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Principal Components of Short-term Variability in Venus' UV Albedo

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Abstract

We explore the dominant modes of variability in the observed albedo at the cloud tops of Venus using the Akatsuki UVI 283-nm and 365-nm observations, which are sensitive to SO_2 and unknown UV absorber distributions respectively. The observations consist of images of the dayside of Venus, most often observed at intervals of 2 hours, but interspersed with longer gaps. The orbit of the spacecraft does not allow for continuous observation of the full dayside, and the unobserved regions cause significant gaps in the datasets. Each dataset is subdivided into three subsets for three observing periods, the unobserved data are interpolated and each subset is then subjected to a principal component analysis (PCA) to find six oscillating patterns in the albedo. Principal components in all three periods show similar morphologies at 283-nm but are much more variable at 365-nm. Some spatial patterns and the time scales of these modes correspond to well-known physical processes in the atmosphere of Venus such as the $\sim$4 day Kelvin wave, 5 day Rossby waves and the overturning circulation, while others defy a simple explanation. We also a find a hemispheric mode that is not well understood and discuss its implications.