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VEx/VIRTIS and TNG/NICS cloud tracked winds at Venus' lower cloud level using nightside observations

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We present results based on observations carried out with the Near Infrared Camera and Spectrograph (NICS) of the *Telescopio Nazionale Galileo* (TNG), in La Palma, on July 2012. We observed for periods of 2.5 hours starting just before dawn, for three consecutive nights. We acquired a set of images of the night side of Venus with the continuum K filter at 2.28 microns, which allows to monitor motions at the lower cloud level of the atmosphere of Venus, close to 48 km altitude. Our objective has been to measure the horizontal wind field in order to characterize the latitudinal zonal wind profile, to study variability, to help constrain the effect of large scale planetary waves in the maintenance of superrotation, and to map the cloud distribution. We will present first results of cloud tracked winds from ground-based TNG observations and winds retrieved from coordinated space-based VEx/VIRTIS observations. The cloud deck extends in altitude from 45 to 70 km, and can be divided into three main regions, centered at 48, 54 and 60 km. The lowest of these is the lower cloud, where fundamental dynamical exchanges that help maintain superrotation are thought to occur. The lower venusian atmosphere is a strong source of thermal radiation, with the gaseaous CO_2 component allowing radiation to escape in windows at 1.74 and 2.28 μm. At these wavelengths radiation originates below 35 km, and unit opacity is reached at the lower cloud level, close to 48 km. Therefore, in these windows it is possible to observe the horizontal cloud structure, with thicker clouds seen silhouetted against the bright thermal background from the low atmosphere. Our objective is to provide direct absolute wind measurements and a map of cloud distribution at the lower cloud level in the Venus troposphere, in order to complement Venus Express (VEX) and other ground-based observations of the cloud layer wind regime. By continuous monitoring of the horizontal cloud structure at 2.28 μm (NICS Kcont filter), it is possible to determine wind fields using the technique of cloud tracking. We acquired a series of short exposures of the Venus disk. Cloud displacements in the night side of Venus were computed taking advantage of a phase correlation semi-automated technique. The Venus apparent diameter at observational dates was greater than 32" allowing a high spatial precision. The 0.13" pixel scale of the the NICS narrow field camera allowed to resolve $\sim$ 3-pixel displacements. The absolute spatial resolution on the disk was $\sim$ 100 km/px at disk center, and the (0.8–1") seeing-limited resolution was $\sim$ 400 km/px. By co-adding the best images and cross-correlating regions of clouds the effective resolution was significantly better than the seeing-limited resolution. In order to correct for scattered light from the (saturated) day side crescent into the night side, a set of observations with the Br_γ filter were performed. Cloud features are invisible at this wavelength due to the high optical depth of the gaseous CO_2 component, and this technique allows for a good correction of scattered light.