Geophysical Research Abstracts, Vol. 9, 06852, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06852

Multivariate analysis of Virtis/Venus-Express observations

S. Erard (1), P. Drossart (1), G. Piccioni (2) and the Virtis/Venus-Express team

(1) LESIA Observatoire de Paris, France (stephane.erard@obspm.fr) (2) INAF-IASF, Roma, Italy

The Virtis-VEx spectral cubes obtained at Venus have been analyzed with Independent Component Analysis (ICA). The objectives of this study are to 1) separate various types of cloud signatures, 2) detect single events such as lightning, 3) identify and filter instrumental effects in the data. The software used is derived from the Jade algorithm, and is run in the image dimension.

The analyses have been run separately on night side and day side observations of Venus with the low spectral resolution imaging channel (Virtis-M_IR). On the night side, typically 4 components are required to match the Venus IR spectral radiance.

Overall, the night side IR signal is dominated by emission from deep warm clouds. Another, warmer, cloud component is always detected and represents a deeper cloud layer. In polar views, these two components clearly identify the polar vortex from a higher altitude cloud layer. Similarly, two cold, high altitude, components always stand out, one of which is dominated by the O2 airglow. The structure of the 1.27 μm intensity peak in particular is differentially detected (cold component sensitive to the O2 airglow at 1.27 μm, and warm, deep clouds, component sensitive to thermal emission at 1.29 μm). In general, the surface contribution does not stand alone as an individual component, but is mixed with the main, warmest cloud layer signal.

In successive observations, both the components and the fraction maps are consistent. This demonstrates the robustness of the method to random noise, and will allow to map individual components between various sessions, with potential application to cloud tracking.

Additional components concentrate information related to hot pixels and remaining

instrumental effects, such as a small stray light contribution in a part of the FOV. Study of these components therefore allows to identify remaining calibration artifact at this level. Signal reconstruction from the main 4 components allows efficient noise filtering and destriping in image dimension.