

Abstract Submitted
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**Extraction of Velocity Fields from Telescope Image Pairs of
Jupiter's Great Red Spot, New Red Oval, and Zonal Jet Streams**

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— We use a variety of new and old methods, including Coherence Image Velocimetry, image reconstruction, data assimilation of satellite imagery and animation, to extract Jovian velocity fields (and their uncertainties) from image pairs taken with the Hubble Space Telescope. Velocities are derived from cloud displacements in the image pairs. Our methods go far beyond the traditional technique of deriving a velocity vector by setting it equal to an image pair's cloud displacement vector divided by the time between images. The images in some pairs were taken as few as 12 minutes apart. To understand why new techniques are needed, we note that the characteristic velocities are $\sim 30\text{ms}^{-1}$. Therefore, a cloud's displacement over 12 minutes is only 22km, which is less than half a pixel (and the spatial resolution in our observations was ~ 5 pixels). To obtain sub-pixel resolution, it was necessary for us to use all of the data from all of the image pairs and to employ all of our techniques in an iterative manner. We outline how these methods work and how they can be applied to archived data sets of satellite imagery of the giant planets.

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