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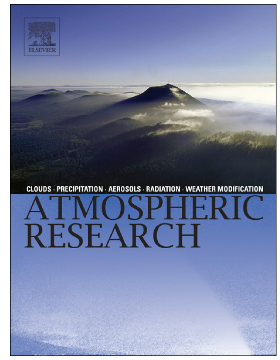

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Investigating the size, shape and surface roughness dependence of polarization lidars with light-scattering computations on real mineral dust particles: application to dust particles' external mixtures and dust mass concentration retrievals

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Abstract. Our understanding of the contribution of mineral dust to the Earth's radiative budget is limited by the complexity of these particles, which present a wide range of sizes, are highly-irregularly shaped, and are present in the atmosphere in the form of particle mixtures. To address the spatial distribution of mineral dust and atmospheric dust mass concentrations, polarization lidars are nowadays frequently used, with partitioning algorithms allowing to discern the contribution of mineral dust in two or three-component particle external mixtures. In this paper, we investigate the dependence of the retrieved dust backscattering (β_d) vertical profiles with the dust particle size and shape. For that, new light-scattering numerical simulations are performed on real atmospheric mineral dust particles, having determined mineralogy (CAL, DOL, AGG, SIL), derived from stereogrammetry (stereo-particles), with potential surface roughness, which are compared to the widely-used spheroidal mathematical shape model. For each dust shape model (smooth stereo-particles, rough stereo-