



Imaging spectroscopy of Venus in the thermal infrared: variability of HDO and SO₂, and daily variations of the thermal structure

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Since 2012, we have been monitoring the lower mesosphere of Venus using high-resolution imaging spectroscopy with the Texas Echelon Cross Echelle Spectrograph (TEXES) at the Infrared Telescope Facility (IRTF) at Maunakea Observatory in Hawaii. In January 2012 and March 2015, the evening terminator was observed, while the morning terminator was observed in October 2012, February 2014 and July 2014. We have mapped the abundances of SO₂ and H₂O (through HDO) above the H₂SO₄ cloud top at 7 and 19 μm to study the short-term and long-term variability of the two species. While the HDO variations in time and space are moderate, SO₂ exhibits strong variations over the disk and on a timescale as short as two hours. We have also observed two CO₂ bands at 10.5 μm and 12.6 μm in order to retrieve the thermal structure above the cloud tops as a function of latitude and local hour. At high latitudes (around 70N and 70S), our data show the isothermal or inversion layer just above the cloud associated with the polar collar. This effect is clearly stronger around the morning terminator than at the evening terminator, and is consistent with the presence of a cold diurnal longitudinal wave, also observed in other datasets.