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Detection of mesospheric sodium layer from SCIAMACHY/ENVISAT limb observations

Gabriele Brizzi (1), Stefano Casadio (1), Lidia Saavedra de Miguel (1), Marta De Laurentis (1), Rosario Quirino Iannone (1), and Angelika Dehn (2)

(1) Serco S.p.A., Via Sciadonna, 24, 00044 Frascati, Italy (gabriele.brizzi@serco.com), (2) European Space Agency (ESA), Via Galileo Galilei, 00044 Frascati, Italy

Despite its relevance as a boundary between the terrestrial environment and the outer space, the Mesosphere-lower Thermosphere (MLT) region remains a poorly characterized part of the Earth's atmosphere for the limited number of instruments able to access and probe it. The MLT region (80–120 km) is characterized by various dynamic features (i.e. zonal winds, atmospheric tides, gravity and planetary waves), electrical processes (i.e. ionization, discharge events), and by resonant emissions from metal atoms entering the Earth's atmosphere via meteorite ablation.

In this paper we focus on the limb viewing capabilities of the SCIAMACHY/ENVISAT instrument, sounding the upper atmosphere. Limb measurements covering the MLT region were permanently implemented into SCIAMACHY mission operations since November 2008 via a dedicated state (ID 55) executed instead of routine limb observations for about 30 orbits each month. The new SCIAMACHY Mesosphere-Thermosphere state scan the atmospheric limb from 150 km downwards to 60 km and allow a full investigation of the sodium layer in the Mesosphere.

Exploiting detectable emission features in the visible part of the spectrum (585 – 595 nm) corresponding to the Sodium doublet, and applying a two-line differential inversion algorithm permitted the retrieval of Mesospheric sodium profiles from daytime sun-normalized limb spectra for tangent altitudes above 70 km (S. Casadio et al. 2007). Results obtained analyzing the new Limb Mesosphere-Thermosphere measurements from 2008 to the end of the SCIAMACHY measurement period (2012) are presented also with the validation approach based on the University of Colorado Sodium Lidar data.