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Impact of polarized inelastic scattering in atmosphere on the retrieval of aerosol and cloud properties with Sentinel-4/UVN measurements

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The quantification of rotational Raman scattering (RRS) in atmosphere and the in-filling of telluric lines, such as the oxygen A-band (758 - 772 nm), by inelastically scattered photons is investigated as it can be used for cloud, aerosol and greenhouse gas characterisation. We present results using the vector radiative transfer model SCIATRAN, which has been extended to account for the spectral effects of RRS together with polarization in presence of aerosols and clouds. Upon comparison with previous independent results in the ultraviolet and near-infrared spectral regions, results for the inelastic radiative transfer are shown for various viewing geometries, instrumental specifications and geophysical scenarios. Specifically, bidirectional reflective effects induced by a polarizing surface are taken into account as well as scattering properties of asymmetric dust particles and ice crystals. The impact of RRS, and the changes in light polarization induced by it, on the accuracy of retrieved aerosol and cloud properties can be already demonstrated for simulated measurements of the upcoming ESA Sentinel-4 geostationary mission onboard the Meteosat Third Generation Sounder (MTG-S) satellite, whose launch is scheduled for 2020. Sentinel-4's payload is the imaging spectrometer Ultra-violet/Visible/Near-Infrared (UVN) that covers the oxygen A-band at a nominal spectral resolution of 0.12 nm and monitors Europe with hourly time sampling.