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Small scale variations of the atmosphere and their implications for the size of noctilucent cloud particles

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Noctilucent clouds (NLC) in the summer mesopause region (about 83 km altitude) are well known since more than 130 years. They are primarily made of ice particles of a few tens of nanometers and thus much smaller than the wavelength of visible light. Nevertheless, lidar measurements allow calculating particle size and inferring particle shape when combined with optical and microphysical modeling of non-spherical ice particles.
We use the ALOMAR RMR-lidar, located in Northern Norway at 69°N, that is able to measure NLC with sub-second resolution. The signal levels at three widely separated wavelengths from 335 nm to 1064 nm allow deriving particle sizes with a temporal resolution of two minutes. We will use lidar observations between 2008 and 2014 to investigate the shape of the size distribution. The fundamental question of the shape of the size distribution is a link to the microphysics but also to atmospheric variability by turbulence and waves. Due to large sounding volumes (compared to the lidar sounding volume) this shape of the size distribution is of essential importance for most optical remote sensing methods that depend on assumptions about the width of the size distribution when retrieving mean particle sizes.
The actual shape of the size distribution is of essential importance for most optical remote sensing methods (which have larger sounding volumes than the lidar) that depend on assumptions about the width of the size distribution when retrieving mean particle sizes.