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Venus Atmospheric Circulation from VMC Observations

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Abstract

The Venus Monitoring Camera (VMC) on Venus Express continues to monitor the Venus cloud cover at four wavelengths (365, 519, 965 and 1000 nm with 40 nm bandpass) on most orbits during specified imaging opportunities during the 24-hour orbit. The UV images have been used for measuring the average latitudinal characteristics of atmospheric circulation and preliminary results confirmed the general characteristics of the zonal circulation [1]. A more extensive analysis of the visual tracking results was performed which also confirmed the presence of solar thermal tides [2]. Analysis of the automated digital tracking results from tracking images over more orbits confirms the presence of the thermal tides.

The UV images have also been used to examine the global organization of the vortex organization which shares many similarities with tropical cyclone circulation [3]. Hemispheric space-time composites of VMC images in polar stereographic projection have been generated to reveal the dynamic evolution of the vortex structure in the southern hemisphere.

The VMC observations used for cloud tracking have been generally obtained during the apoapsis passage, resulting in less than ideal spatial resolution for cloud tracking. Although the view from this portion presents a view of the entire sun-lit hemisphere, the lower spatial resolution makes a good determination of the north-south component challenging. This also impacts the ability to obtain reliable estimates of the eddies using the day-side average values.

Similarly, the detailed structure of the thermal tides (amplitude and phases of the diurnal and semi-diurnal components as well as the zonal average) is also difficult to obtain reliably with low resolution observations.

To overcome these challenges, a special effort was mounted in May 2009 to obtain multi-frame mosaics of Venus during the pre and post-periapsis portions of the orbit so that cloud tracking could be performed with images obtained at higher spatial resolution to yield better estimates of the meridional flow, the thermal tides and the eddy circulations. Analysis of these data is underway and the preliminary results will be presented.

Bibliography

The references will be numbered in order of appearance [1] [2] [3]. The reference format is as follows:

References

[1] Markiewicz, W. J. et al. (2007) *Nature*, 450, 633-636.

[2] Moissl, R., Khatuntsev, I., Limaye, S. S., Titov, D. V., Markiewicz, W. J., Ignatiev, N. I., Roatsch, T., Matz, K.-D., Jaumann, R., Almeida, M., Portyankina, G., Behnke, T., Hviid, S. F. Venus cloud top winds from tracking UV features in Venus Monitoring Camera images, *J. Geophys. Res.*, **114**, Issue 9, CiteID E00B31.

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