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TITLE: Diurnal and Seasonal Variations of Temperatures from Lower to Upper Atmosphere at McMurdo, Antarctica from 2010 to 2011

PRESENTATION TYPE: Assigned by Committee (Oral or Poster)

CURRENT SECTION/FOCUS GROUP: SPA-Aeronomy (SA)

CURRENT SESSION: SA03. Chemistry and Temperatures in the Upper Mesosphere/Lower Thermosphere

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ABSTRACT BODY: Temperature is one of the fundamental parameters for atmospheric science studies. Many phenomena, such as polar mesospheric clouds, polar stratospheric clouds, and metallic layer chemistry at MLT region, are dominated by temperature. Also, temperature is a key tracer for tidal and gravity waves. However, long-term and range-resolved temperature measurements with full-year and full-diurnal coverage are very rare at southern high latitudes, though some MF radars have provided wind measurements since 1980s. To help address this issue, we installed a ground-based Fe Boltzmann temperature lidar at McMurdo and started data collection since December 2010. McMurdo (77.83°S, 166.66°E), near south magnetic pole and close to the Trans-Antarctic Mountain Ridge, is a scientifically critical location for polar atmospheric study. Over 650 hours of data have been retrieved so far, providing long-duration continuous observations that cannot be achieved by satellites, not to mention high latitude and diurnal coverage for satellites are usually poor.
Provided with full-diurnal coverage and year-round lidar measurements of temperatures, we establish the morphology of atmospheric thermal structure for McMurdo. The diurnal and seasonal variations of the thermal structure from 30 to 105 km are characterized, which will help understand metal layer variations and PMC formation, and provides ground-truth observations for satellite measurements. The amplitude and phase of 24-hour tide and the first few harmonics are investigated as well. The tide is believed to have small amplitude in polar winter. However, in the MLT region, a coherent wave structure with period between 4 and 6 hours appears in the monthly composite temperature in June, which might provide a clue for studies of tidal and gravity wave interaction. Finally, we compare winter data with existed satellite measurements, such as MLS and SABER, and atmospheric models, such as TIME-GCM and WACCM.

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