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Local Time Variations of Mesospheric Ice Layers – Modeling by MIMAS and Observations by Ground-based Lidar and the AIM Satellite

The Mesospheric Ice Microphysics And tranSPort model (MIMAS) is used to study local time (LT) variations of noctilucent clouds (NLC), also known as polar mesospheric clouds (PMC), in the Northern Hemisphere during the period from 1979 to 2013. In addition, we make use of multi color lidar observations by the RMR lidar at the ALOMAR observatory located close to the Andoya space center in Northern Norway (69_N). We investigate the tidal behavior of brightness, altitude, and occurrence frequency and find a good agreement between model and lidar observations.

We also analyse PMC in terms of ice water content (IWC) and show that local time variations are found to depend on latitude and threshold conditions. The persistent features of strong local time modulations in ice parameters are mainly forced by tidal variations in background temperature and water vapor.

The combination of satellite observations and modeling studies can help to better understand the variability of PMC throughout the polar region. Most satellites are sun-synchronous and cover only a small local time period. Therefore we calculated a climatology of IWC local time variations from a 35-year average from 1979 to 2013 for different thresholds and latitude bands, which might be useful for satellite data analysis in order to perform local time corrections. Our results of modeled PMC parameters at the core of the season are very compatible with AIM satellite observations.