

Seasonarity of turbulent energy dissipation rates over Syowa Station, Antarctic

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The turbulent energy dissipation rate (ϵ) is one of the fundamental physical quantities for atmospheric turbulence. We have investigated the seasonality of ϵ and the characteristics of ϵ in the stratospheric polar vortex margins using ϵ estimated by a VHF radar at Syowa Station, Antarctica (PANSY radar; Sato et al., 2014). In this study, we focus on the seasonality of ϵ in the upper troposphere and lower stratosphere using five years of observation data, and discuss the factors that cause the ϵ seasonality.

As also shown in Kohma et al. (2019), ϵ increases from winter to spring in the lower stratosphere. We have shown in previous analyses that this is likely due to a seasonal change in polar vortex and gravity wave activity. It is interesting to note that the seasonal variation of ϵ just above the tropopause ($z=9\sim 11$ km) has a maximum value in February. The frequency histogram of ϵ in this altitude region shows that the right tail of the histogram of ϵ is extended in February compared to other months. In other words, strong turbulence events frequently occur in February, resulting in an increase in the monthly mean value of ϵ . We will discuss the background winds and gradient Richardson number during the strong turbulence events.

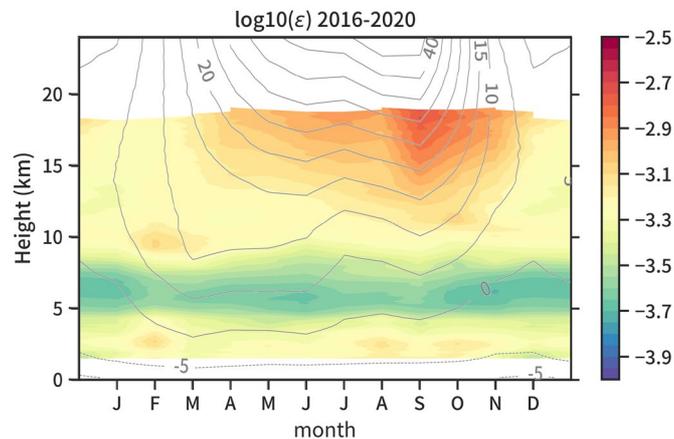


Fig. 1: Monthly mean ϵ (color) and zonal wind (contours) over Syowa Station as a function of height.