

Cloud tracking in Venus using Rotation Invariant Phase Only Correlation

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The atmospheric circulation and the associated material transport are thought to be crucial for the maintenance of the global cloud/atmospheric structure on Venus. In the ultraviolet range, Venusian clouds show various patterns created by absorbers whose chemical identities are still unknown. Wind velocities have been measured by cloud tracking using images obtained sequentially in such ultraviolet range. In the previous cloud tracking studies, wind speed has been measured by template matching using the cross correlation method; however, with this method, only parallel movements of clouds can be derived, and rotations and scale changes of clouds were not taken into account. The rotation and scale change are not only error sources of cloud tracking but also important information on atmospheric dynamics. In this study, we apply the “rotation invariant phase-only correlation method” to cloud tracking considering the rotation of cloud patterns. The data used are 365 nm images taken by UVI onboard JAXA’ Akatsuki. The derived velocity field is compared with the cloud morphology to understand the role of dynamics in shaping the clouds. Using the rotation angles derived for image patches, we can observe smaller structures in the rotation field than those derived from the wind field. We examine the difference between the rotational component obtained from the wind field and that obtained from the rotation angle of the image.