The spatial structures and seasonal variations of the polar mesospheric clouds seen from the meteorological satellite Himawari-8

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Polar mesospheric clouds (PMCs) consist of water-ice particles, and have been observed near the summer polar mesopause region. Production and disruption of PMC are sensitive to the background mesospheric state, such as the temperature and water vapor conditions. Its distribution is strongly affected by the background wind. Hence, PMC is a good proxy for the thermal structure and dynamics in the high latitude summer mesosphere.

Observations of PMC have been widely performed by various methods from the ground as well as from Low-Earth-Orbit (Leo) satellites. However, these methods have some limitations, especially in local time coverage or observational continuity to monitor the long-term PMC activity. While a large number of studies have been done with the LEO satellites data, there are only a few studies of PMC observations from Geostationary Earth Orbit (GEO) satellites, which include Meteosat First Generation (MFG) and Meteosat Second Generation (MSG). The GEO satellites provide full-disk images of the Earth including the polar mesosphere on the Earth's limb, which would give valuable opportunities for PMC observations.

Recently, our group found that the PMC signal can be observed by the Advanced Himawari Imager (AHI) onboard Himawari-8, the Japanese Geostationary-Earth-Orbit meteorological satellite (Tsuda et al., 2018). In the presentation, we will show the PMC detection method for application to Himawari-8 AHI images. To evaluate the PMC signal correctly, the background emissions from atmospheric scattering (i.e., Rayleigh scattering) should be removed. We present how we remove the background emissions and evaluate the PMC signal. The detection capability, especially the limit of sensitivity, of AHI on the PMC observations will be discussed. Based on the detection method, The PMC spatial structures and its temporal variations will be presented.

