

Planetary wave propagation in the middle atmosphere from Odin satellite data and ground base instruments in summer 2003-2005 in relation to PMSE

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A number of studies have shown that 5-day planetary waves modulate noctilucent clouds at the summer mesopause and the closely related Polar Mesosphere Summer Echoes (PMSE). This is somewhat surprising since the upward propagation of 5-day planetary waves should be effectively hindered by the prevailing westward winds in the summer stratosphere and mesosphere. Although some numerical models do show a possibility for upward wave propagation, it has also been suggested that the upward propagation may in practice be confined to the winter hemisphere with horizontal propagation of the wave from the winter to the summer hemisphere at mesosphere heights causing the effects observed at the summer mesopause. In this study, we first demonstrate 5-day fluctuations at the summer mesopause using local observations of PMSE and temperature fluctuations over northern Scandinavia and Canada during the summers of 2003-2005. We then use global characterization of 5-day planetary waves using the ODIN satellite to test whether northern-hemisphere or southern-hemisphere waves are the more likely source of the fluctuations at the summer mesopause. We find evidence for both sources at different times.