Measurements of Saturn's Zonal Wind from Voyager Images using Modern Cloud-Tracking Method

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We present preliminary analysis of Saturn images captured by the Voyager mission investigating how the planet’s zonal wind speeds have evolved in time between 1980 and the Cassini era. Global zonal wind as a function of latitude during the Voyager flybys have been retrieved by previous studies; notably Sanchez-Lavega et al. 2000's measurements have been treated as the standard wind profile of Saturn. However, they employed manual tracking methods that returned only 2075 wind vectors, while newer analyses of Cassini data employ automated digital tracking algorithms. No study has systematically analyzed the wind speeds during the Voyager flybys and the Cassini era using a consistent method. We aim to make new wind measurements by first improving the navigation of the images of Saturn captured by the Voyager spacecraft’s Imaging Science Subsystem (ISS) camera, and then applying an automated 2D Correlation Imaging Velocimetry (CIV) technique. We also analyze Cassini Imaging Science Subsystem (Cassini ISS) images using the same methodology. This provides a long-baseline (more than a Saturnian year) analysis of global zonal winds over time for the planet. I hypothesize that new measurements of Saturn’s equatorial wind will address the longstanding discrepancy between results from Voyager and those from later observations. Sanchez-Lavega et al. 2000 reports a wind speed of approximately double that found by later studies using Hubble and Cassini. I expect that analyzing the Voyager datasets with modern, automated methods will help us better constrain previously published trends in wind profiles retrieved for the planet. I also aim to provide a stronger baseline Voyager wind profile for future studies than what is currently available in the literature.

Keywords: Saturn, Atmospheric Dynamics, Giant-planet Atmospheres, Voyager, Cassini

