Local time variations of the main auroral emission at Jupiter

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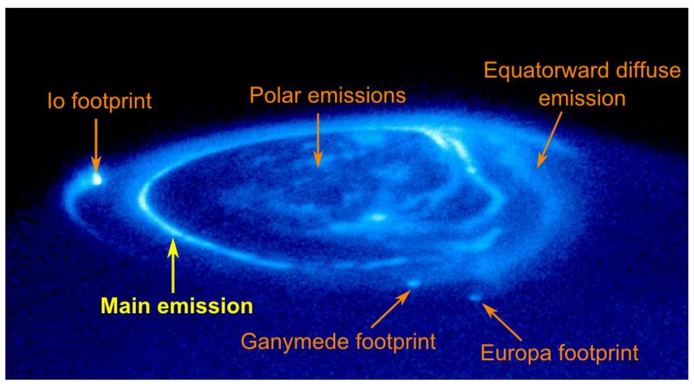
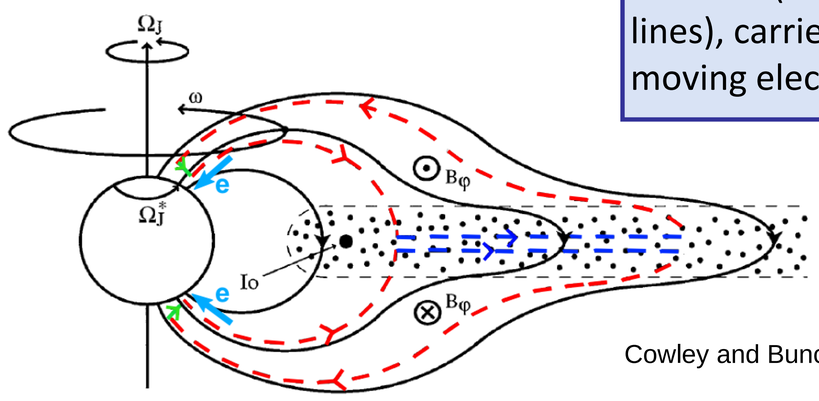
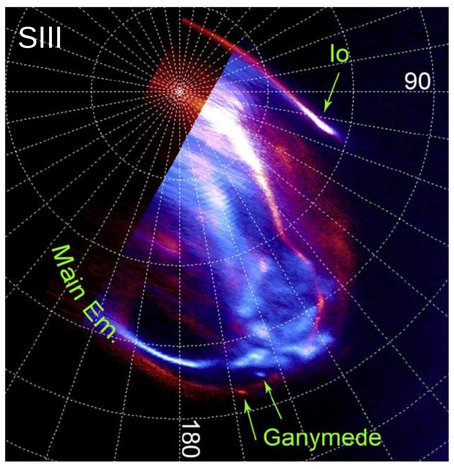
Main auroral emission at Jupiter



Main emission
→ magnetosphere-ionosphere coupling current system associated with the **breakdown of corotation**
→ ionospheric footprint of the upward **field aligned currents** (FAC, red dashed lines), carried by downward moving electrons



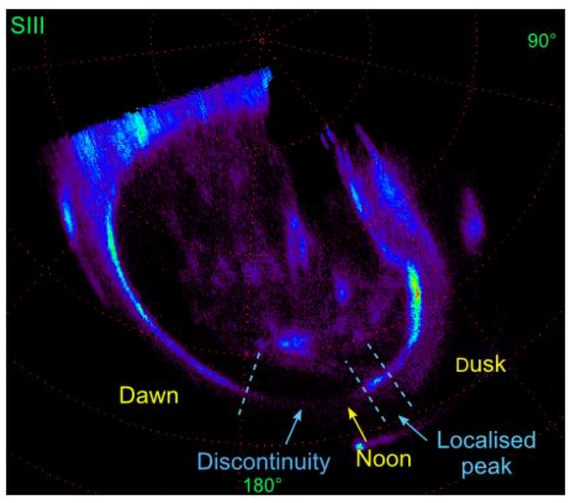
Cowley and Bunce (2001)



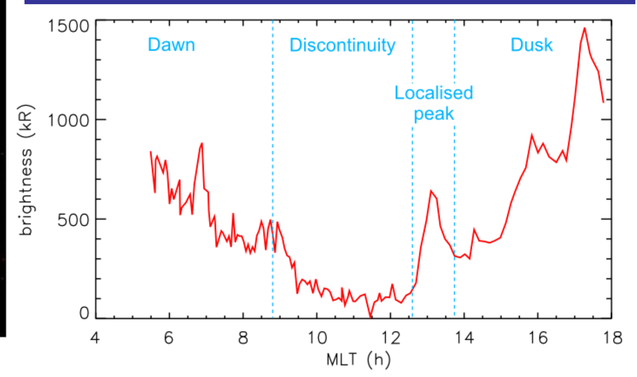
Large scale **variations** of the main emission in terms of : → brightness
→ width
→ position
Analyses of **local time variations** based on polar projection of series of FUV images obtained with HST between 1997 and 2007 (51 observation days).

Grodent et al. (2008)

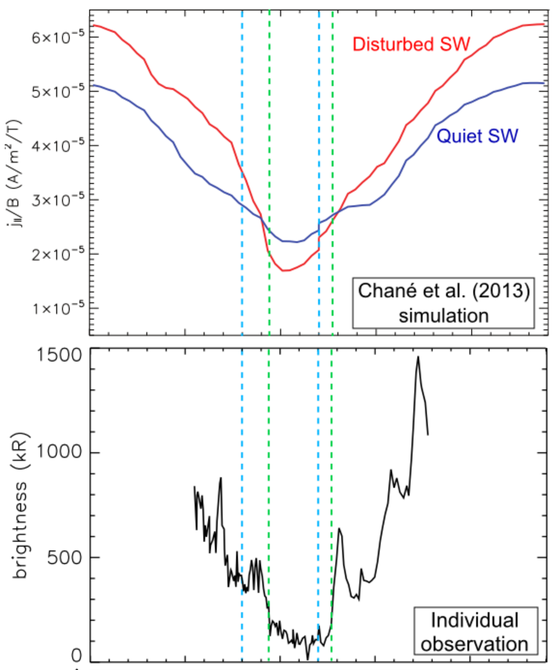
Local time variation of the intensity of the main emission

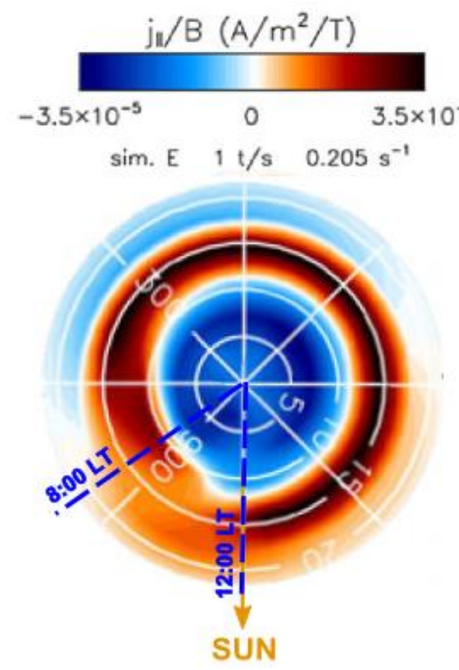


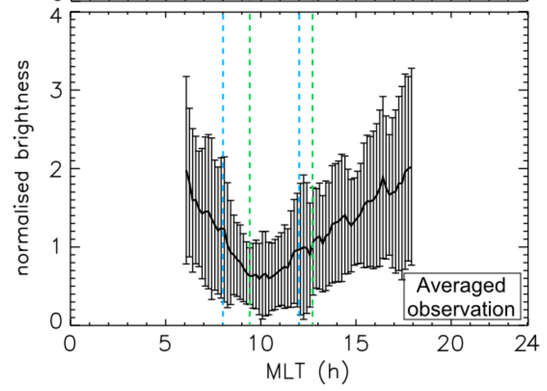
Brightness profile
→ discontinuity 08:00 – 12:00 LT
→ localised peak 11:00 – 14:00 LT



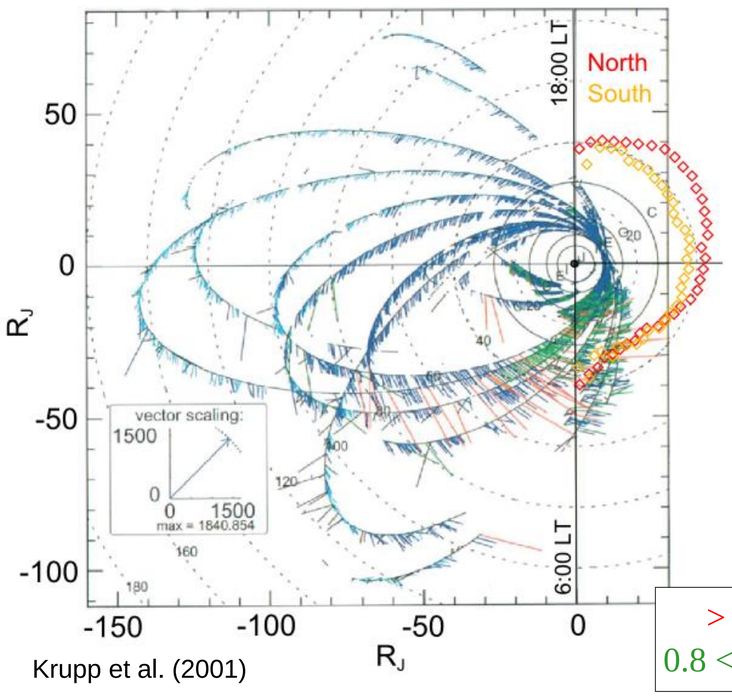
Comparison with MHD simulation (Chané et al., 2013).
→ **same trend in variation of intensity**
→ **discontinuity caused by a thermal pressure decrease** around 09:00 LT due to the interaction between rotating plasma and the magnetopause.
→ **localised peak is not obvious in the simulation**







Local time variation of the mapped location of the main emission : indication of the corotation breakdown location

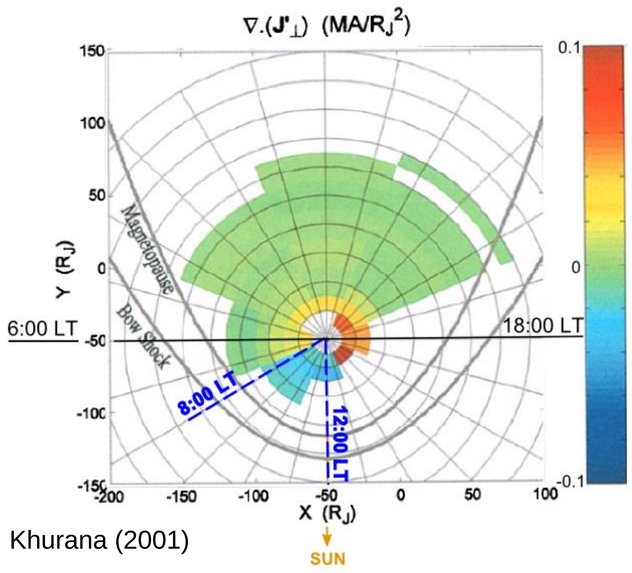


Krupp et al. (2001)

Statistical location of the main emission on the equatorial plane (magnetic field model of Vogt et al., 2011) :
→ **closer in dawn-noon than noon-dusk**.
Comparison with Galileo measurements of plasma flow velocity distribution (Krupp et al., 2001).

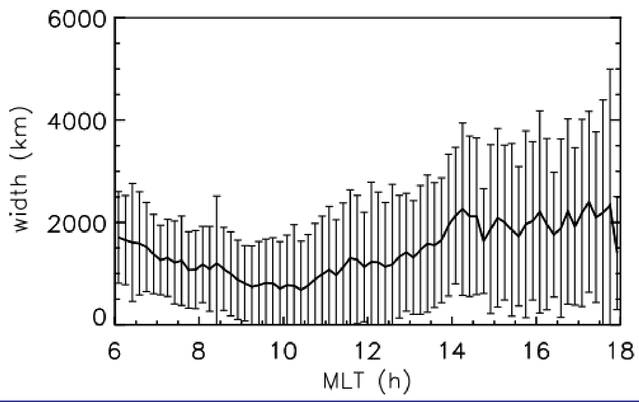
$> 1.2\ v_{cor}$ $\quad 0.2 < v_{cor} < 0.8$
$0.8 < v_{cor} < 1.2$ $\quad < 0.2\ v_{cor}$

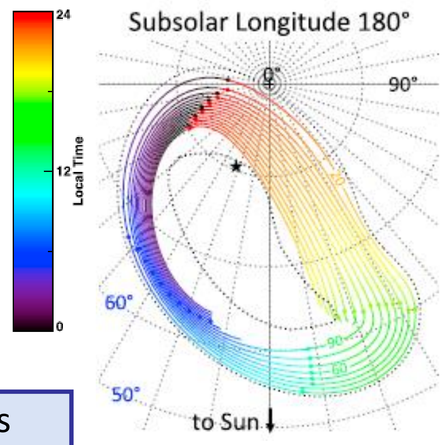
Galileo measurements
→ **downward FAC in the prenoon and early noon** sector (Khurana, 2001) where the equatorial source of the discontinuity is located



Khurana (2001)

Local time variation of the width of the main emission





Vogt et al. (2011)

The width (FWHM) of the main emission varies slightly in local time
→ **due to asymmetry in the component of the magnetic field normal to the current sheet**.

Conclusion

Main emission shows local time variations of :
- **brightness** → discontinuity associated with downward FAC due to a thermal pressure decrease
  → localised peak so far unexplained
- **mapped location of the main emission on the equatorial plane**
  → indication of the corotation breakdown location
  → closer in the dawn-to-noon quadrant than in the noon-to-dusk
- **width** → asymmetry in the component of the magnetic field normal to the current sheet

Chané et al. (2013), J. Geophys. Res., 118, doi:10.1002/jgra.50258
Grodent et al. (2008), J. Geophys. Res., 113, A01206, doi:10.1029/2007JA012601
Khurana (2001), J. Geophys. Res., 106, A11, doi:10.1029/2000JA000352
Krupp et al. (2001), J. Geophys. Res., 116, A11, doi:10.1029/2000JA900138
Vogt at al. (2011), J. Geophys. Res., 116, A03220, doi:10.1029/2010AJ016148