A statistical analysis of the spectral width of the PMWE observed by the PANSY radar at Syowa Station (69°S, 40°E) in the Antarctic

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Polar mesosphere winter echoes (PMWE) are the VHF radar echoes in the middle mesosphere from about 55 to 85 km altitude in both hemispheres. PMWE are not fully understood since they are rarer and weaker than summer echoes. Several mechanisms that was previously suggested include strong air turbulence (Lübken, et al., 2007; Lübken, 2014) and infra-sound wave (Kirkwood, et al., 2006) in the ionized atmosphere. Furthermore, high Schmidt number associated with charged meteor smoke may be responsible for PMWE (La Hoz and Havnes, 2008). The spectral width of PMWE have been investigated by several studies (e.g., Strelnikova and Rapp, 2013), although these studies are based on observations in the Northern Hemisphere. In the present study, we perform statistical analyses of seasonal variation of PMWE frequency and its spectral width using 3-year observations of the atmospheric radar at Syowa Station (the PANSY radar) in March through October. Furthermore, the seasonal variation of the turbulence intensity in the mesosphere is discussed. The PANSY radar has been operated with its full system since October 2015 at Syowa Station in the Antarctic (Sato, et al., 2014). We analyzed the polar mesosphere winter echoes (PMWE) detected by the radar in March through October of 2016–2018. The value range of radar volume reflectivity is on the order of 10^{-18}–10^{-15} m^{-1}, and the height range of PMWE is 55–85 km. The median of radar spectral width shows the seasonal variation with a maximum in June and minima in March and October, which accords well with the seasonal variation of GW activity observed by an MF radar.