

Average characteristics of polar mesosphere winter echoes observed by EISCAT VHF 224MHz radar

Hailong Li¹, Zheng Qin¹, Tong Xu², Shucan Ge¹, Yumei Chen¹, Safi Ullah¹, Abdur Rauf¹, Bin Wang¹, Yong Yin¹, Maoyan Wang¹, Xuesong Yuan¹

¹School of Electronic Science and Engineering, University of Electronic Science and Technology of China

²National Key Laboratory of Electromagnetic Environment, China Research Institute of Radiowave Propagation

lihailong@uestc.edu.cn

The polar mesosphere winter echoes (PMWE) are radar echoes detected from the height region 50-80km in the polar during winter month [1-3]. The main purpose of this paper is to analyze the average characteristics of PMWE by using statistical data of PMWE observed by the EISCAT VHF 224MHz radar from 2003 to 2014. PMWE are extremely rare phenomenon with mean occurrence rate of about 3.3%. To obtain a more detailed description of PMWE occurrence as a function of season and time (UT), the diurnal PMWE occurrence distribution observed by EISCAT (European Incoherent Scatter Scientific Association) VHF Radar during the years 2003-2014 is given in Fig. 1. The dashed lines mark the solar zenith angle 98° separating daytime from nighttime conditions. On the basis of statistical results, the average variation characteristics of PMWE, such as occurrence rate, height distribution, diurnal variation, seasonal variation and annual variation, are analyzed and the factors that influence the occurrence rate of PMWE are discussed at the same time.

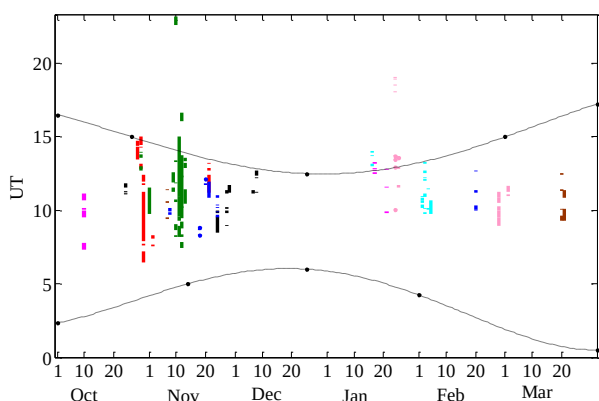


Fig 1. Occurrence of PMWE observed by EISCAT VHF

Radar during the years 2003-2014 plotted against time (UT) and season.

Acknowledgments

This work is supported by National Natural Science Foundation of China (Grant No. 61771096 and No.41304119), Fundamental Research Funds for the Central Universities (ZYGX2015J039, ZYGX2015J037, and ZYGX2015J041) and by the National Key Laboratory of Electromagnetic Environment, China Research Institute of Radio wave Propagation (CRIRP). The EISCAT Scientific Association is supported by the research councils of China, Finland, France, Germany, Japan, Norway, Sweden and UK.

References

- [1] Kirkwood S, Chilson P, Belova E et al. Infrasound - the cause of strong Polar Mesosphere Winter Echoes? *Ann. Geophys.* 24(2), 475-491. 2006
- [2] Belova E, Kirkwood S, Sergienko T. EISCAT and ESRAD radars observations of polar mesosphere winter echoes during solar proton events on 11-12 November 2004. *Ann. Geophys.*, 31(7), 1177-1190, 2013.
- [3] Zeller O, Zecha M, Bremer J et al. Mean characteristics of mesosphere winter echoes at mid- and high-latitudes. *J. Atmos. Sol. Terr. Phys.* 68(10), 1087-1104. 2006.