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Statistical characteristics of wind fluctuations in the troposphere and lower stratosphere over Andøya, Norway (69.30°N, 16.04°E) revealed by MAARSY

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We explore the spectral characteristics of the horizontal and vertical wind fluctuations, in the troposphere and lower stratosphere, using the Middle Atmosphere Alomar Radar System (MAARSY) during the years 2017-2020 over Andøya, Norway (69.30°N, 16.04°E). The power spectral density covers a broad frequency range of 3.5 d^{-1} > f > 1 h^{-1}. The power spectra are categorized in different ranges: two frequency ranges (lower and higher than (13 h)$^{-1}$), four altitude ranges (lower troposphere, middle troposphere, tropopause region, and lower stratosphere), and four seasons (spring, summer, autumn, and winter). We investigated the power-law S(f) □ f^{β} through a least-squares regression. Our results demonstrate that (i) the spectra of the horizontal winds follow a power-law with slopes of about β = -5/3 (at high-frequency), and β = -2 (at low-frequency), respectively, and the slope steepens vertically around the tropopause and seasonally during the summer, and (ii) the slope β in the vertical wind is shallow β > -1, which flattens with altitude. The momentum flux and vertical wind variance exhibit seasonal and altitudinal variations, both of which minimize in summer and maximize at the lower troposphere. The probable reason for such variation will be discussed in the presentation.