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Mesospheric temperature at terminator using SDO/HMI aureole photometry and comparison with Venus Express

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We report on SDO/HMI photometric observations during the June 5-6 transit of Venus. Close to ingress and egress phases, the fraction of Venus disk projected outside the solar photosphere is outlined by an irregular thin arc of light called the "aureole". We have shown that the the aureole photometry reflects the local density scale height and the altitude of the refracting layer (Tanga et al. 2012). Since the aureole brightness is the only quantity that can be measured during the transit, an appropriate model allows us to determine both parameters and constrain the local mesospheric temperature along the terminator. Our measurements are in excellent 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) as seen from the orbiter. The polar aureole, significantly brighter than the mid-latitude aureole due to the larger scale height of the polar mesosphere, appears consistently offset toward morning terminator by about 15 deg. latitude near 75N. This result reflects local latitudinal structure in the polar mesosphere, both in temperature and aerosol altitude distribution. Relation with ESA / Venus Express / SOIR mean profiles (Mahieux et al., 2012) and temperature modeling at terminator will be discussed at the meeting.

Mahieux et al., J. Geophys. Res. , VOL. 117, E07001, doi:10.1029/2012JE004058 (2012)
Tanga et al., Icarus 218, 207-219 (2012)