Optical extinction by upper tropospheric/stratospheric aerosols and clouds: GOMOS observations for the period 2002–2008

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Although the retrieval of aerosol extinction coefficients from satellite remote measurements is notoriously difficult (in comparison with gaseous species) due to the lack of typical spectral signatures, important information can be obtained. In this paper we present an overview of the current operational nighttime UV/Vis aerosol extinction profile results for the GOMOS star occultation instrument, spanning the period from August 2002 to May 2008. Some problems still remain, such as the ones associated with incomplete scintillation correction and the aerosol spectral law implementation, but good quality extinction values are obtained at a wavelength of 500 nm. Typical phenomena associated with atmospheric particulate matter in the Upper Troposphere/Lower Stratosphere (UTLS) are easily identified: Polar Stratospheric Clouds, tropical subvisual cirrus clouds, background stratospheric aerosols, and post-eruption volcanic aerosols (with their subsequent dispersion around the globe). For the first time, we show comparisons of GOMOS 500 nm particle extinction profiles with the ones of other satellite occultation instruments (SAGE II, SAGE III and POAM III), of which the good agreement lends credibility to the GOMOS data set. Yearly zonal statistics are presented for the entire period considered. Time series furthermore convincingly show an important new finding: the sensitivity of GOMOS to the sulfate input by moderate volcanic eruptions such as Manam (2005) and Soufrière Hills (2006). Finally, PSCs are well observed by GOMOS and a first qualitative analysis of the data agrees well with the theoretical PSC formation temperature. Therefore, the importance of the GOMOS aerosol/cloud extinction profile data set is clear: a long-term data record of PSCs, subvisual cirrus, and background and volcanic aerosols in the UTLS region, consisting of hundreds of thousands of altitude profiles with near-global coverage, with the potential to fill the aerosol/cloud extinction data gap left behind after the discontinuation of occultation instruments such as SAGE II, SAGE III and POAM III.

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