



The potential of a synergistic lidar and sunphotometer retrieval for the characterization of a dust event over Finokalia and for aerosol model evaluation

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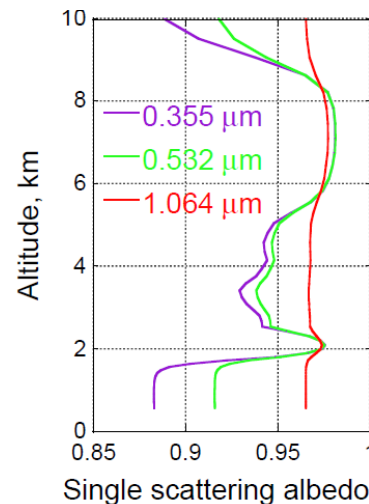
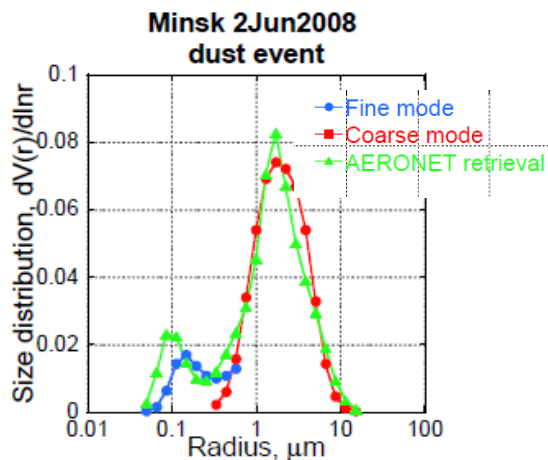
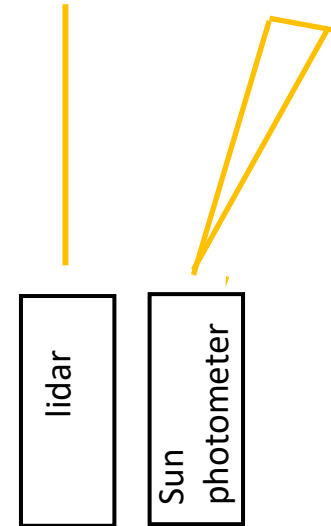
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EGU, 6 May 2020

GRASP algorithm

GRASP

- Input
- Lidar backscatter signal at 355, 532, 1064 nm
 - Sunphotometer AOTs and total scattered radiances at 440, 670, 870, 1020 nm
- Output
- Concentration profiles
 - Column-averaged size distribution, refractive index and spherical particle fraction, different for fine and coarse particles
 - Optical property profiles (absorption, SSA)



[Lopatin et al., 2013]

Methodology



Location: **Finokalia station**
(35.3 ° N, 35.7° E), north coast of Crete

Campaign experiment: **PRE-TECT**
(<http://pre-TECT.space.noa.gr/>)

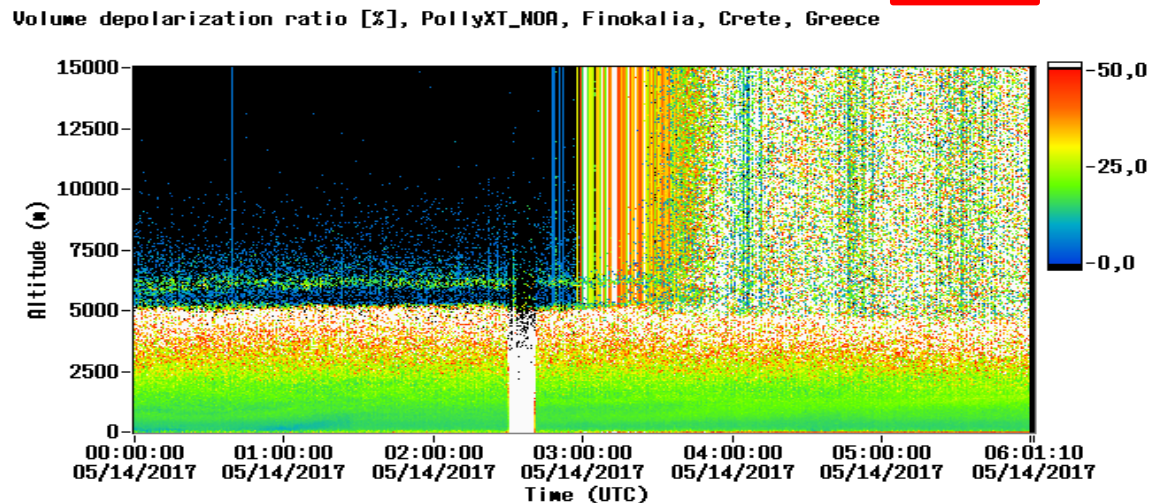
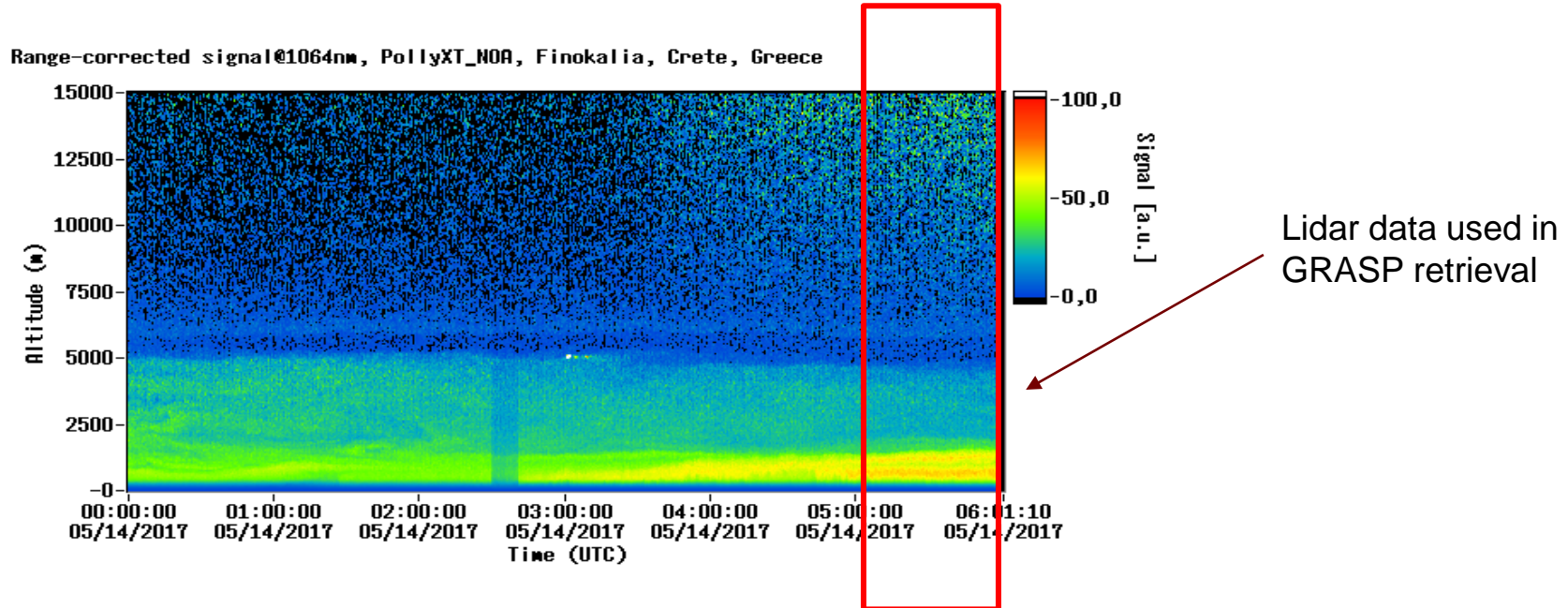
Instruments

- **Polly XT lidar** (part of EARLINET)
- **CIMEL sunphotometer** (part of AERONET)

GRASP algorithm for retrieval of dust properties

⇒ evaluation of **NMME-DREAM** dust model

Dust event

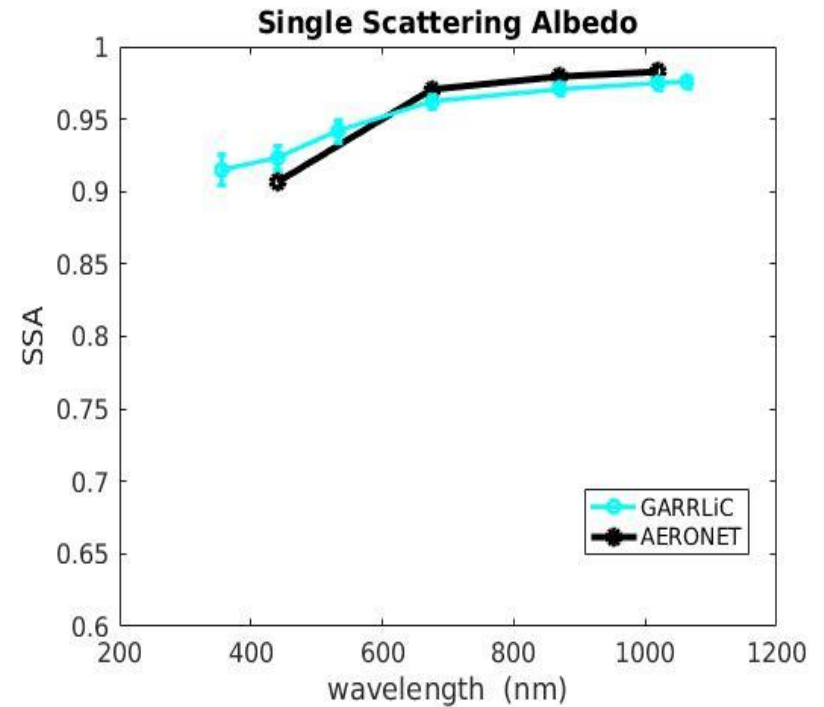
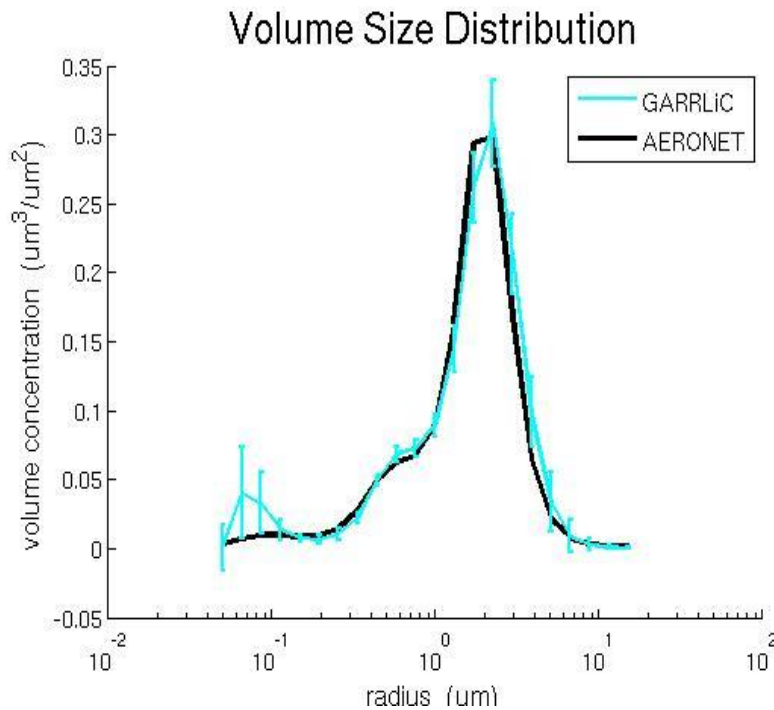


Case study of 14/5/2017 over Finokalia station

Strong AOD ~ 0.6

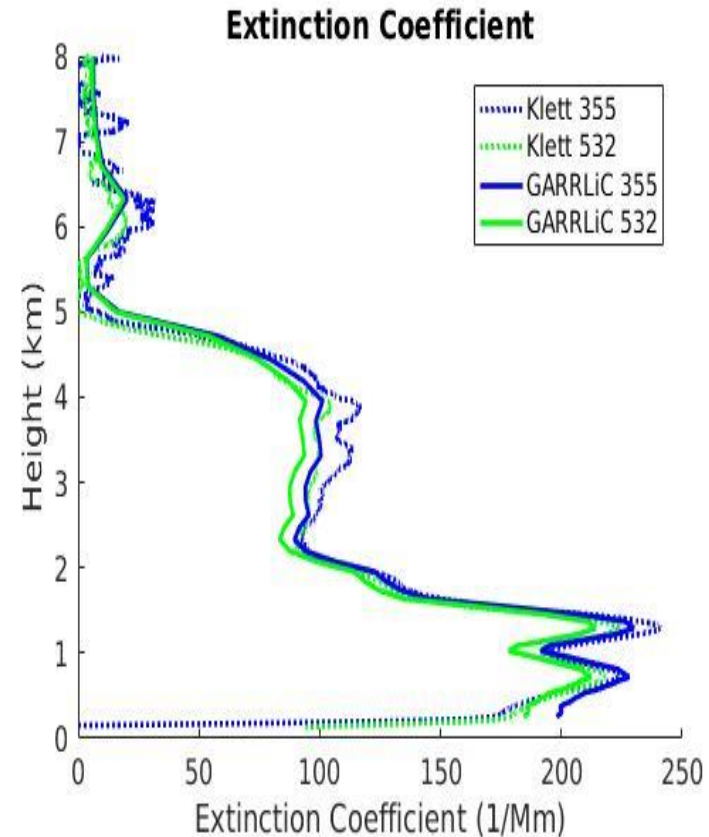
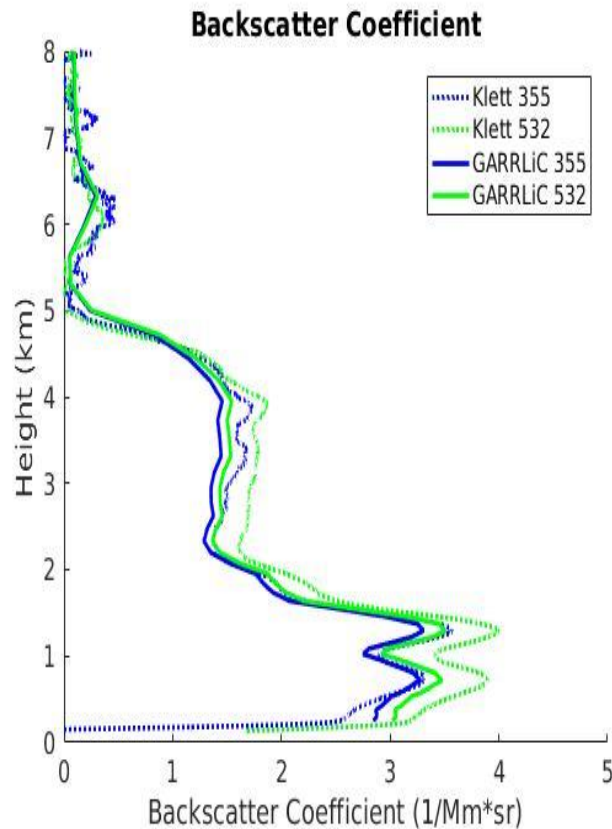
Distinct homogenous aerosol structure at low layers (<2km)

Retrieval of dust properties



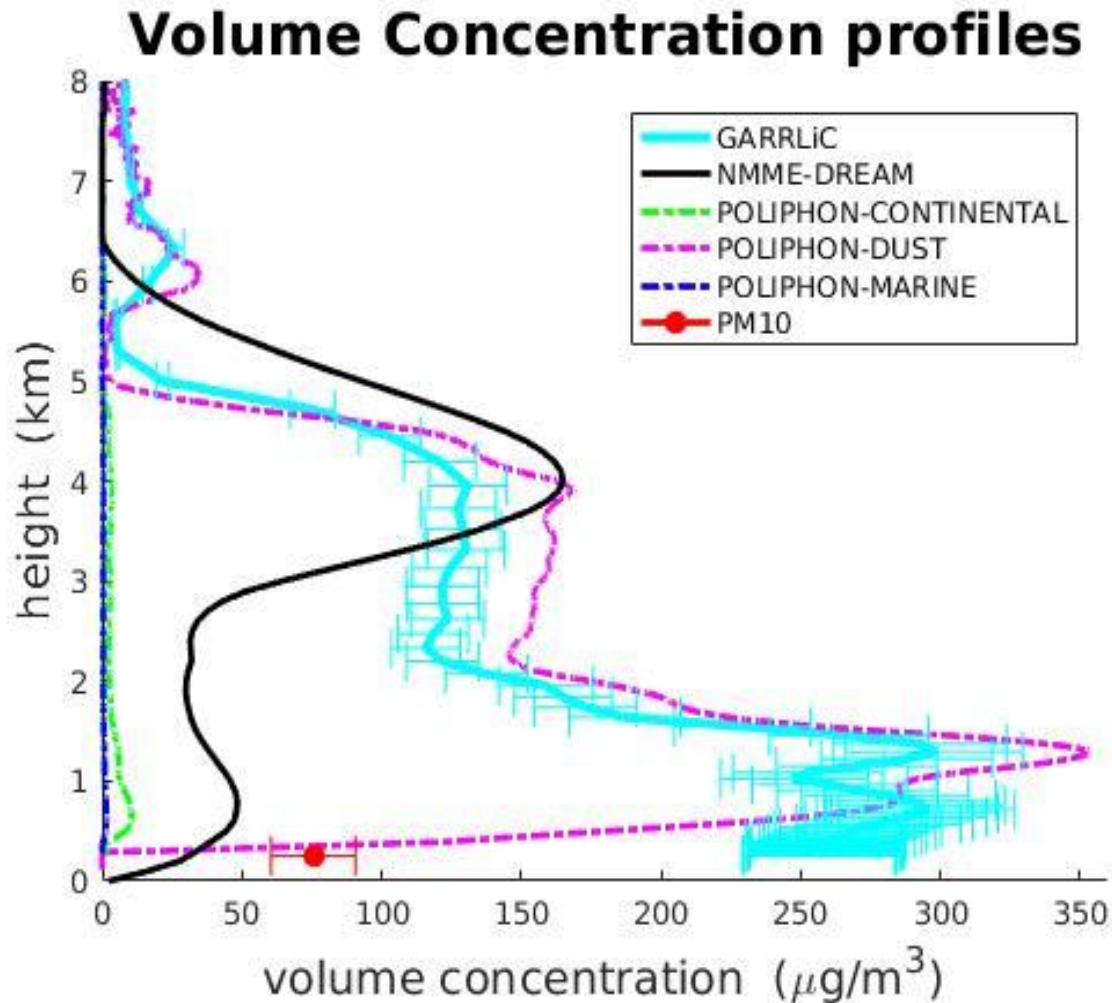
- one mode of coarse particles
- agreement between AERONET and GRASP retrievals
- ➔ retrievals indicate the dominance of **high dust load**

Retrieval of dust properties



→ retrievals indicate the presence of dominance of **Saharan dust aerosols advected over Finokalia in low layers**

Comparison of retrieved with simulated dust properties



⇒ NMME-DREAM fails to simulate the dust particle profile in low altitudes
probably due to low model's resolution

Conclusion

- **It was shown that the innovative combination of lidar with sunphotometer data in GRASP provides an advancement in aerosol characterization.**
- **For the dust event under study GRASP achieved to successfully characterize the derived dust properties, in good agreement with AERONET and the climatological values of dust.**
- **GRASP sophisticated algorithm provides the potential to effectively characterize not only dust properties (size, shape, refractive index) but also dust vertical distribution and concentration profiles.**
- **NMME-DREAM strongly underestimates the high dust load observed in low layers (<2km) over Finokalia**
- **The use of GRASP algorithm for aerosol properties retrieval constitutes a powerful tool to constrain dust description in atmospheric models.**