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Local time dependence of polar mesospheric clouds and model validation with satellite data

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Polar mesospheric clouds (PMCs), also known as noctilucent clouds (NLCs), consist of water-ice cystals. They occur at high latitudes in the summer mesopause region at very low temperatures below 150 K. In this case PMCs are highly sensitive to atmospheric conditions. Therefore, PMCs are thought to be sensitive indicators of climate changes in the middle atmosphere. The ice clouds show spatial and temporal variations. We present a model that can help to understand the variability of mesospheric clouds. The model is called Mesospheric Ice Microphysics And tranSport model (MIMAS) and is a threedimensional Lagrangian transport model, which can be used on multiple dynamic fields. MIMAS is a good instrument to check observations and also to fill some gaps that are included in satellite observations, e.g., the local time dependence of PMCs. The ice model is used to study local time dependencies of the PMC occurrence frequency, brightness and ice water content. At the station ALOMAR in Northern Norway (69°N, 16°E) we have the most ice water content with a total mean of around 90 g/km^2 (July 2008) in the morning hours. In the afternoons the ice water content decreases to 10 g/km^2 and increases again in the evening hours to 50 g/km^2. Tidal variability will impact results of long-term PMC observations which do not cover the full diurnal cycle. To investigate the local time dependence of PMCs in its entirety, ground-based remote sensing instruments, e.g., lidars are usefull. Variations in PMCs relating to occurrence frequency and brightness as function of local time had been already observed with the ALOMAR Rayleigh/Mie/Raman lidar. But lidar measurements offer only observations at a single local station. Models give the opportunity of a global perspective on a possible local time dependence of PMCs. In this context we will present latitudinal variations regarding to local time dependence. The combination of further observations and modeling studies can help to understand the variability of PMCs with local time throughout the polar region. The aim of modeling ice clouds is to represent the reality as accurately as possible by coupling of dynamics, radiation and microphysics. Comparison of modeled PMCs and measured by satellites shows similar ice parameters.