Synergy of PARASOL and CALIOP observations using GRASP algorithm for enhanced aerosol characterization

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Currently, many experiments pursuing comprehensive characterization of the atmosphere, in particular the Atmosphere Observation System (AOS), include coordinated observations by both lidar and polarimeters in order to obtain important complimentary information about aerosol properties. The most advanced passive observations by space-based multi-angle polarimeters are sensitive to the properties of aerosol in total atmospheric column, but have very limited sensitivity to vertical structure of the atmosphere. Polarimeter observations can be used not only for retrieval of aerosol optical thickness, but also for deriving microphysical information about aerosol particle shape, size distribution, chemical composition simultaneously with the properties of underlying surface [1]. In a contrast, the lidar observations of atmospheric responses from different altitudes to laser pulses are designed to provide vertical profiles of atmospheric characteristics. Here we present the recent advancement in GRASP algorithm (Generalized Aerosol Retrieval of Atmospheric and Surface Properties) [2] that allows simultaneous inversion of co-incident lidar and polarimeter spaceborne observations and derives a united set of vertically resolved aerosol and surface parameters. Such synergetic retrieval is an extension to satellite data of the approach for synergetic processing of active and passive measurements developed earlier for ground-based observations [3]. Another addition to these developments apart of possibility to include of Raman-shifted and volume depolarization observations, is the inclusion of particles chemical composition retrieval [4], allowing to differentiate the composition of several aerosol modes together with their detailed vertical distributions.
The potential and limitations of such synergetic processing is illustrated by application to co-incident PARASOL and CALIPSO data.

References

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Preferred mode of presentation: oral