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Limb Altitude and the Southern Hemispheric Vortex Observed by Venus Monitoring Camera on VEX Orbiter

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The Venus Monitoring Camera (VMC) on European Space Agency's Venus Express orbiter has been collecting almost daily images at four wavelengths (365, 550, 980 and 1050 nm) since June 2006 with a few gaps during solar conjunctions. These data provide a nearly continuous record of the southern vortex (Limaye at al. 2009) that spans the entire hemisphere and reveal a dynamic, constantly evolving structure and showing a range of dynamical instability features in the central region. These instability features are also seen in the near infrared observations from the VIRTIS instrument on Venus Express (Luz et al. 2011).

Some similarities between the Venus hemispheric vortex and a tropical cyclone have been previously noted (Suomi and Limaye, 1981; Limaye et al., 2009; 2011) and more have been discovered from the VMC observations. While the details of the spatial structure of the vortex is easily observed from the imaging observations at ultraviolet (VMC) and near infrared wavelengths (VIRTIS), the vertical structure is more difficult to determine from Venus Express.

Here we present inferences about the vertical level obtained from the visible limb of the planet in VMC images. The altitude of the limb has been measured using full or near full disk images and depicts the altitude of the Venus cloud cover which comprises the vortex circulation. By precisely locating the limb location by fitting each limb profile in the VMC images, the average latitudinal profile of the limb altitude has been estimated. Although the pixel size of the images used is $\sim$ 30-45 km, the large number of images ($>$ 25,000) provides a very large sample of limb altitude determinations at each latitude between the equator and about 60° S latitude enabling sub-pixel variations of the limb altitude. The latitudinal profile of the limb altitude is similar to that inferred from the near infrared observations from VIRTIS (Ignatiev et al., 2009; Cottini et al., 2012) – high in low latitudes and low in polar latitudes and is consistent with the vortex structure.

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