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Multiwavelength imaging polarimetry of Venus at various phase angles

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Venus is the only planet with an atmosphere that we can observe from the ground at a large range of phase angles. Therefore it constitutes an important benchmark for direct observations of exoplanets, which will soon become available. Moreover, polarimetric observations at various phase angles and wavelengths provide a unique way to characterize any (exo-)planetary atmosphere. For instance, the famous study by Hansen & Hovenier (1974) which combines disk-integrated polarimetric observations and modeling has unambiguously shown that Venus' upper atmosphere consists of sulphuric acid droplets of $\sim$1 um in diameter.

We present new spatially resolved observations of Venus using the imaging polarimeters ExPo at the William Herschel Telescope and ZIMPOL at the IRSOL telescope. These observations are taken in narrow-band filters from 364–648 nm, and span phase angles from 10–49 degrees. We find that the degree of polarization varies strongly with wavelength and phase angle, as generally predicted by the model by Hansen & Hovenier. However, the polarization behaviour near the equator differs considerably from that at the poles, hinting at different atmospheric compositions and/or stratifications. In the intensity images we detect a significant shift of the location of maximum intensity with wavelength. These observations allow us to refine the model by Hansen & Hovenier, and we present the preliminary results of our efforts to do so.