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Observations of Jupiter's auroral emission during Juno apojove 2017

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Abstract

We present a case study of Jovian X-ray observations from a joint Chandra and XMM-Newton campaign on June 18th - 19th 2017. The 10-hour Chandra observation and 28-hour XMM-Newton observation overlapped by $\sim$ 5 hours from midnight June 19th, allowing both spatial and spectral X-ray analysis of Jupiter in tandem. We showcase dynamic new X-ray auroral videos demonstrating the time-varying spatial morphology of the highest energy auroral emission over a 10 hour continuous observation. Alongside the X-ray auroral videos, we present light curves from Chandra; timing analysis of significant quasi-periodic oscillations detected in the north polar region and further discuss the morphology of the emission with new polar plots of the Chandra observations. We frame the X-ray observations in the context of Juno in situ observations. During this X-ray observation interval Juno was near its apojove on the dawn flank, close to the expected nominal position of the magnetopause. Juno data can be used to infer the state of compression or expansion of the magnetosphere and to place these observations in context of possible magnetospheric drivers linked to boundary dynamics.

The X-ray emissions were found to come from an extended region as opposed to a "hot spot" as found by previous studies [1, 2]. The morphology of the aurora observed during this time may map to the UV swirl region found by Grodent et al. 2003 [3].

The timing analysis used on the Chandra light curves found statistically significant quasi-periodic oscillations periods of $\sim$ 37 mins when the X-ray active region was first in view of Chandra (beginning of the observation window) and $\sim$ 27 mins when the active region was in view for a second time (end of the observation window). This variability on the timescale of a Jovian rotation will be explored in the context of the *in situ* data.

References

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