# Concurrent observations of the ultraviolet NO and infrared $O_2$ nightglow emissions: Uncorrelated behavior explained with the VTGCM

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Venus Express (VEX) has been observing the night airglow emissions and their variability in the atmosphere. Specifically, VIRTIS has observed $O_2$ IR and SPICAV has observed NO UV nightglow variability on multiple timescales. Furthermore, when these nightglow emissions are observed simultaneously they are not correlated (Gerard et al., 2009). One reason for the lack of correlation is the presence of strong horizontal winds that vary with altitude in the lower thermosphere. Comparing the information provided by VEX with 3-D numerical modeling of the nightglow emissions can help develop an understanding of the variable dynamics observed in Venus' upper atmosphere.

The National Center for Atmospheric Research (NCAR) thermospheric general circulation model for Venus (VTGCM) produces results that are comparable to recently obtained VEX data. The VTGCM is a three dimensional model that can calculate temperatures, zonal winds, meridional winds, vertical winds, and concentration of specific species. The VTGCM also computes the $O_2$ IR, NO UV, and OH IR (recently added) nightglow intensity distributions. These parameters have been benchmarked as a "mean" case and provide a platform to perform sensitivity tests. The mean case is a representation of averaged observed parameters, such as the $O_2$ IR nightglow emission map, for VEX conditions (Gerard et al., 2008).

Starting with the mean case, sensitivity tests are performed with three adjustable parameters: the maximum nightside eddy diffusion, the global wind system, and the $N+O+CO_2$ reaction rate. These tests show how sensitive the nightglow emissions and the nightside temperature distributions are to these specific parameters. Lastly, a time scale plot that shows the dominant dynamics for specific chemical species for the nightside at the equator is presented. Based on the sensitivity tests, time scale plots, and other parameter checks, our goal is to determine why these two modeled nightglow emissions are uncorrelated.