Modeling of Observations of Night OH in the Venusian Mesosphere

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Airglow emissions, such as NO and O2, have been observed previously on Venus. Airglow emissions provide insight into chemical and dynamical processes that control the composition and energy balance in the upper atmosphere. The OH airglow emission has been observed previously only in the Earth's atmosphere which was discovered (Meinel 1950) in high-resolution spectra of the Earth's atmosphere and were successfully modeled by Pickett et al. (2006). Similarly, Venus airglow emissions have been unambiguously detected in the wavelength ranges of 1.40−1.49 and 2.6−3.14 μm in limb observations by the Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) on the Venus Express (VEX) spacecraft. These emissions are attributed to the OH (2−0) and (1−0) Meinel band transitions as well (Piccioni et al., 2008; Krasnopolsky, 2011; Soret et al., 2012). Photochemical model calculations suggest the observed OH emission is produced primarily via the Bates-Nicolet mechanism, as on the Earth. However, the Venus background atmosphere is different than that of the Earth, and we are able to distinguish relative contributions due to different key photochemical reactions in the modeling corresponding to observed features from the VEX VIRTIS data. We discuss the modeling effort from both a 1-D and 3-D perspective using the CALTECH/JPL 1-D photochemical model and VTGCM 3-D codes, respectively.