be inferred by the different techniques and methods
- ❑ Methods are different and differences have to be taken into account
- ❑ Pro and cons different for each different technique