Venus's Atmospheric Features in UV as Viewed from Ground-Based Observations

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We are currently investigating the dynamics of Venus's atmosphere to understand the link between variability of atmospheric superrotation to the existence and occurrences of the Y-feature. The atmospheric superrotation, in which the equatorial atmosphere rotates with a period of approximately 4-5 days (~60 times faster than the solid planet), has forcing and maintenance mechanisms that remain to be explained. Temporal evolution of the zonal wind could reveal the transport of energy and momentum in or out of the equatorial region, and eventually shed light on mechanisms that maintain the Venusian superrotation. We postulate that the Y-feature is a manifestation of equatorial waves (either Kelvin, Rossby, or a combination of the two in nature) that may play a role in such energy transport that could affect Venus's superrotation. To understand the connection between the Y-feature and the superrotation, we must determine the frequency of the Y-feature's existence, the variability of the atmospheric wind field, and analyze the connection between the two to determine to what extent the Y-feature plays a role in Venus's superrotation.

We characterize the existence of the Y-feature's occurrence and phase speed between 2006 and 2017. It is observed in ultraviolet images captured by the Venus Monitoring Camera on board the ESA Venus Express (VEX) spacecraft which observed Venus's southern hemisphere as well as the Ultraviolet Imager on the Akatsuki spacecraft which viewed pole to pole latitudes. We also extend our analysis to ground-based observations between 2016 and 2019. This includes data captured with the 3.5 m Astrophysical Research Consortium telescope at the Apache Point Observatory (APO) in Sunspot, NM and small 10-inch scale telescopes at Hampton University in Hampton, VA. Images we have captured demonstrate that, even under unfavorable illumination, it is possible to see large features that could be used to supplement gaps in dayside UV data during Akatsuki.

The method for observing and analysis of atmospheric features seen in UV from ground-based observations is discussed. Preliminary Akasuki wind measurements made using a 2D Correlation Image Velocimetry method developed at Hampton University are also presented.

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