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Waves at the edge of space revealed by noctilucent cloud observations using camera and lidar

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Noctilucent clouds (NLC) exist at an altitude of about 83 km during the summer season at middle and polar latitudes. They consist of icy particles that exist in the polar summer mesopause region where the atmosphere is about 100 K colder than expected from pure radiative forcing. Dynamical effects, for example the dissipation of gravity waves, play an important role in the global circulation finally leading to the cold summer mesopause region. Ever since the first reports on the occurrence of NLC in 1885 the observers noticed distinct structures in the clouds that are most often wave-like. However at times the wave field becomes seemingly chaotic.

State of the art lidar and camera observations of NLC allow studying small-scale structures of tens of meters in the vertical and horizontal direction. Given a high time resolution (about one second), the development of these structures is measured on temporal scales spanning the range from inertia gravity waves to acoustic gravity waves. We will show observations with the RMR-lidars at ALOMAR (Northern Norway at 69°N) and Kühlungsborn (54°N) as well as cameras located nearby these stations. Using these combined observations we study waves and their transition to turbulence.