MLS Scientific Publication

Scientific Themes: Atmospheric Dynamics, Gravity Waves, Polar Vortex

MLS Observations of Atmospheric Gravity Wave over the Antarctica. Dong L. Wu and Jonathan H. Jiang, *J. Geophys. Res.*, **107**, No. 24, 10.1029/2002JD2390, 2002.

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Summary

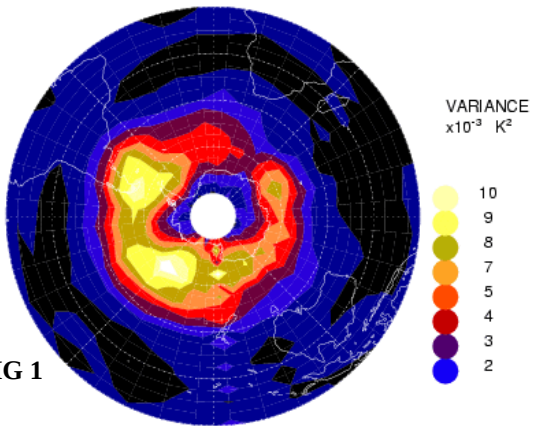

FIG 1

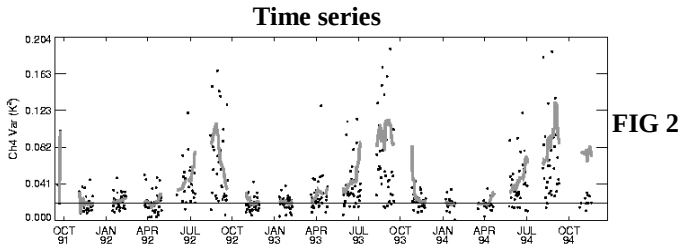

FIG 2

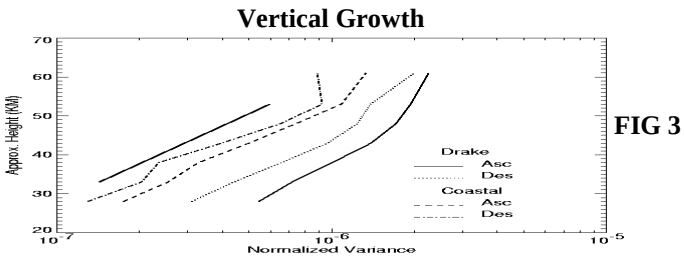

FIG 3

This paper analyzes gravity wave (GW) variances observed by UARS MLS over Antarctica for the period of August-September in 1992-1994. Despite variability in GW amplitudes and distributions, the salient feature over the Drake Passage to Scotia Sea near the Antarctica vortex edge appears to be consistent and highly repeatable from year to year (FIG 1). The peak variance at ~ 28 km over the Drake Passage region is associated closely to the southern Andes. With increasing height, the center location shifts slightly towards the Antarctic Peninsula and spreads to a larger area. Analyses of different variance amplitudes from descending and ascending orbits indicates westward propagating waves in the eastward background winds of the southern hemisphere winter vortex. The evolution of the variances over the Drake Passage region is dominated by the annual cycle with largest GW activity in August-September (FIG 2). Elsewhere, the GW activities follow the Antarctic coastline quite well, especially at the lowest altitude, with the main enhanced regions at longitudes between 90°-220° likely due to the surface topography. Unlike the feature over the Drake Passage region, the locations of these enhancements vary from year to year but in a given year are correlated between low and high altitudes. Vertical growth of the variances for both the Drake and coastal regions show similar growth trend between 28-48 km with scale height close to 14 km (FIG 3).

This work may help further modeling studies in understanding interactions between topography and jet-stream excited gravity waves in the middle atmosphere. Also, analysis of simultaneous observations from UARS MLS and CLAES/ISAMS, and a joint statistical study on GW and PSC activities are underway because of this work (http://mls.jpl.nasa.gov/jonathan/GW-PSC_Antarctic.html). Our continued study on atmospheric gravity waves in the middle atmosphere using MLS data can ultimately benefit society by improving our understanding of atmospheric circulations and other issues related to climate change.