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Jupiter's X-ray Aurora During the Juno Approach

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Jupiter's Northern soft X-ray aurora is concentrated into a mysterious polar hot spot that rotates with the planet and is characterised by spectral line signatures of precipitating ∼MeV ions [Gladstone et al. 2002; Elsner et al. 2005; Branduardi-Raymont et al. 2007]. These energetic polar auroral emissions exhibit pulsations on timescales of several 10s of minutes and vary morphology, intensity and precipitating particle populations with changing solar wind conditions [Dunn et al. 2016; Kimura et al. 2016]. Precisely how the solar wind modifies Jupiter's downward current system in order to produce these changes in X-ray aurora remains debated (suggestions include: magnetopause reconnection [e.g: Bunce et al. 2004]; Kelvin Helmholtz Instabilities [e.g: Kimura et al. 2016] or internal drivers [Waite et al. 1995; Cravens et al. 2003]).

To better constrain the link between the auroral X-rays and the solar wind, we present analysis of the May-June 2016 Chandra and XMM-Newton X-ray observation campaigns of Jupiter, which were conducted while Juno was measuring upstream solar wind conditions. These X-ray observations reveal an important new auroral X-ray feature, and suggest some non-conjugacy in North-South auroral emissions. From observation-to-observation, we also detect significant changes in the spatial, spectral and temporal signatures of Jupiter's X-ray aurora. Understanding the behaviour and drivers of Jupiter's X-ray aurora will help identify the extent to which solar wind-magnetosphere interactions at Earth differ to those at giant, rotationally-dominated systems, like Jupiter.