

Vertical Structure of Terdiurnal Tides in the Antarctic MLT Region: 15-Year Observation Over Syowa

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The terdiurnal tide (TDT) in the Antarctic mesosphere and lower thermosphere region is poorly known. This study examines TDT using neutral wind observations at Syowa during years of 2004–2018. TDT is found to be a significant tidal component with distinct vertical structures and seasonal evolution. (1) It shows a prominent height-dependent seasonal variation with phase reversal at 94 km. (2) The vertical wavelength in summer is ∼40 km shorter than in winter. These features differ largely from those in the Arctic, indicating hemispheric asymmetry. The phase structure reveals a dominant upward propagating mode in local summer but superposition of more than one mode in other seasons. A downward propagating mode above 94 km in winter suggests Joule heating/ion drag as additional tidal sources to lower atmosphere ones. These results provide new constrains and benchmarks for model simulations that seek to understand terdiurnal tidal forcing mechanisms in polar regions. We also examine the possible influence of auroral heating on the tides using WACCM-X model.

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