Characteristic of Vertical Winds Fluctuations in the Lower Troposphere at Syowa Station in the Antarctic Revealed by the PANSY Radar

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Using wind data over three years from July 2012-June 2015 from the PANSY radar, an MST radar, newly installed at Syowa Station (39.59°E, 69.0°S), statistical characteristics of vertical winds and vertical momentum fluxes in the Antarctic lower troposphere are examined. Frequency spectra covering a wide frequency range from $(30\ \mathrm{d})^{-1}$ to $(8\ \mathrm{min})^{-1}$ are divided into three frequency regions obeying power laws with different scaling exponents. The transition frequencies are different between horizontal and vertical wind spectra. Vertical fluxes of horizontal momentum and variances of vertical wind were estimated for two wave period ranges of 1 d-2 h and 2 h-8 min having almost equal logarithmic scales. The momentum fluxes are larger for longer period components, and the variances of vertical wind disturbances are larger for shorter period component than longer period component. There are a few evidences showing that the vertical wind disturbances in the lower troposphere are due to gravity waves forced by topography aligned the north-south direction. First, the strong disturbances are observed when horizontal winds are strong near the surface. Second, zonal winds tend to almost zero around the top of the disturbances. Third, frequency spectra are large at a wide range of frequency below a critical level, as is consistent with the phase modulation of mountain waves by unsteady mean flow.

Keywords: MST Radar, Polar Atmosphere

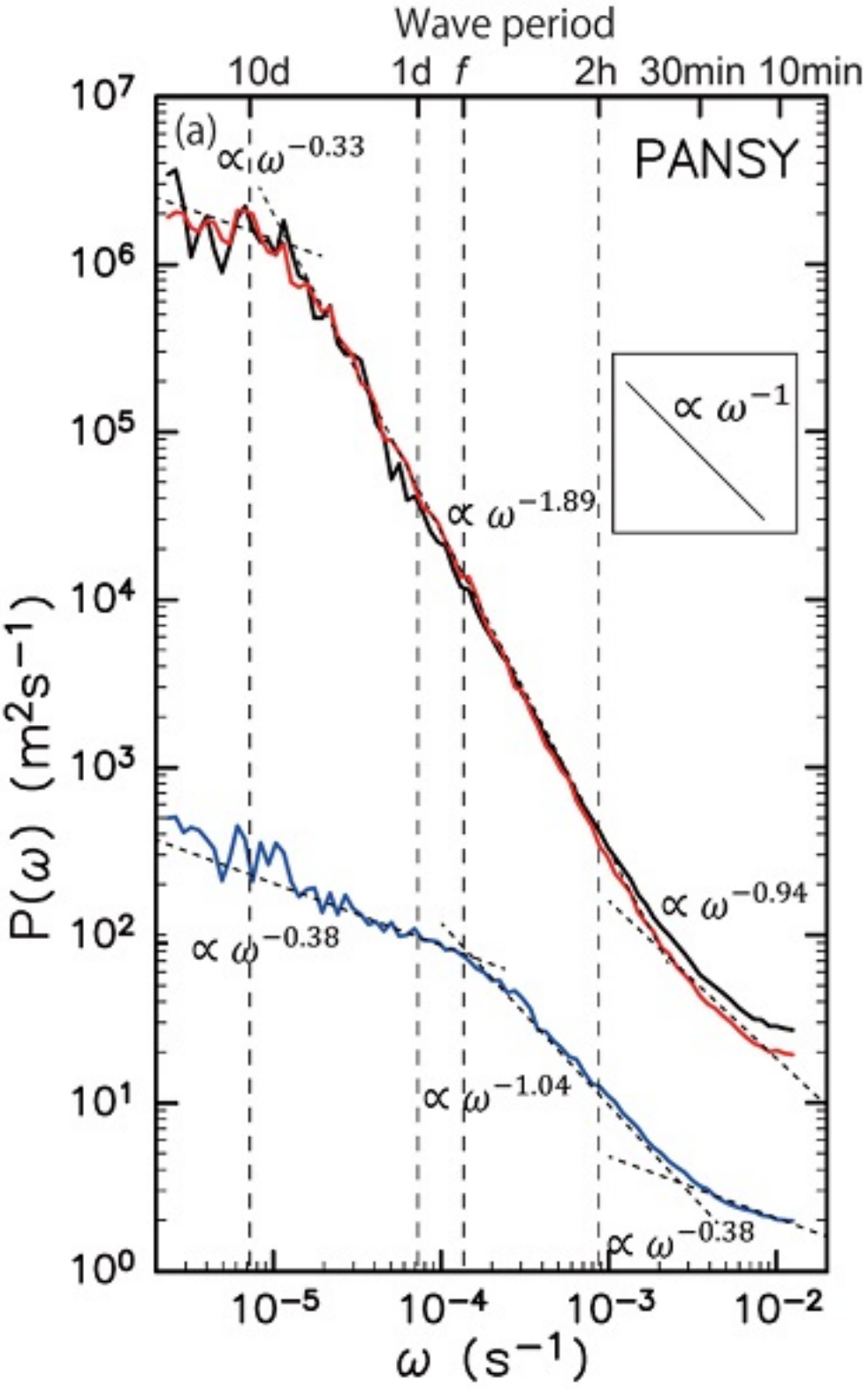

Figure : The frequency power spectra of zonal wind (black), meridional wind (red), and vertical wind (blue) fluctuations by PANSY radar. Both axis are log-scale.

