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Measuring planetary waves and tides in the MLT at 65N using a longitudinal array of SuperDARN radars

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Atmospheric tides and planetary waves (PWs) play an important role in shaping the day-to-day and seasonal variability of the Mesosphere-Lower-Thermosphere (MLT). Measurements of tidal and PW variability in the mid-latitude MLT have however remained sparse. This study uses a longitudinal array of SuperDARN radars, which provide hourly measurements at ∼95km altitude, to investigate tides and PWs in the MLT at 65 degrees North. Using the array of SuperDARNs, we can identify east and westward traveling S1, S2 and S3 wave components over a broad range of frequencies. The approach to extract the wave components is based on wave-fitting and the Stockwell-transform, which results in time-frequency diagrams of wave amplitudes. Using this technique, variations in amplitude on the scale of days can be identified for individual waves (e.g. the 5-day Rossby normal-mode). The approach is tested and validated using NAVGEM High Top (HT). NAVGEM-HT is a global reanalysis product which is data driven to approximately 114km. Initial results are in agreement with previous studies on (low frequency) quasi-stationary planetary waves and (high frequency) tides in the MLT. The temporal resolution provided by the proposed approach can give insight in sources of MLT variability such as nonlinear wave-wave interaction, selective gravity wave filtering and energetic particle precipitation.