

# EARLINET: Observations for aviation management

Lucia Mona - CNR

inDust User Workshop on **Aviation**

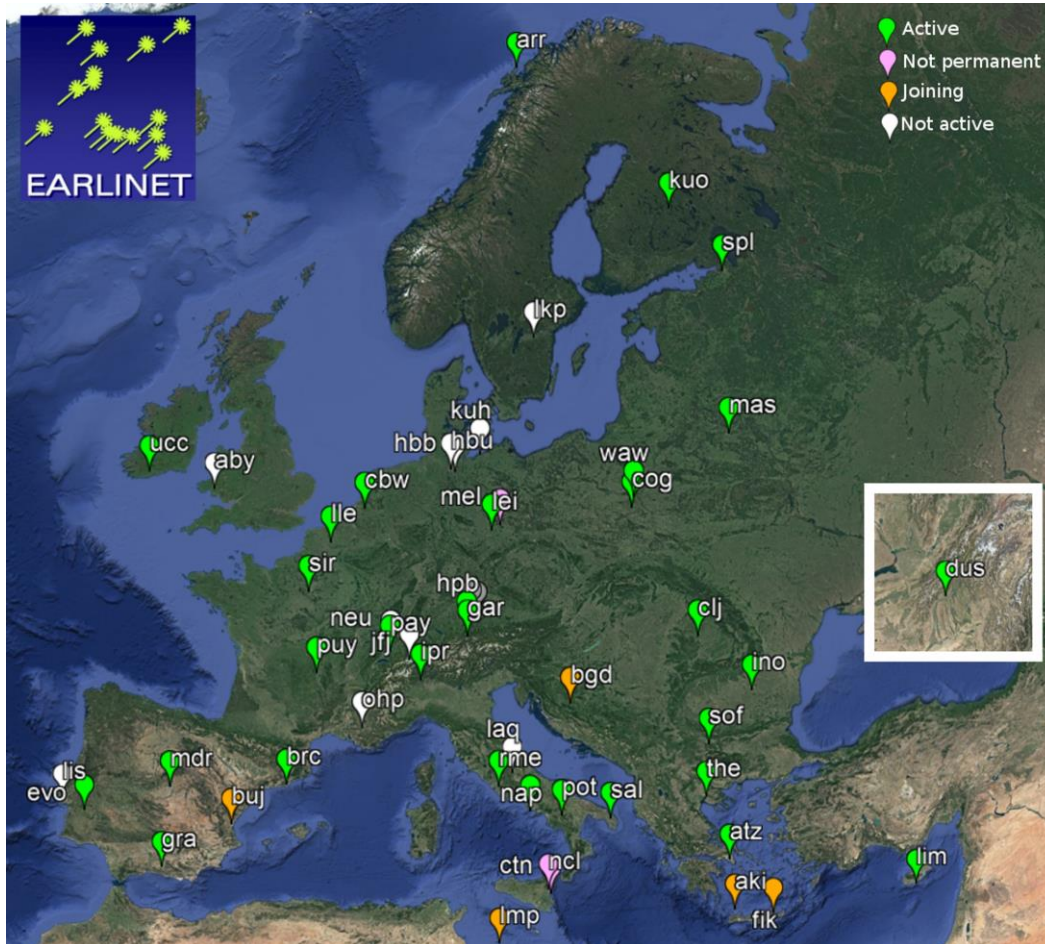
*20 May 2021*





# EARLINET/ACTRIS

## European Aerosol Research Lidar NETwork



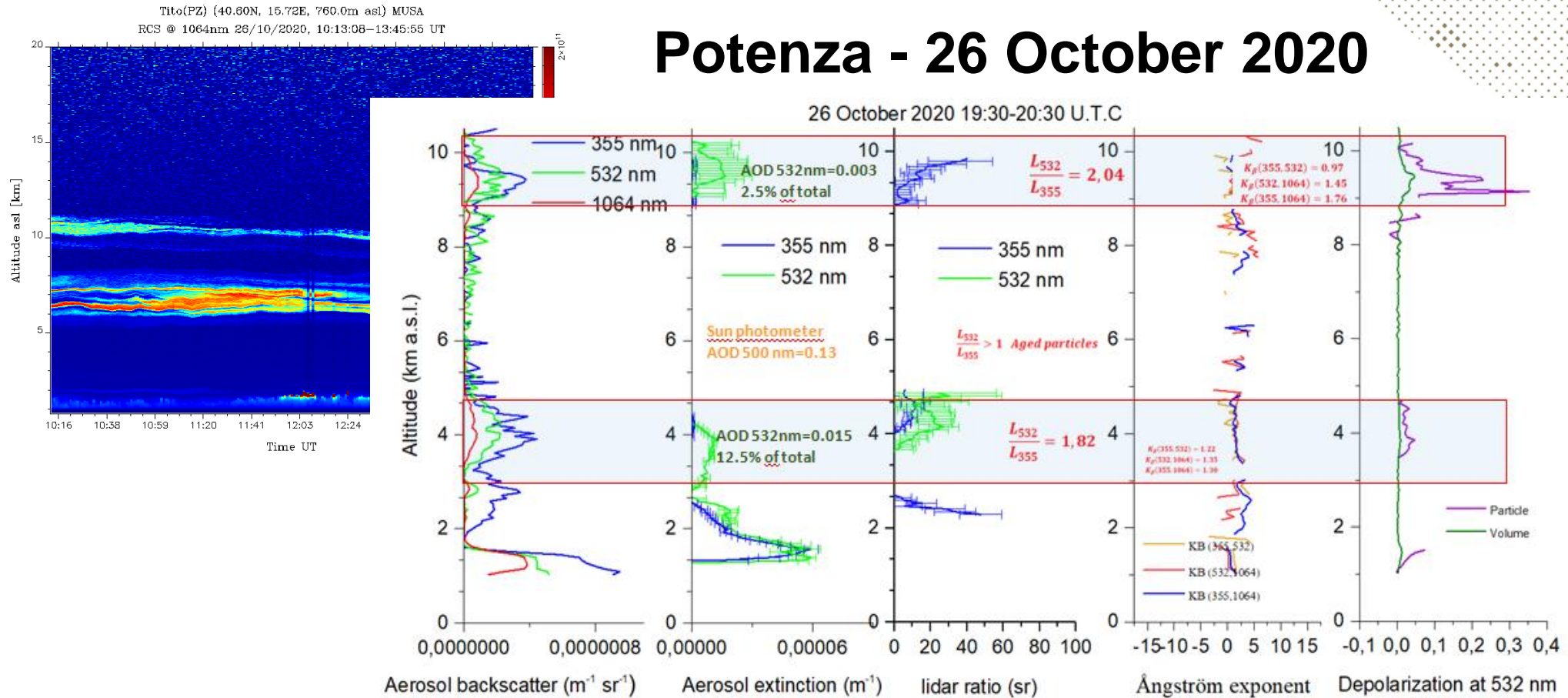
- mainly based on **Raman** lidar systems, able to provide vertical **profiles of aerosol extinction** and **backscatter** coefficients without significant assumptions.
- most of the stations at **different wavelengths**
- in some cases coupled to measurements of the **linear particle depolarization ratio**

EARLINET is since 2011 integrated in **ACTRIS (Aerosol, Clouds, and Trace gases Research Infrastructure)**



# EARLINET products

## Potenza - 26 October 2020



- Temporal vertical evolution of the aerosol content
- Vertical profiles of aerosol optical properties

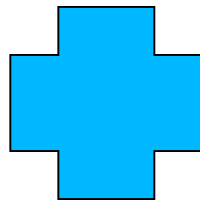




# EARLINET products

## How often measurements are performed?

- 3 times per week (Monday Lunch time + Monday and Thursday night)
- CALIPSO overpasses (on voluntary basis)
- Intense interesting cases on the base of scientific interest at the stations



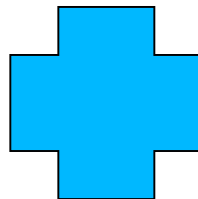
- A bunch of stations working 24h/7d



# EARLINET products

## When products are made available

- No constraint currently
- Typically within 6 months
- Indication provided by the EARLINET council and monitored: within 1 year



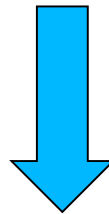
- 9 stations currently providing data in NRT + fully QC data in 6 months



# EARLINET products

## How products are analysed

- Software based on assured algorithm but developed at the stations
- Centralized processing system agreed at network level (SCC=Single Calculus Chain)



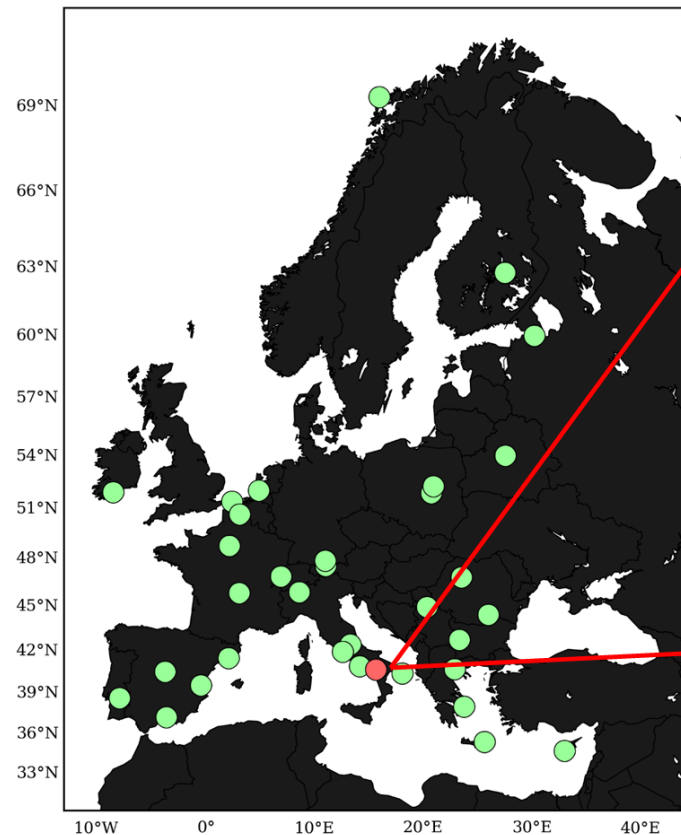
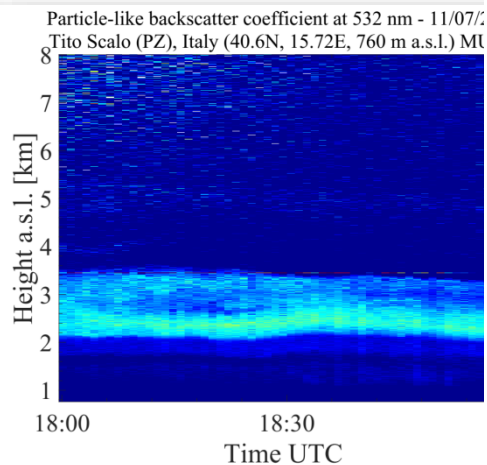
In the ACTRIS implementation SCC will be mandatory for all for harmonization purposes (implemented for the NRT provision already)



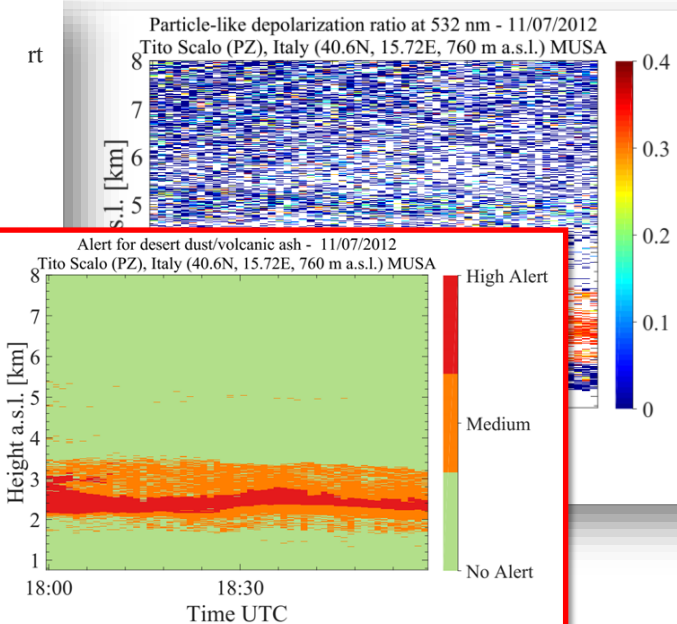
# Lidar based alerting system

The EARLINET ash/dust alerting system is an experimental tailored product developed for EUNADICS purposes.

Based on High



polarization





# Lidar based alerting system

## The approach

**The EWS is based on a 532 nm depolarization lidar and the delivery of the alert is a two-step approach.**

**1. Retrieval of particle parameters in temporally high resolution**

The particle backscatter coefficient is decided iteratively similar to an elastic backscatter lidar.

Consequently, the particle depolarization ratio is estimated.

**2. Identification of the location and intensity of the hazardous event.**

Following the Poliphon approach, the coarse particle backscatter coefficient is estimated.

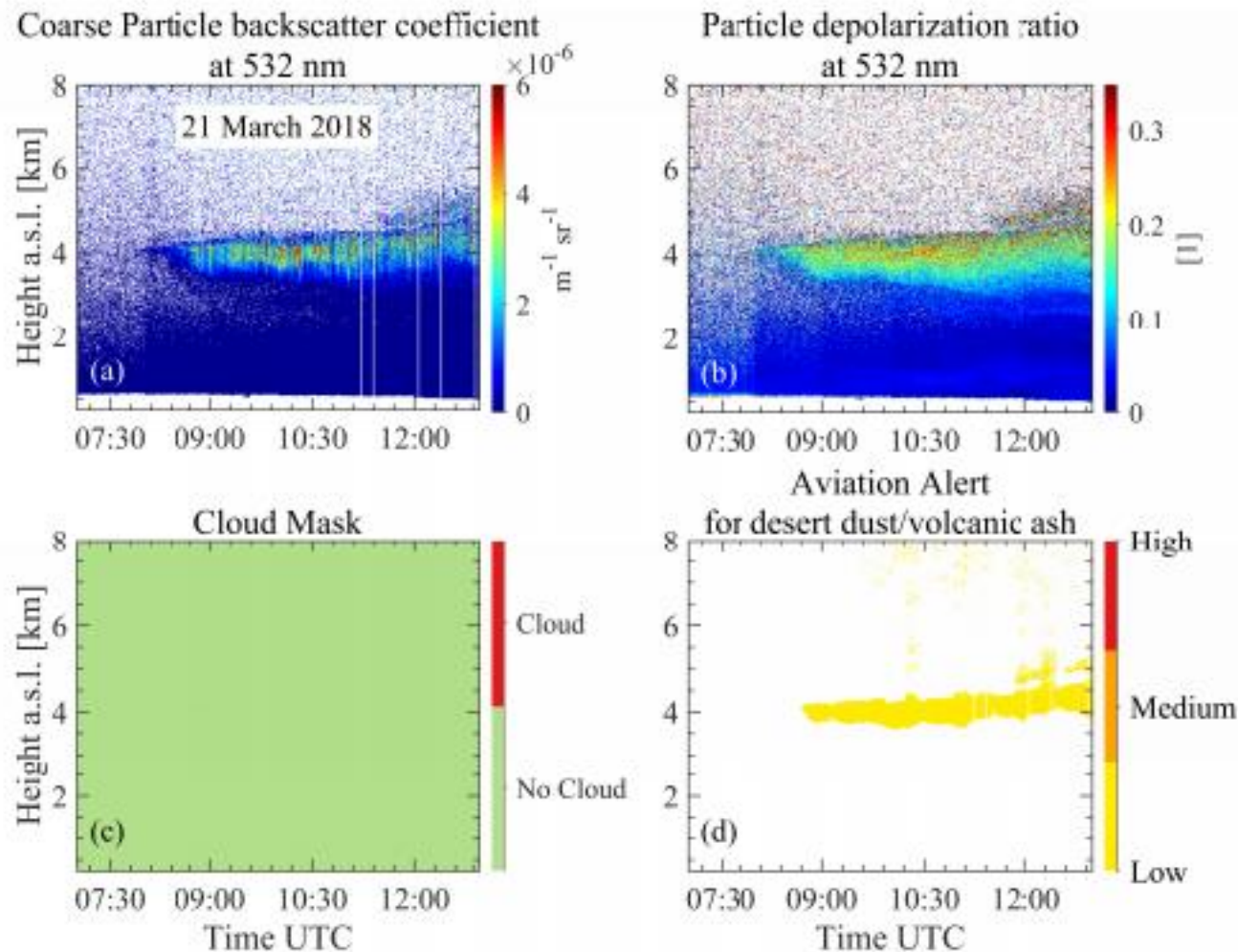
The ICAO mass concentration levels (0.2, 2, 4 mg/m<sup>3</sup>) are converted into particle backscatter coefficient.

The thresholds above are used to define the likely dangerous aerosol plumes for flight operations.





# Case study: Finokalia March 2018



Dust Event

Closure of airports in  
Crete and Greece



# Next steps


- NRT processing for the EWS sub product
- Demo case for the Etna 2021 case + February 2021 dust event
- Integration with photometer data for dust/ash discrimination



# Acknowledgments

This work was initially conducted within the framework of the **EUNADICS-AV** project, which has received funding from the European Union's Horizon 2020 research programme for Societal challenges - smart, green and integrated transport under grant agreement No. 723986. The activity is continuing now under **e-shape** (EuroGEOSS Showcases: Applications Powered by Europe), a project funded under the European Union's Horizon 2020 Programme (Grant Agreement n. 820852).

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# **inDust**

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