Characteristics of noctilucent clouds observed by the NICT Rayleigh lidar at Poker Flat

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A Rayleigh lidar was installed at Poker Flat Research Range (65.1N, 147.5W, 394m ASL) in November 1997 as one of the nine instruments of the Alaska Project which is conducted by NICT (National institute of Information and Communications Technology; the former CRL). Height profiles of atmospheric density and temperature in the altitude range of 35-80 km are derived from the NICT Rayleigh lidar data in winter seasons. In summer months except for bright night sky time (late May to early July) we can also observe scattering signals from noctilucent clouds (NLCs) which occur in the upper mesosphere (around 82-84 km). NLCs occur only in polar summer when the upper mesospheric temperature is lower than 150 K. A shape of NLC signal profile is a thin layer with thickness of ~0.5-2 km. Observed centroid altitudes are usually around 82-84 km and are rarely below 80 km. Brightness, thickness and centroid altitude of NLCs can vary with time. Previous studies report relationship between NLCs and planetary/tide/gravity waves [e.g. Jensen and Thomas, 1994; Collins et al., 2003; Kirkwood and Stebel, 2003; Thayer et al., 2003].

We analyzed the NLC data by the NICT Rayleigh lidar at Poker Flat. Three strong NLC events were observed on the nights of 4-5 August 1999, 3-4 August 2002, and 6-7 August 2003. Weaker scattering signal enhancement was also observed on some other nights. The strong NLCs occurred at the same local time rage (25:45-27:10) and exhibited change of brightness, thickness and centroid altitude in all three cases. The range of centroid altitude change was around 1-2 km. The centroid altitude of NLC was around 79 km on 3-4 August 2002. This centroid altitude is somewhat lower than the typical value. We will also discuss those characteristics of NLCs in terms of background wind and temperature and atmospheric wave activities derived from the NICT Rayleigh lidar and MF radar at Poker Flat.