Height and time characteristics of seasonal and diurnal variations in PMWE based on observations by PANSY radar (69S,39E)

Takanori Nishiyama[1]; # Takuji Nakamura[1]; Kaoru Sato[2]; Masaki Tsutsumi[1]; Toru Sato[3]; Koji Nishimura[1]; Masashi Kohma[4]; Yoshihiro Tomikawa[1]; Mitsumu K. Ejiri[1]; Takuo Tsuda[1]

[1] NIPR; [2] Graduate School of Science, Univ. of Tokyo; [3] Communications and Computer Eng., Kyoto Univ.; [4] Earth and Planetary Science, Univ. of Tokyo

We report height and time variations of Polar Mesosphere Winter Echo (PMWE) based on PANSY (Program of the Antarctic Syowa MST/IS) radar observations in Antarctica. The PANSY radar is a 47 MHz VHF radar installed at Syowa station in Antarctica (69S, 39E), and it is being developed toward full system operation. In 2013, mesosphere observations have been conducted regularly with total antenna aperture of 3,900 m^2 (full system aperture of 18,000 m^2) and peak output power of 113 kW (full system output of 520 kW). It was already the largest MST radar in the Antarctic at that moment, and the more detailed description of PANSY radar itself was summarized in Sato et al. [2014]. PMWE were identified almost every day from March to October 2013 even during periods without any Solar Proton Events, probably because of ionization by energetic electrons precipitations. Both enhancement of electron density and neutral turbulence have strong control over PMWE as pointed out by Luebken et al. [2006]. Monthly means of PMWE characteristics were also deduced. They demonstrated that the most part of PMWE was restricted to daytime when solar zenith angle (SZA) was smaller than 98 degree, suggesting that electrons detached from negative ions play an important role. However, PMWE was also detected at altitude of 70-80 km for a few hours after sunset. From a simple estimation of time scale for electron loss based on the continuity equation of electron density ignoring advection, the PMWE detected at 70-80 km after sunset can be explained by effective recombination rates without Meteoric Smoke Particles (MSPs), which implies that electron loss by MSPs is negligible below 80 km altitude.