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# Venus' thermospheric temperature field using a refraction model at terminator : comparison with 2012 transit observations using SDO/HMI and NSO/DST/FIRS

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The transit of Venus in June 2012 provided a unique case study of an Earth-size planet's atmosphere transiting in front of its parent star at 0.7AU, while at the same time ESA's Venus Express orbiter observed the evening terminator at solar ingress and solar egress.

We report on mesospheric temperature at Venus' morning terminator using SDO/HMI aureole photometry and comparison with Venus Express. Close to ingress and egress phases, we have shown that the aureole photometry reflects the local density scale height and the altitude of the refracting layer (Tanga et al. 2012). The lightcurve of each spatial resolution element of the aureole is compared to a two-parameter model to constrain the meridional temperature gradient along the terminator. Our measurements are in agreement with the VEx/SOIR temperatures obtained during orbit 2238 at evening terminator during solar ingress (46.75N - LST = 6.075PM) and solar egress (31.30N - LST = 6.047PM) captured from the Venus Express orbiter at the time Venus transited the Sun for Earth-based observers.

We also performed spectroscopy and polarimetry during the transit of Venus focusing on extracting signatures of $CO_2$ absorption. Observations were taken during the first half of the transit using the Facility InfraRed Spectropolarimeter on the Dunn Solar Telescope. Although the predicted $CO_2$ transmission spectrum of Venus was not particularly strong at 1565 nm, this region of the H-band often used in magnetic field studies of the Sun's photosphere provides a particularly flat solar continuum with few atmospheric and molecular lines. Sun-subtracted Venus limb observations show intensity distribution of vibrational $CO_2$ bands 221 2v + 2$\nu$2 + $\nu$3 at 1.571um and 141 $\nu$1 + 4$\nu$2 + $\nu$3 at 1.606um. Data independently allow to constrain temperature as well as cross-terminator thermospheric winds.