The potential of CALIPSO lidar measurements to provide pollen optical properties

V. Gouliaditis[(1)] ,M.C. Gatou [(1)], E. Giannakaki [(1)], X. Shang [(2)], V. Amiridis, M. Komppula,

(1) Department of Environmental Physics and Meteorology, University of Athens, Greece, E-mail:vasgoul@gmail.com

(2) Finnish Meteorological Institute, Atmospheric Research Centre of Eastern Finland, 70211, Kuopio, Finland

Pollen concentration and type is monitored daily at ground level by aero biological collectors which trap pollen particles. We analyze 4 pollination events using a ground-based Hirst-type air sampler, multiwavelength Raman polarization lidar Polly^{XT} and space-based CALIPSO.

Since CALIPSO data products have never been used to identify pollen, we selected four overpasses during experimental campaigns in Finokalia, between 23/02/2018 and 11/05/2018 and in Kuopio, between 05/05/2016 and 04/08/2016, in which pollen particles were observed.

On 06/03/2018 (00:16UTC) a layer was observed between 0.05 and 1.39 km. Mean depolarization ratio was found equal to 0.09 ± 0.0007. The layer was attributed by the CALIPSO classification scheme to polluted dust. Ground-based lidar system identified a layer between 0.49 and 1.043km with a depolarization ratio of 0.12 ± 0.0050. The Hirst-type volumetric air sampler located next to the lidar, monitored the pollen concentration at 137 counts and attributed to Ulmu pollen type.

Accordingly, on 15/03/2018 (00:11UTC) the observed layer is between 0.083 and 2km. Mean depolarization ratio was found 0.006 ±0.00076 while layer particles are characterized as "marine". A layer between 0.59 and 1.148km was detected by ground-based system with a depolarization ratio of 0.01 ± 0.0026. The pollen concentration was measured at 137 counts and assigned to the Cupressus pollen type.

A layer was reported between 0.05 and 0.98km on April 23, 2016 (00:11UTC). The layer was attributed to dusty marine particles, with a mean depolarization ratio of 0.17 0.0029. A layer with a depolarization ratio of 0.12 0.054 was discovered by a ground-based system between 0.55 and 0.13km. Poac is responsible for a pollen concentration of 137 counts.

Finally, a layer discoverd between 0.75 and 1.60 km on 06/05/2016 (00:54UTC) and depolarization ratio of 0.0520.0003. The CALIPSO ascribed the layer to elevated smoke. With a depolarization ratio of 0.095±0.022 and pollen concentration of 686 counts assigned to birch type, a layer was found between 0.63 and 1.68 km from ground-based system.