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Earth-based characterization of Uranus' aurorae

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Abstract

This study is based on multi-planet multi-wavelength observations of planetary aurorae throughout the heliosphere, acquired along the propagation path of a series of consecutive interplanetary shocks (Figure 1). The underlying motivation to track the shocks was to increase the probability of detection of auroral emissions at Uranus. Despite several Earth-based attempts in the past few years, at Far-UV (FUV) and Near-IR (NIR) wavelengths, such emissions have never been unambiguously re-observed since their discovery by Voyager 2 in 1986. Here, we present a campaign of FUV observations of Uranus obtained in November 2011 with the Hubble Space Telescope (HST) during active solar wind conditions. We positively identify auroral signatures in several of these HST measurements (Figure 2), together with some obtained in 1998, representing the first images of Uranus' aurorae. We analyze their characteristics and discuss the implications for the asymmetric Uranian magnetosphere and its highly variable interaction with the solar wind flow from near-solstice (1986) to near-equinox (2011) configurations.

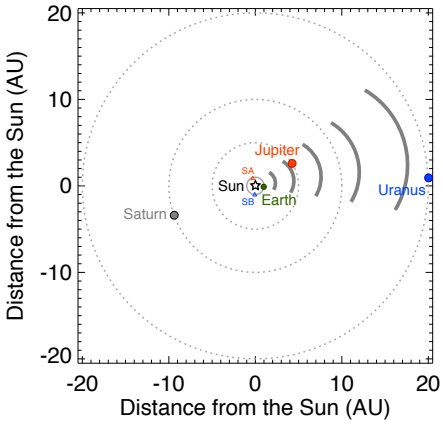

Figure 1: Configuration of the solar system in late 2011.

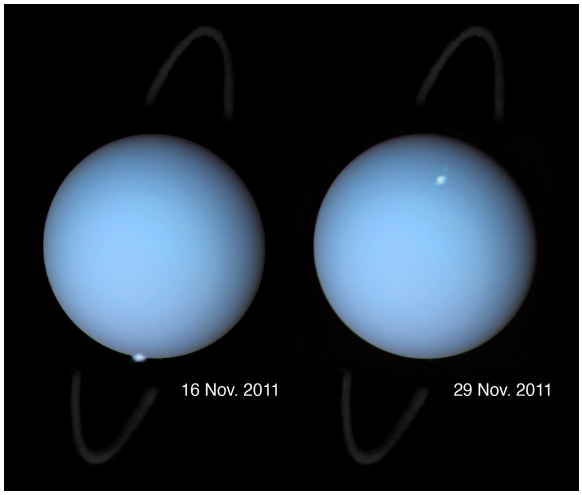

Figure 2: Composite images of Uranus aurorae observed in 2011.