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Dust remote sensing advances in the framework of ACTRIS

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The irregular shape of mineral dust provides a strong signature on active and passive polarimetric remote sensing observations. Nowadays, advanced lidar systems operating in the framework of ACTRIS are capable of providing quality assured, calibrated multi-wavelength linear particle depolarization ratio measurements, while new developments will provide us elliptical polarization recordings in the near future. Passive polarimeters are already part of ACTRIS and their integration in operational retrieval algorithms is expected in the near future. This wealth of new information combined with updated scattering databases and sophisticated inversion schemes provide the means towards an improved characterization of desert dust in the future.

We present here some examples from the ACTRIS journey on dust research during the last decade, aiming to demonstrate the progress on issues such as: (a) the discrimination of desert dust in external mixtures, (b) the estimation of the fine and coarse particle modes, (c) the synergy of passive and active remote sensing for the derivation of dust profiles, (d) the provision of dust-related CCN and IN particle concentrations for aerosol-cloud interaction studies, (e) the development of new scattering databases based on realistic particle shapes, (e) the application of these techniques on space lidar datasets for the provision of climatological datasets. Future plans within ACTRIS for the evaluation and advancement of the methodologies and retrievals are also discussed.