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Ground-Based Multiwavelength Direct Wind Measurements in Support of Venus Express

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The dynamics of Venus' mesosphere (70-120 km) is characterized by the combination of two different wind regimes: the time-variable retrograde superrotation ; (2) a sub-solar to anti-solar (SSAS) flow pattern, driven by solar EUV heating. Venus Express study of the dynamics of Venus' mesosphere will largely rely on temperature measurements, cloud motion tracking and the structure of non-LTE O_2 and CO_2 emissions. However, direct wind measurements in the mesosphere can only be provided using high spectral resolution ground-based facilities (10^5-10^7) using solar and atmospheric line profiles and Doppler shifts in CO and isotopic ^{13}CO rotational millimeter lines (95, 105 km), solar Fraunhofer and Venus $CO_2 5\nu_3$ lines (67, 74 km), or O emission line at 557 nm (100 km). Zonal wind variability in the mesosphere is generally interpreted as due to variable gravity-wave activity, since the latter are thought to be responsible for the overall decrease of the zonal wind with altitude through momentum deposition upon wave-breaking. In the visible (OHP/Sophie, ESO/VLT/UVES), variations measured in Fraunhofer lines (near 67 km) and CO_2 lines (near 74 km) are strongly correlated and indicate a negligible wind shear over two scale heights near and above clouds top (Widemann et al., 2007). In millimeter-wave (IRAM), single dish and interferometric line shift measurements provide a means to monitor the wind field and its temporal variation at several time scales in the 95-105 km range with coarse hemispheric spatial resolution (Lellouch et al., 1997). Acquired simultaneously with Venus Express payload operations during the May 23 – June 9 East elongation period, which also encompasses the *Messenger* June 6 flyby date, direct ground-based wind measurements will be compared to wind retrieved from cloud motion (VMC, VIRTIS), thermal profiles retrieved from inversion of CO_2 profiles at 15 and 4.3 μm (VIRTIS-M), or radio, solar and stellar occultations (VeRA, SPICAV/SOIR), based on

thermal wind equation (but excluding equatorial regions) in the framework of « Dynamics of the Middle Atmosphere of Venus » Supporting Investigation program (Lellouch et al.). We present updated plans for the ground-based observing campaign.

Lellouch et al. 1997, Venus II, pp. 295-324.

Widemann et al, 2007, Plan. and Sp. Sci, in press.