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Satellite measurements of the global mesospheric sodium layer

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Abstract. Optimal estimation theory is used to retrieve the absolute Na density profiles in the mesosphere/lower thermosphere from limb-scanning measurements of the Na radiance at 589 nm in the dayglow. Two years of observations (2003 and 2004), recorded by the OSIRIS spectrometer on the Odin satellite, have been analysed to yield the seasonal and latitudinal variation of the Na layer column abundance, peak height, and peak width. The layer shows little seasonal variation at low latitudes, but the winter/summer ratio increases from a factor of ~3 at mid-latitudes to ~10 in the polar regions. Comparison of the measurements made at about 06:00 and 18:00 LT shows little diurnal variation in the layer, apart from the equatorial region where, during the equinoxes, there is a two-fold increase in Na density below 94 km between morning and evening. This is most likely caused by the strong downward wind produced by the diurnal tide between ~02:00 and 10:00 LT. The dramatic removal of Na below 85 km at latitudes above 50° during summer is explained by the uptake of sodium species on the ice surfaces of polar mesospheric clouds, which were simultaneously observed by the Odin satellite.

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