

# Comparison study between polar mesosphere winter echo, CNA and electron density in the mesosphere based on the PANSY radar

Takanori NISHIYAMA<sup>1,2</sup>, Kaoru SATO<sup>3</sup>, Takuji NAKAMURA<sup>1,2</sup>, Masaki TSUTSUMI<sup>1,2</sup>, Toru SATO<sup>4</sup>, Koji NISHIMURA<sup>1,2</sup>, Yoshimasa TANAKA<sup>1,2</sup>, Yoshihiro TOMIKAWA<sup>1,2</sup>, and Masashi KOHMA<sup>3</sup>

<sup>1</sup>*National Institute of Polar Research, Tokyo, Japan*

<sup>2</sup>*SOKENDAI (The Graduate University for Advanced Studies), Polar Science, Tokyo, Japan*

<sup>3</sup>*Earth and Planetary Science, University of Tokyo, Tokyo, Japan*

<sup>3</sup>*Communications and Computer Engineering, Kyoto University, Kyoto, Japan*

Polar Mesosphere Winter Echo (PMWE) is known as back scatter echo from 55 to 85 km in the polar region during non-summer period. Since density of free electrons as scatterer is low in the dark mesosphere during winter, it is suggested that PMWE requires strong ionization associated with energetic particles precipitations during Solar Proton Events (SPE) or during geomagnetically disturbed periods. However, studies on relationship between occurrence of PMWE and background electron density has been poorly understood yet. The PANSY (Program of the Antarctic Syowa MST/IS) radar, which is the largest MST radar in Antarctica, observed many PMWE events since it has started mesosphere observations in June 2012. We established an application method of the PANSY radar as riometer, which makes it possible to estimate Cosmic Noise Absorptions (CNA) as proxy of relative variations on background electron density. Additionally, electron density profiles from 60 to 150 km altitude are calculated by Ionospheric Model for the Auroral Zone [McKinnell and Friedrich, 2007]. In this presentation, we would like to focus on strong PMWE during one SPE and two big geomagnetic storm events in order to compare observed PMWE characteristics to model background electron density.

Key words: the PANSY radar, polar mesosphere winter echo, cosmic noise absorption

## References

McKinnell, L.-A., and M. Friedrich, 2007: *J. Atmos. Sol. Terr. Phys.*, **69**, 1459–1470, doi:10.1016/j.jastp.2007.05.003.