Mapping the surface of Venus with VIRTIS on VenusExpress

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We will report here about surface observations of Venus from VIRTIS on VenusExpress after one year in orbit.

The M-IR channel of VIRTIS on VenusExpress allows observing the surface of Venus in three small atmospheric windows at 1.02, 1.10 and 1.18µm. While the atmospheric windows show little CO_2 absorption, on its way through the atmosphere the thermal radiation is modified by scattering and absorption by clouds. Variations in the optical thickness of the clouds modulate the spatial distribution of upwelling radiation. Multiple reflections between surface and clouds generally wash out image contrast from surface emissivity. We have developed a data processing pipeline based on the approach by [1] which allows processing the huge amount of data returned by VIRTIS on VenusExpress in a timely manner. The data processing corrects for various atmospheric effects including limb darkening, scattered sunlight, etc and reduces the cloud induced contrast variations. The algorithm has been extensively tested and is continuously improved based on the available data.

While there have been observations using the atmospheric windows by Galileo/NIMS [2] and Cassini/VIMS [3] VIRTIS on VenusExpress allows for the first time to systematically map the surface radiance from orbit over a long period of time. This extensive data set allows us by now to map most of the southern hemisphere of Venus. By stacking data we can significantly improve the signal-to-noise ratio to search for small variations in the surface emissivity. Using the individual observations allows searching for temporal variations in surface radiance, which especially in combination with localized peak in the composition of tracers, would be indicative of active volcanism
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References

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