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Velocities of Venus clouds derived from VIRTIS observations

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Retrograde superrotation is a well known feature of the atmosphere of Venus, with Venus' cloud tops rotating in only 4.4 days, much faster than the 243-day rotation period of the solid globe. A good characterization of the circulation of the venusian atmosphere is essential in order to understand the mechanisms controlling superrotation. VIRTIS, onboard ESA's Venus Express, is one of the most flexible instruments for such a characterization. The VIRTIS-M imaging spectrometer, operating in the range 0.25 to 5 micrometers, has acquired images of Venus' clouds from the cloud tops, in visible wavelengths, to the lower cloud layer, close to 40 km, at infrared wavelengths. We present velocity determinations from automated cloud tracking in the night side at 1.74, 2.3 and 5 micrometers, from high to mid latitudes in the southern hemisphere. The method is based on a digital correlator which compares two or more consecutive images and identifies patterns by maximizing correlations between image blocks (Luz, Berry and Roos-Serote, 2008, New Ast. 13, 224). Notable features are the variability of the winds and the detection of a clear transition region between 75S and 80S. The meridional component is suggestive of a polar Hadley cell. Wave motions are detected at the transition latitudes with wavenumbers 3 and 8 for the zonal and meridional components. We estimate the contribution from the subsolar to antisolar-point wind component to be higher than 10 m/s.