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Photochemistry and Transport of CO and OCS in the Middle Atmosphere of Venus

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The bulk chemical composition of the atmosphere of Venus is about 96.5% CO2 and 3.5% N2. Other minor species include CO, HCl, H2O, SO_2, HDO, HF, and OCS. The chemical regimes in the atmosphere range from photochemistry in the middle atmosphere to thermal equilibrium chemistry and surface-atmosphere reactions in the lower atmosphere and the surface. The primary chemical cycles are known but few details about these cycles have been fully verified by concurrence between observations and modeling. Recent high quality observations of CO and OCS provide a unique opportunity to test our understanding of chemistry and transport in the atmosphere of Venus. CO is formed in the upper atmosphere via photolysis of CO2; catalytic reactions in the atmosphere and surface reactions provide a sink for CO. OCS is produced by heterogeneous reactions on the surface; the middle atmosphere is a net sink for OCS. Thus, the spatial distribution of CO and OCS in the middle atmosphere of Venus reflects a sensitive balance between chemical sources and sinks, as well as transport. Using an updated photochemical model of Yung and DeMore (1982) and winds from Lee's (2006) GCM, we will present preliminary results from our chemistry-transport model (CTM). The goals of our CTM are (1) to quantitatively verify the chemistry of CO, (2) to quantitatively verify heterogeneous chemistry of OCS, and (3) to quantitatively verify the transport in the middle atmosphere of Venus.