

X-ray aurorae on Jupiter as probes of particle acceleration in the magnetosphere

G. Branduardi-Raymont

Department of Space and Climate Physics

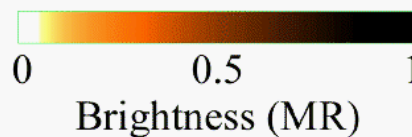
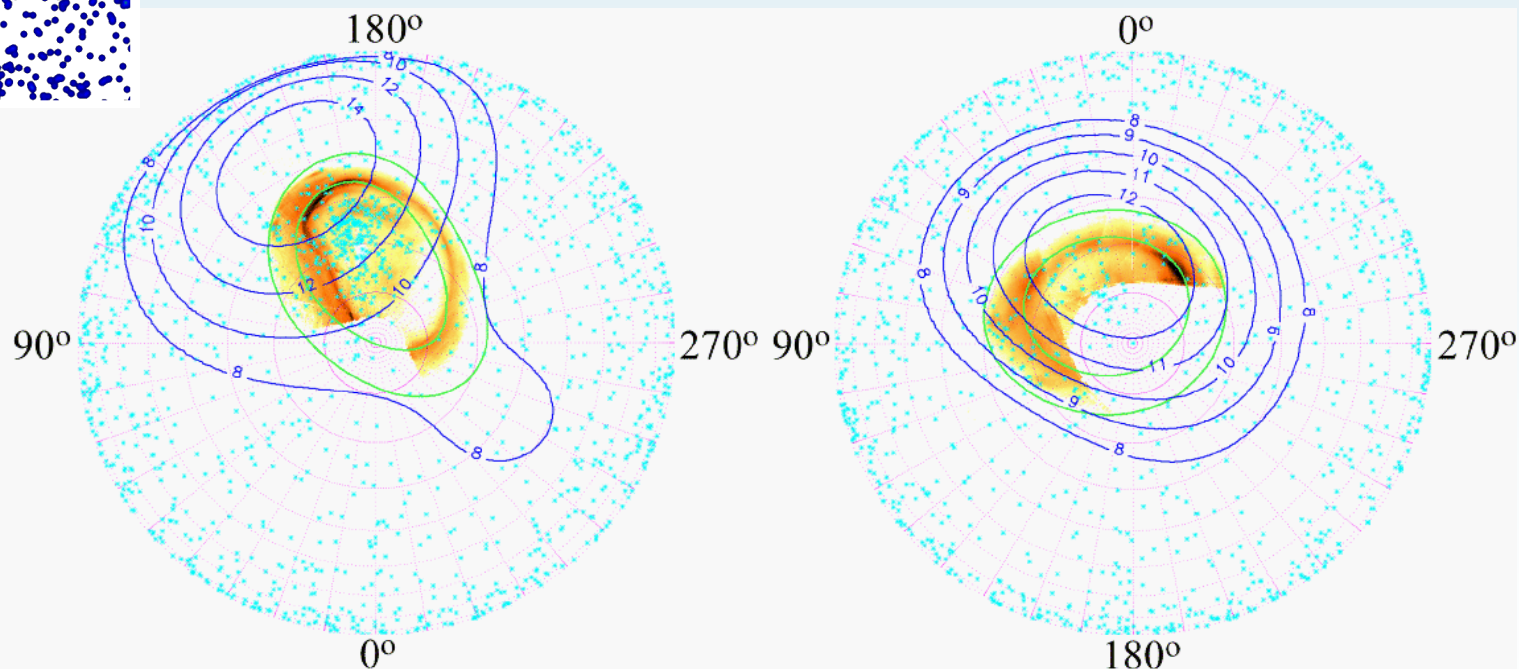
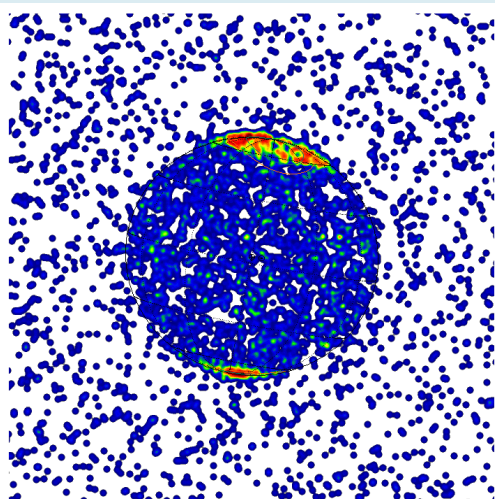
Mullard Space Science Laboratory

University College London

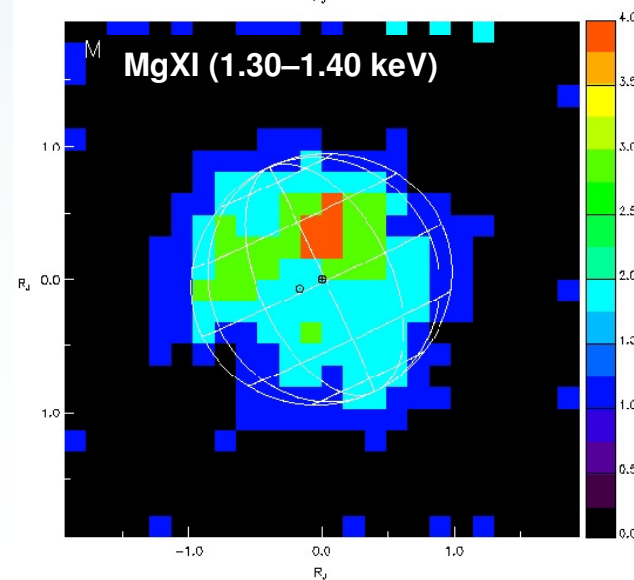
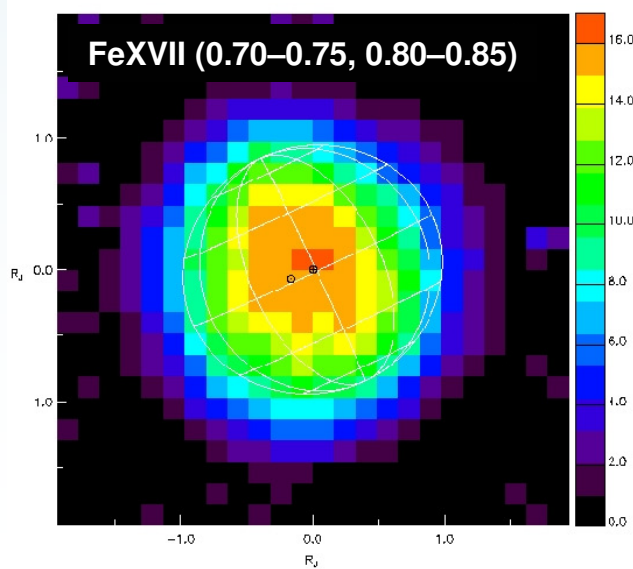
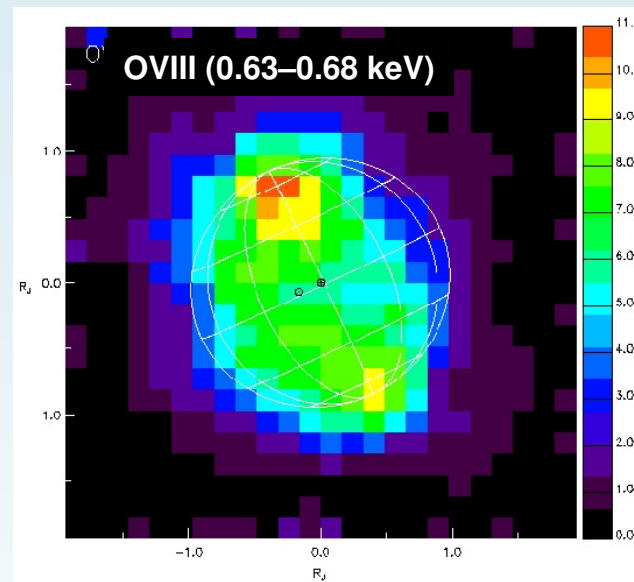
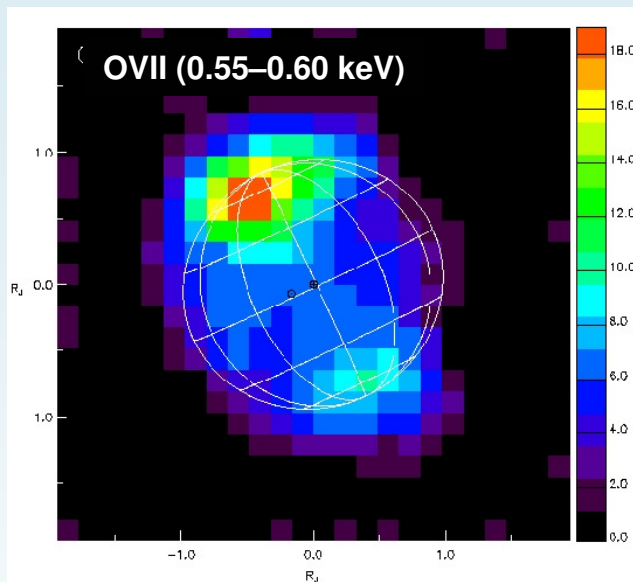
MSSL workshop, 18 - 20 September 2007

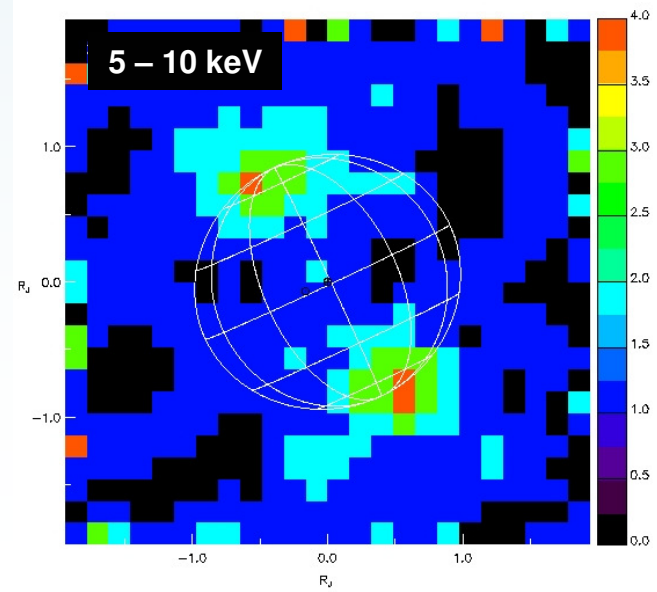
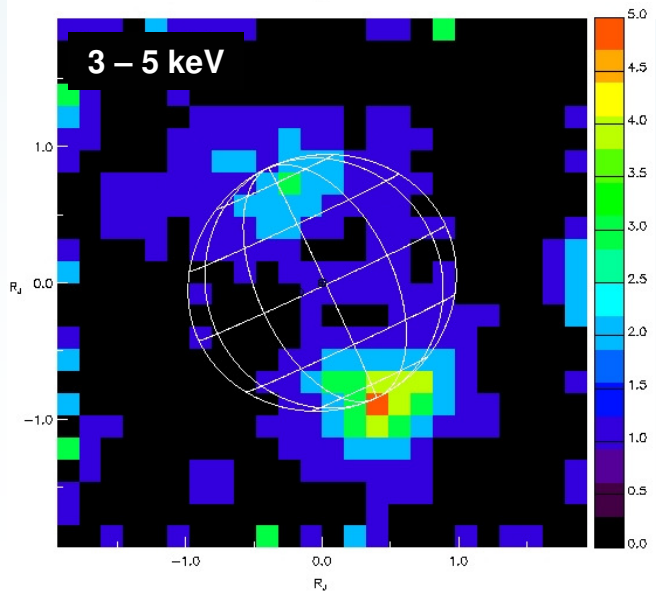
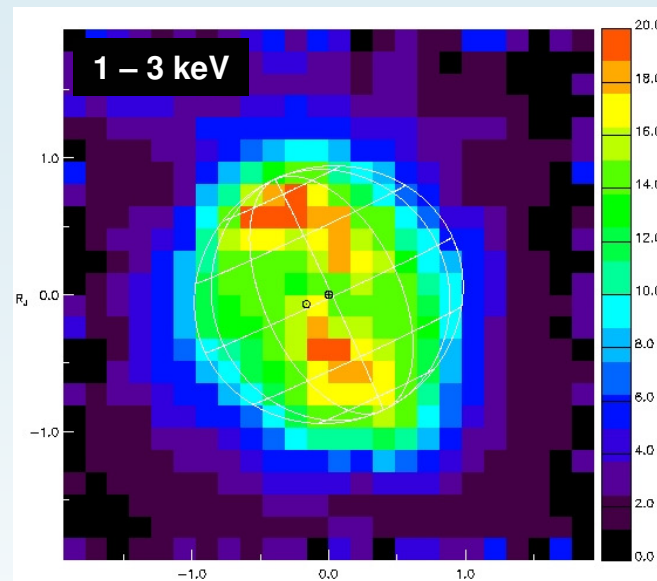
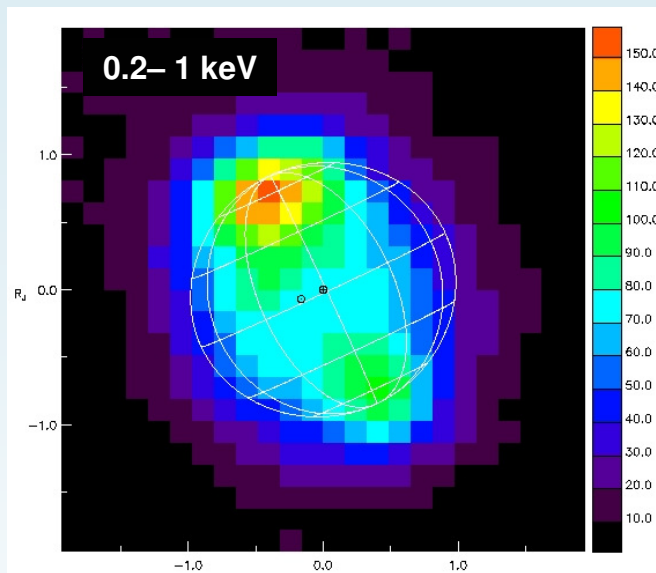
Chandra HRC-I polar projections

Jupiter



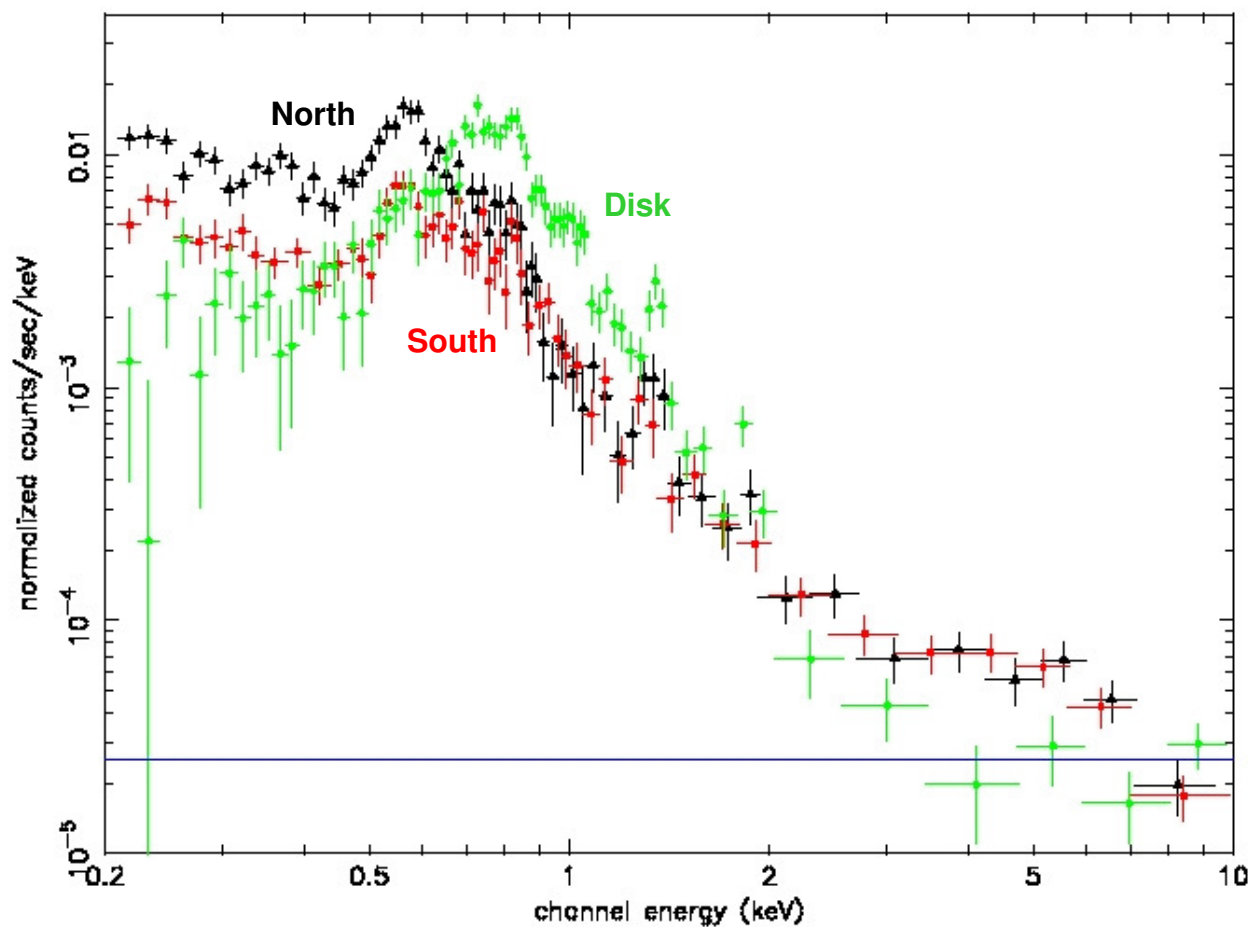
Gladstone et al. 2002

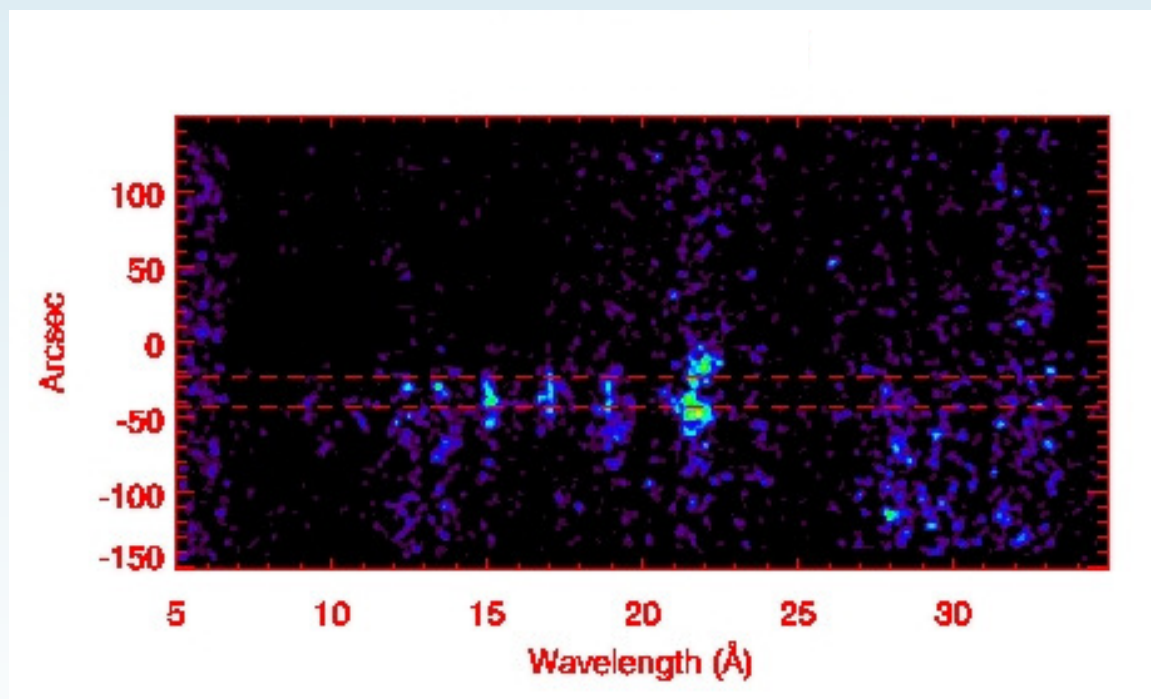
Jupiter**XMM-Newton – Nov. 2003: EPIC**

Jupiter**XMM-Newton – Nov. 2003: EPIC**

Jupiter**XMM-Newton – Nov. 2003: EPIC**

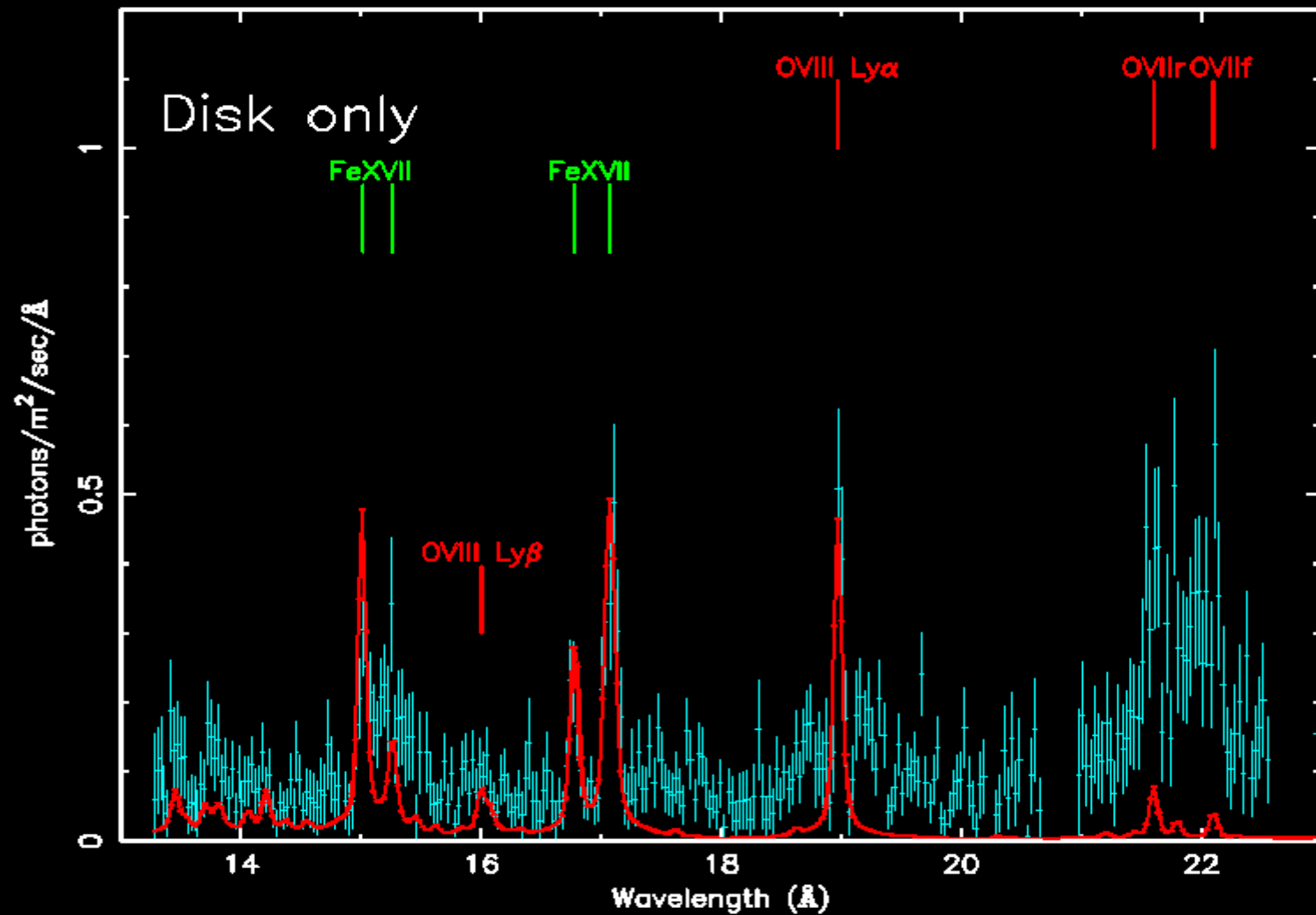
Auroral and disk spectra



Jupiter***XMM-Newton* – Nov. 2003: RGS**

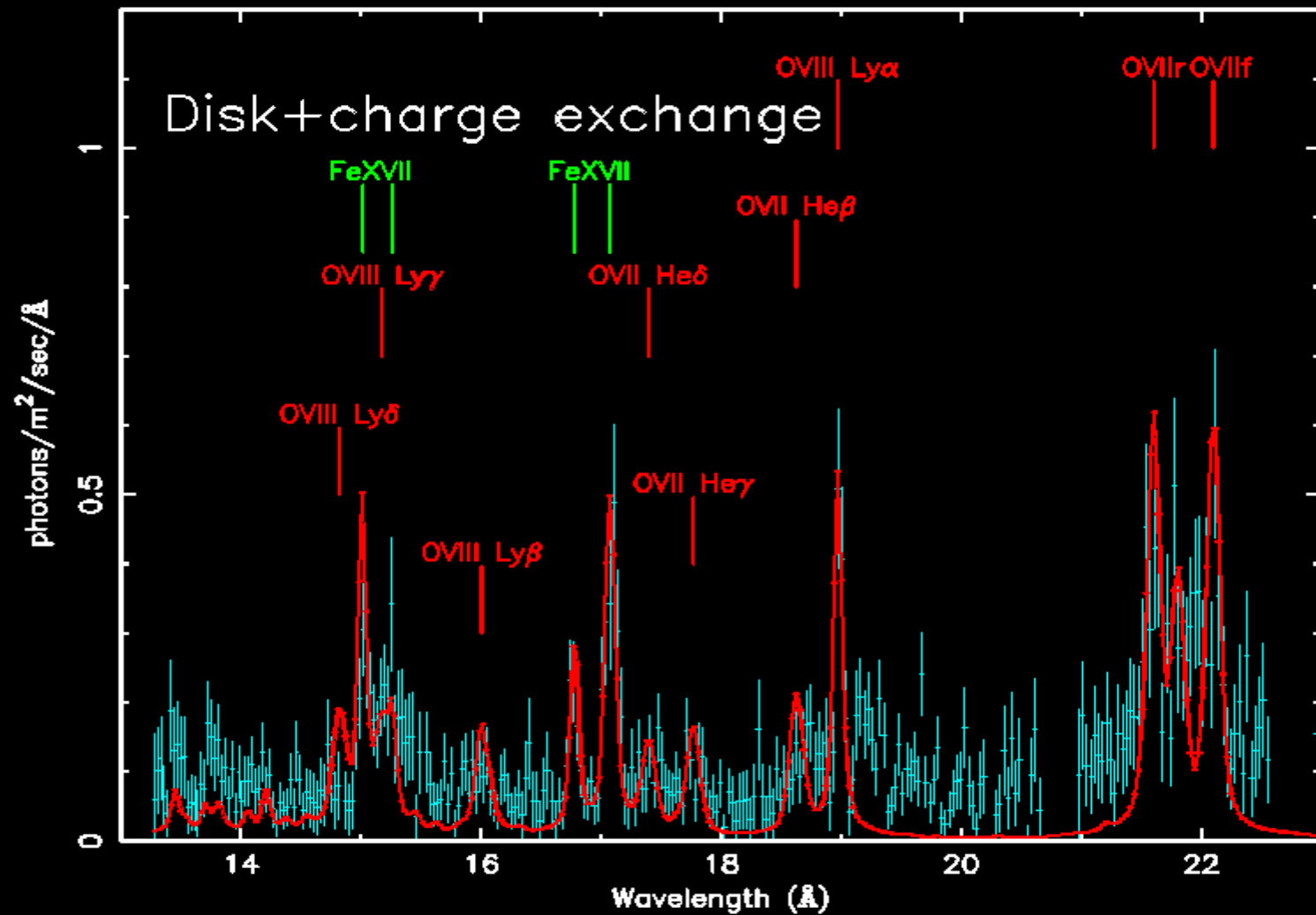
↑ FeXVII ↑ FeXVII ↑ OVIII ↑ OVII

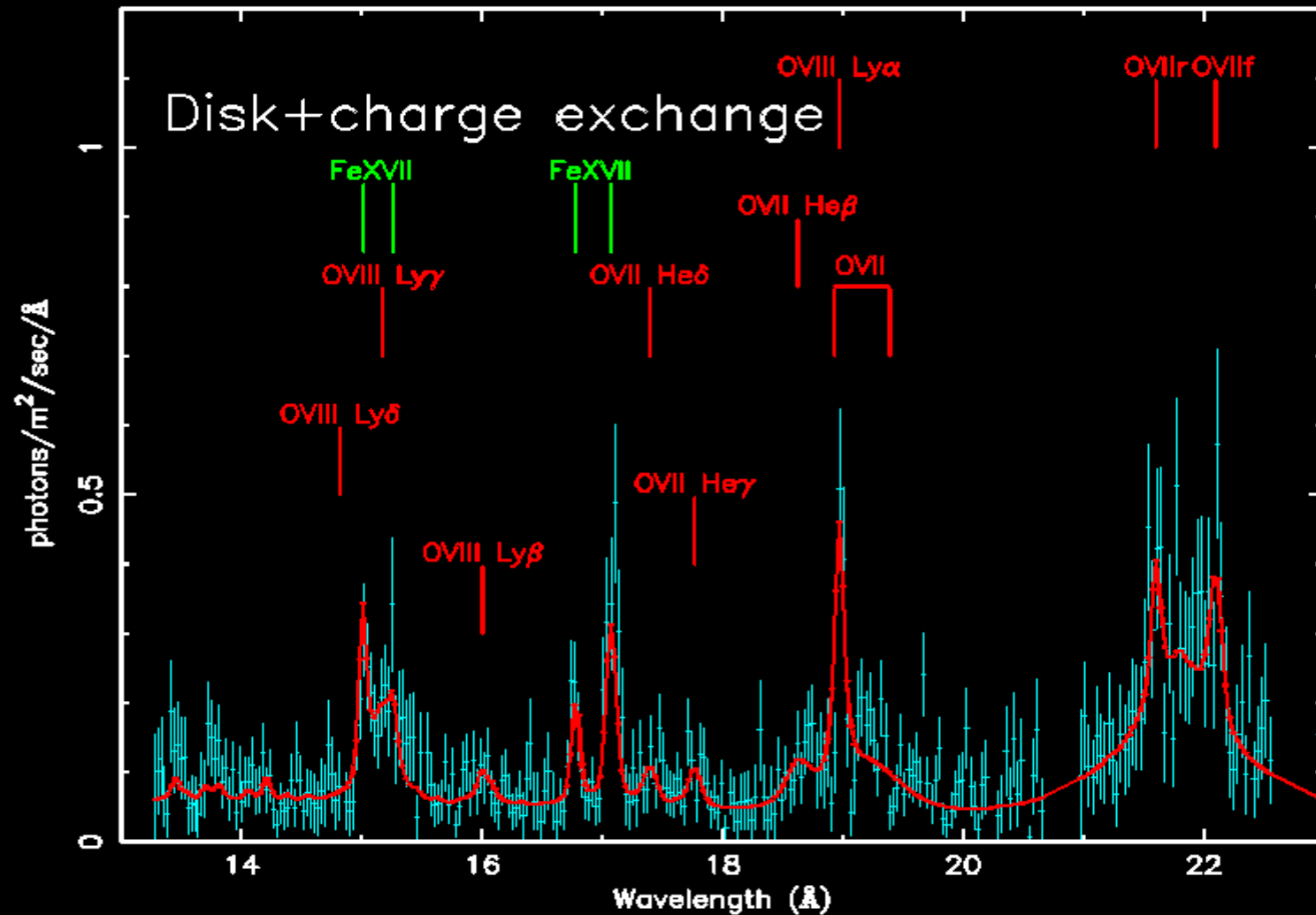
RGS clearly resolves **auroral** CX emission lines
from **disk** contribution

Jupiter**XMM-Newton RGS**

Jupiter

XMM-Newton RGS



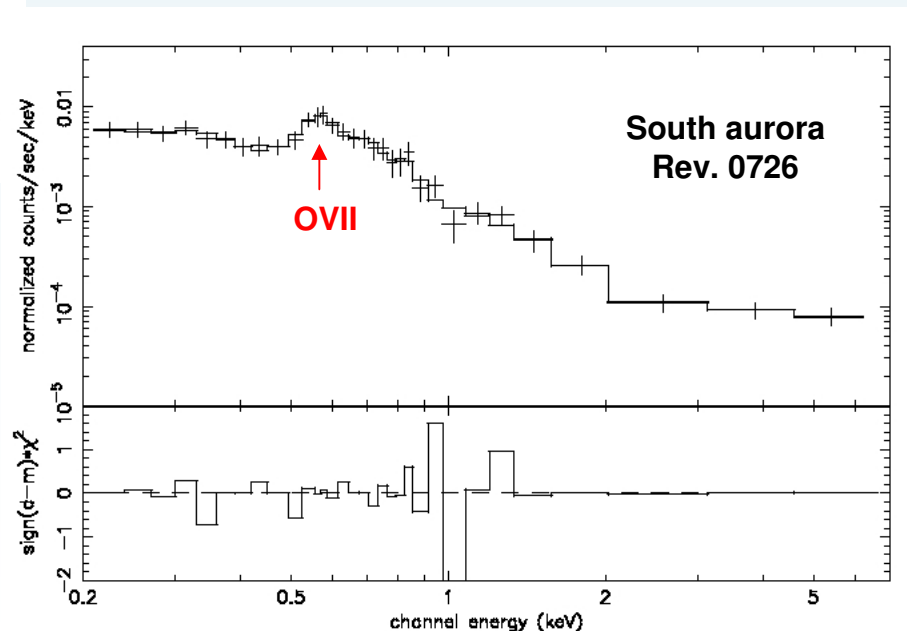
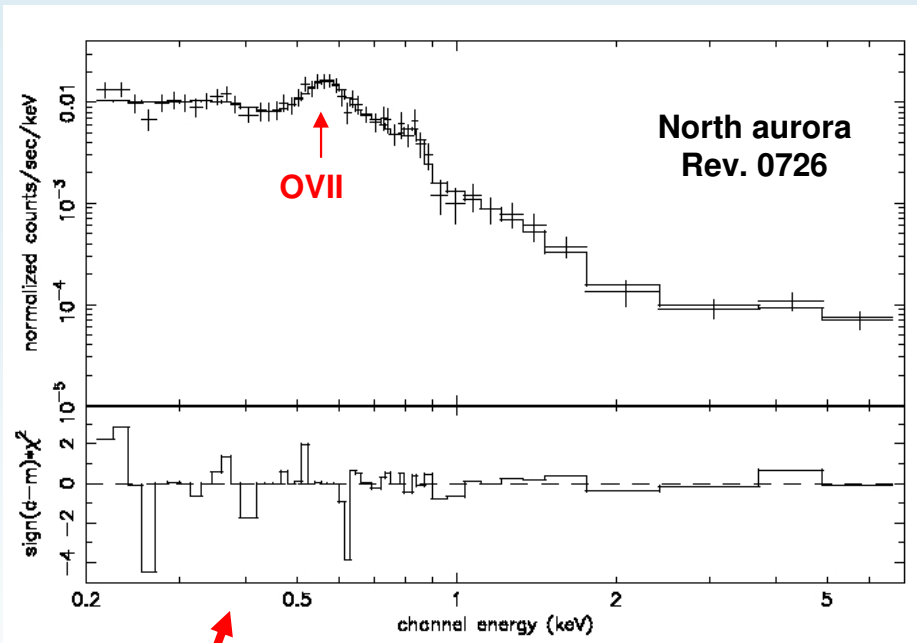
Jupiter**XMM-Newton RGS**

Jupiter

XMM-Newton – Nov. 2003: EPIC


Auroral soft X-ray lines (C/S?, OVII, OVIII) → CX (ion origin?)

Shape of high energy component varies between rev. 0726 and 0727...

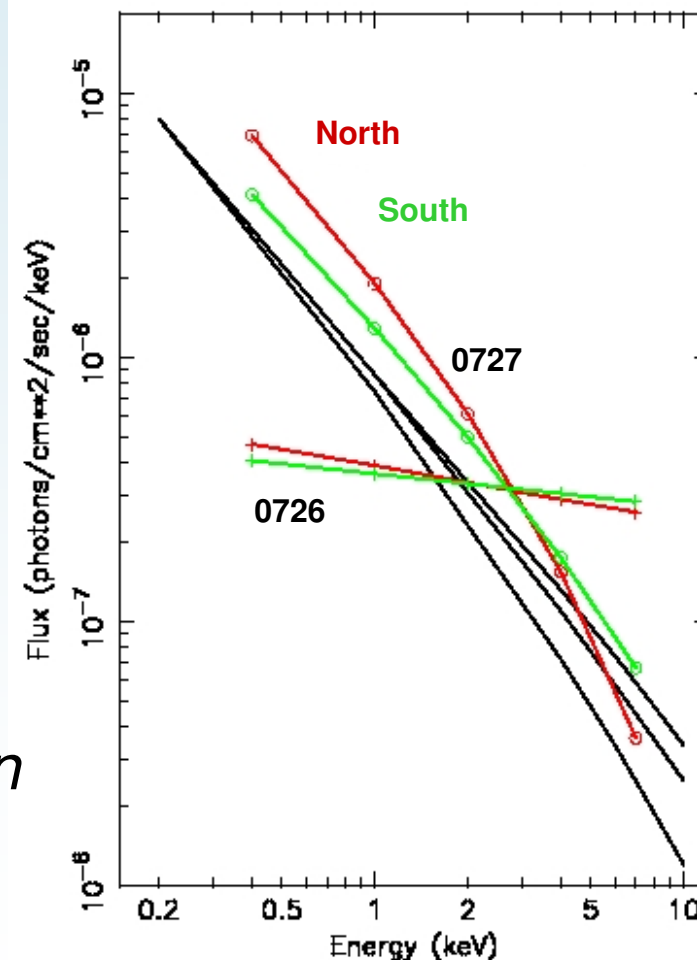


High energy spectral slope best fitted by $\Gamma \sim 0.2$ power law

Jupiter***XMM-Newton* – Nov. 2003: EPIC**

Singhal et al. (1992) predicted bremsstrahlung flux of precipitating electrons with characteristic energies of 10, 30, 100 keV (black) 

Predicted e^- bremsstrahlung in Jupiter's aurorae revealed by *XMM-Newton* and shown to be **variable** in flux and spectral shape (solar activity)



Jupiter**Chandra and Hubble STIS – Feb. 2003**

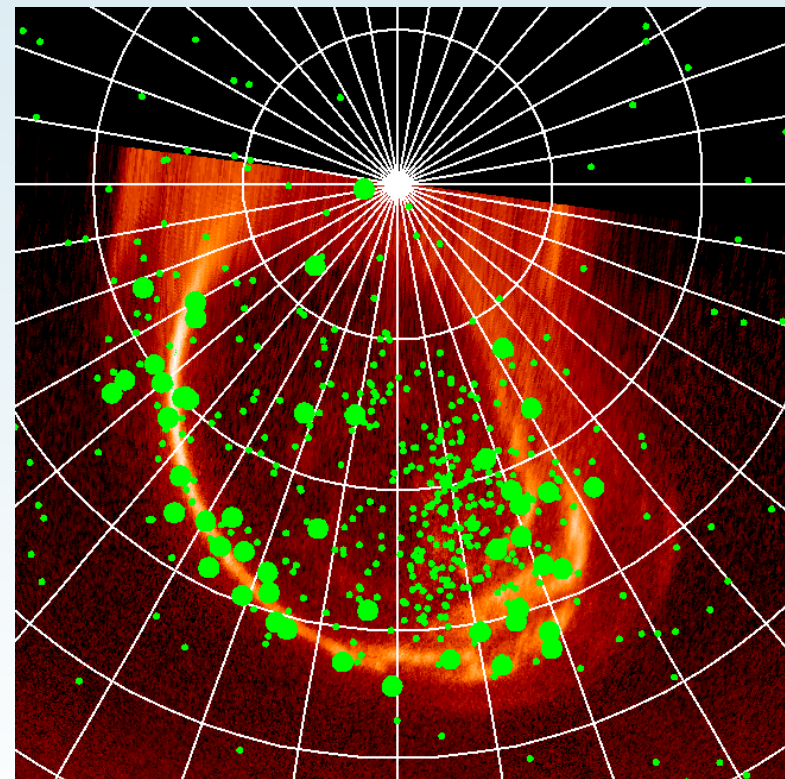
Chandra ACIS reveals different spatial morphology of **soft** (ion CX) and **hard** (electron brems.) X-ray events

Simultaneous Hubble STIS images show > 2 keV events coincide with **FUV bright features**

Same energetic electrons population

likely to be responsible for both, X-ray brems. and FUV emission of aurorae

X-ray and FUV powers consistent with model predictions



*Branduardi-Raymont et al. 2007,
in press*