

# **Investigation of Planetary Waves and Tides in a High Altitude Meteorological Analysis System**

John MCCORMACK<sup>1</sup>,

<sup>1</sup> *Naval Research Laboratory, Washington DC, USA*

This presentation will examine the spatial and temporal variability in free traveling planetary waves and migrating tides (diurnal and semi-diurnal) in the upper stratosphere and mesosphere based on space-time spectral analysis of temperature and winds from a high-altitude (HA) version of the Navy Global Environmental Model (NAVGEM) numerical weather prediction (NWP) system. HA-NAVGEM combines a 4-dimensional variational (4DVAR) data assimilation system with a 3-time-level semi-Lagrangian semi-implicit global forecast model. HA-NAVGEM produces 3-hourly global synoptic analysis of winds, temperature, ozone, and water vapor by assimilating standard meteorological observations in the troposphere and lower stratosphere plus middle atmospheric (10-90 km altitude) temperature and constituent observations from both operational and research satellite platforms. This study will focus on the daily and seasonal variations in both planetary waves and tides during recent stratospheric sudden warming events during the Northern Hemisphere winter, which have been shown to strongly impact the dynamics of the mesosphere and lower thermosphere (MLT) region. Results from HA-NAVGEM will be compared with variations in planetary waves and tides from both reanalysis data sets extending into the mesosphere and from independent ground-based observations. The results of these comparisons will inform a discussion of data assimilation and modeling approaches for extending current meteorological reanalyses to higher altitudes, and the future types of observations needed for development of “whole atmosphere” analysis systems.

Key words: stratosphere, mesosphere, tides, waves, reanalysis

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