

**Aura Microwave Limb Sounder observations of the polar middle atmosphere:
Dynamics and transport of CO and water vapor**Jae N. Lee[†]; Dong Wu; Gloria Manney[†] JPL/Caltech, USALeading author: jnlee@jpl.nasa.gov

The vertical structure and evolution of the wintertime annular modes are studied using six years of geopotential height (GPH), carbon monoxide (CO) and water vapor (H₂O) data from Aura Microwave Limb Sounder (MLS). The Northern Hemisphere annular mode (NAM) and the Southern Hemisphere annular mode (SAM) reveal a strong coupling of the dynamics in the stratosphere and mesosphere between 316 hPa (~9 km) and 0.002 hPa (~90 km). CO is a good tracer throughout the middle atmosphere, while variable vertical gradients of H₂O limit the regions where it is useful as a dynamical tracer. The maximum of the CO NAM and SAM (CNAM and CSAM) indices is used to monitor and characterize the evolution of wintertime polar dynamics as a function of time and height. The CNAM analysis reveals reformation of a stronger mesospheric polar vortex after significant stratospheric sudden warmings (SSWs) in 2006, 2009, and 2010. There is a significant anti-correlation between the mesospheric and stratospheric CNAM indices during 2005-2010 winters, supporting the hypothesis of mesosphere-stratosphere coupling through planetary-gravity wave interactions.