

The IACHEC High-Resolution Working Group's view of
the X-ray emission-line spectrum of Capella

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4th IACHEC @ Shonan Village Center, Japan

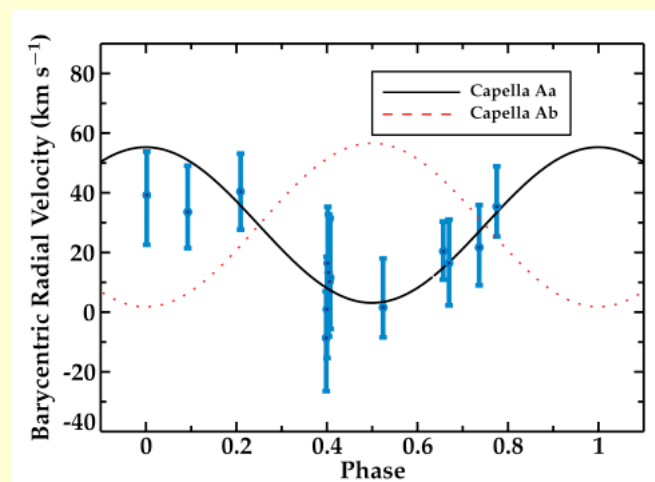
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IACHEC High-Resolution WG objectives

- Instrumental wavelength reference frame (*cf* effective area)
 - dynamics of plasmas
 - $1\text{m}\text{\AA}$ at 12\AA \Leftrightarrow 25 km/s
 - atomic physics
 - observed λ for databases
 - ATOMDB
 - CHIANTI
 - NIST
 - laboratory astrophysics
 - LLNL EBIT
 - theoretical calculations
 - HULLAC and other codes
 - $\Delta\lambda < 35\text{ m}\text{\AA}$
- Not finished
- Canvass IACHEC opinion
 - Do some work here and review methods
 - Role of high-resolution data for unified plasma physics projects
 - Line ID methods
 - VO

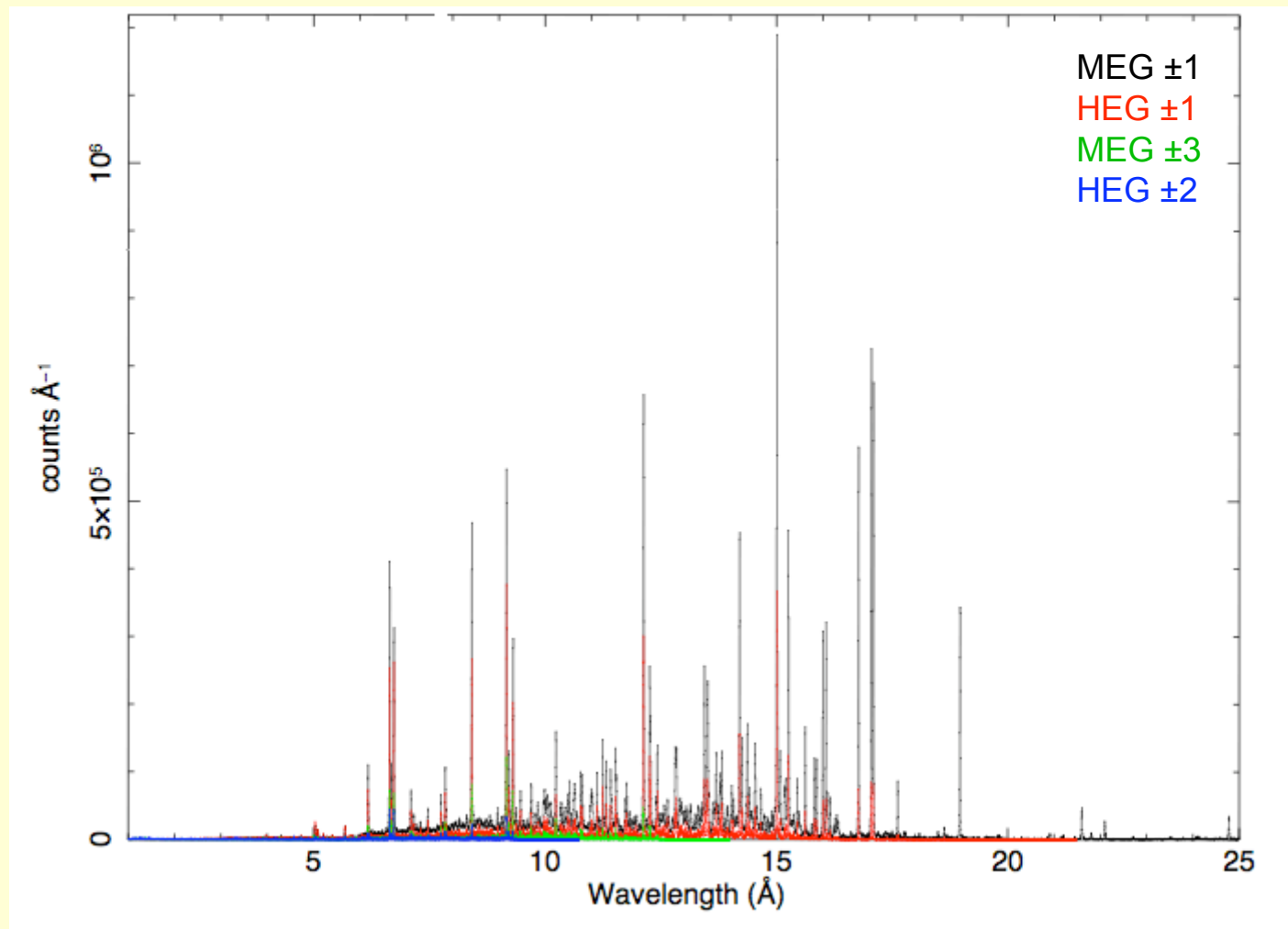
IACHEC High-Resolution WG objectives

- How do we do all this ?
 - Look at Capella
 - G8III + G1III
 - $V=0.08$
 - $d=13.4\text{pc}$
 - $P=104.039\text{d}$
 - Lots of previous work
 - Ishibashi+ 2006
 - It's the G8III primary
 - Behar+ 2001
 - 41 lines measured



Capella's combined Chandra HETG X-ray spectra

T=298ks : data and responses kindly provided by [Dave Huenemoerder](#)



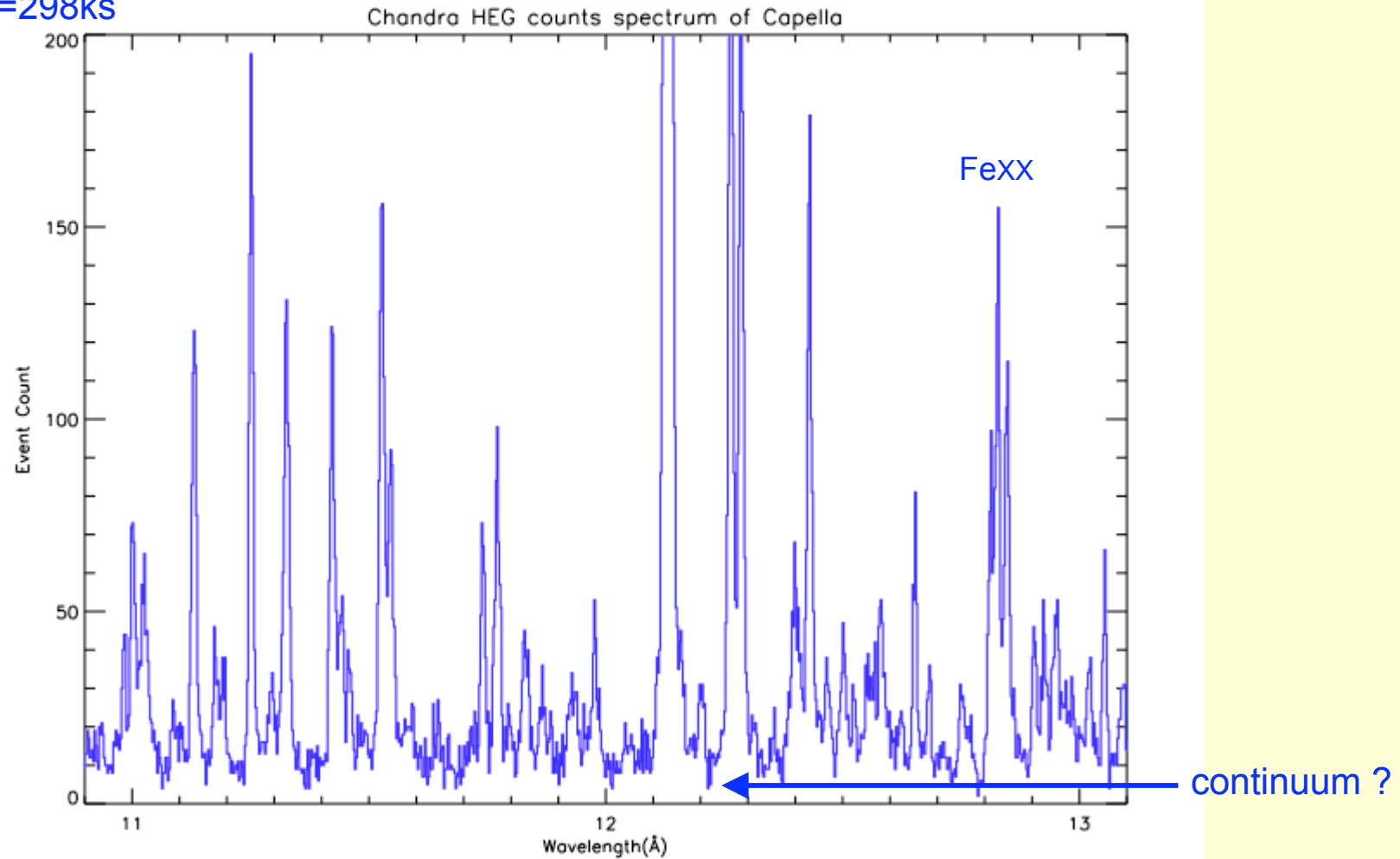
X-ray spectrum of Capella

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Capella's combined Chandra HEG±1 X-ray spectrum

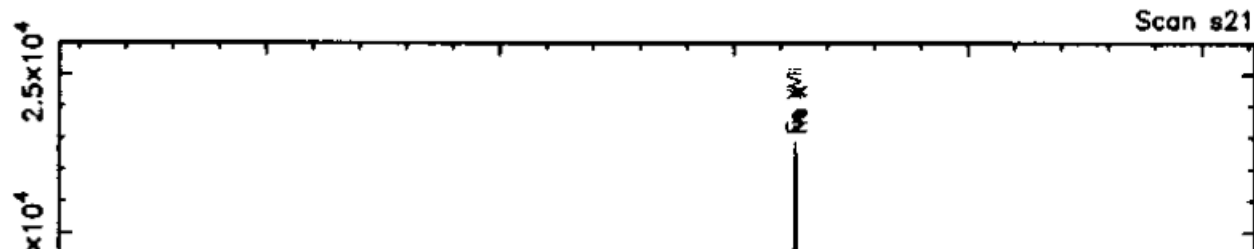
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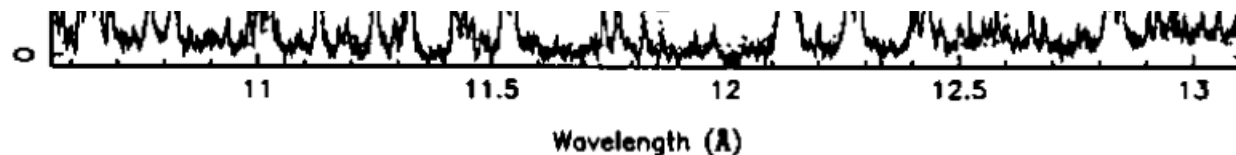
IACHEC High-Resolution WG methods

- Identify every line in the HETG, RGS & LETG spectra of Capella
 - \Rightarrow "phenomenological" line + continuum XSPEC model
 - measure for each line
 - $\lambda \pm \sigma_\lambda$
 - $f \pm \sigma_f$
 - 500 lines or more
 - no physics
 - cf SNR 1ES0102-7219
- organise emission lines ion-by-ion
 - H-like and He-like ions
 - C N O Ne Al Mg Si S Ar ζ [Na P]?
 - laboratory λ generally well known
 - EBIT measurements of lines from 8 L-shell ions
 - Fe XVII - Fe XXIV
 - Ni XIX - Ni XXVI
 - Ar IX - Ar XVI
 - S VII - S XIV
 - ζ [Cr Ca Si]?
 - Solar measurements

SMM X-ray flare spectrum



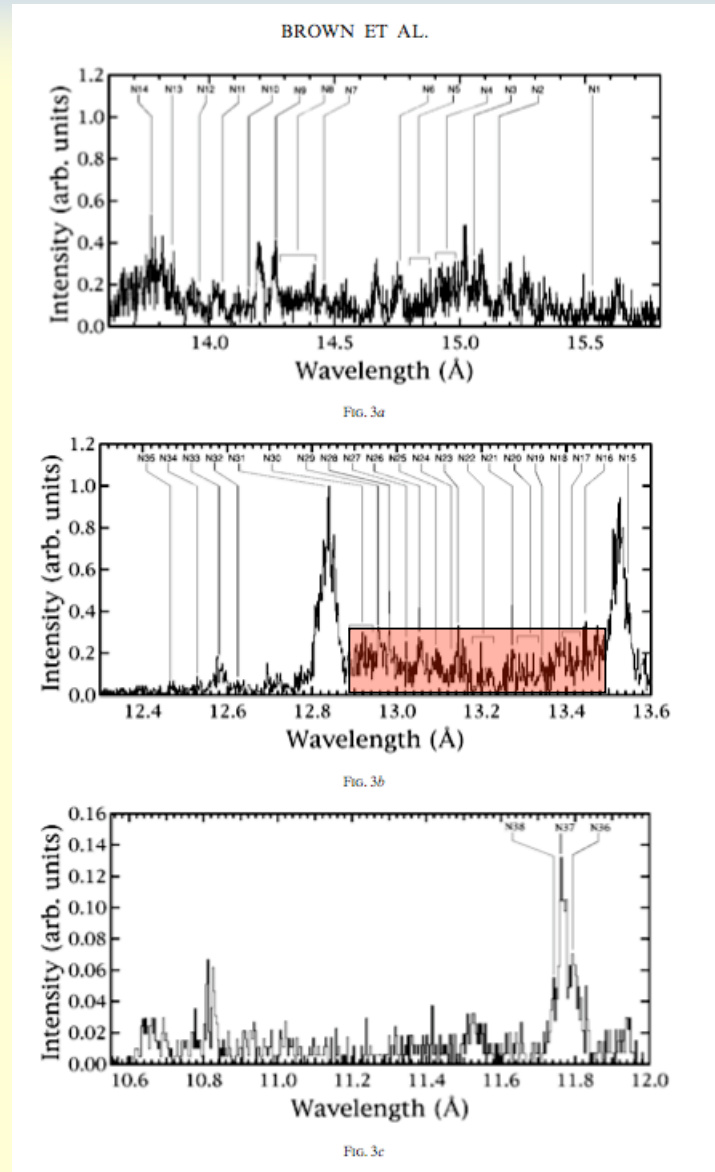
Note that this benchmark study is a very stringent one: the *SMM* FCS spectral resolution is very high, so that even comparatively small (e.g. > 5 mÅ) errors in the MEKAL line wavelength data are very important for the purposes of this work. However, the typical wavelength resolution of the instruments on board *Chandra* and *XMM* is an order of magnitude larger, so such errors would not be of significance for comparison with data from these instruments.



Benchmarking the MEKAL spectral code with solar X-ray spectra*

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EBIT Fe L-shell example Fe XX measurement

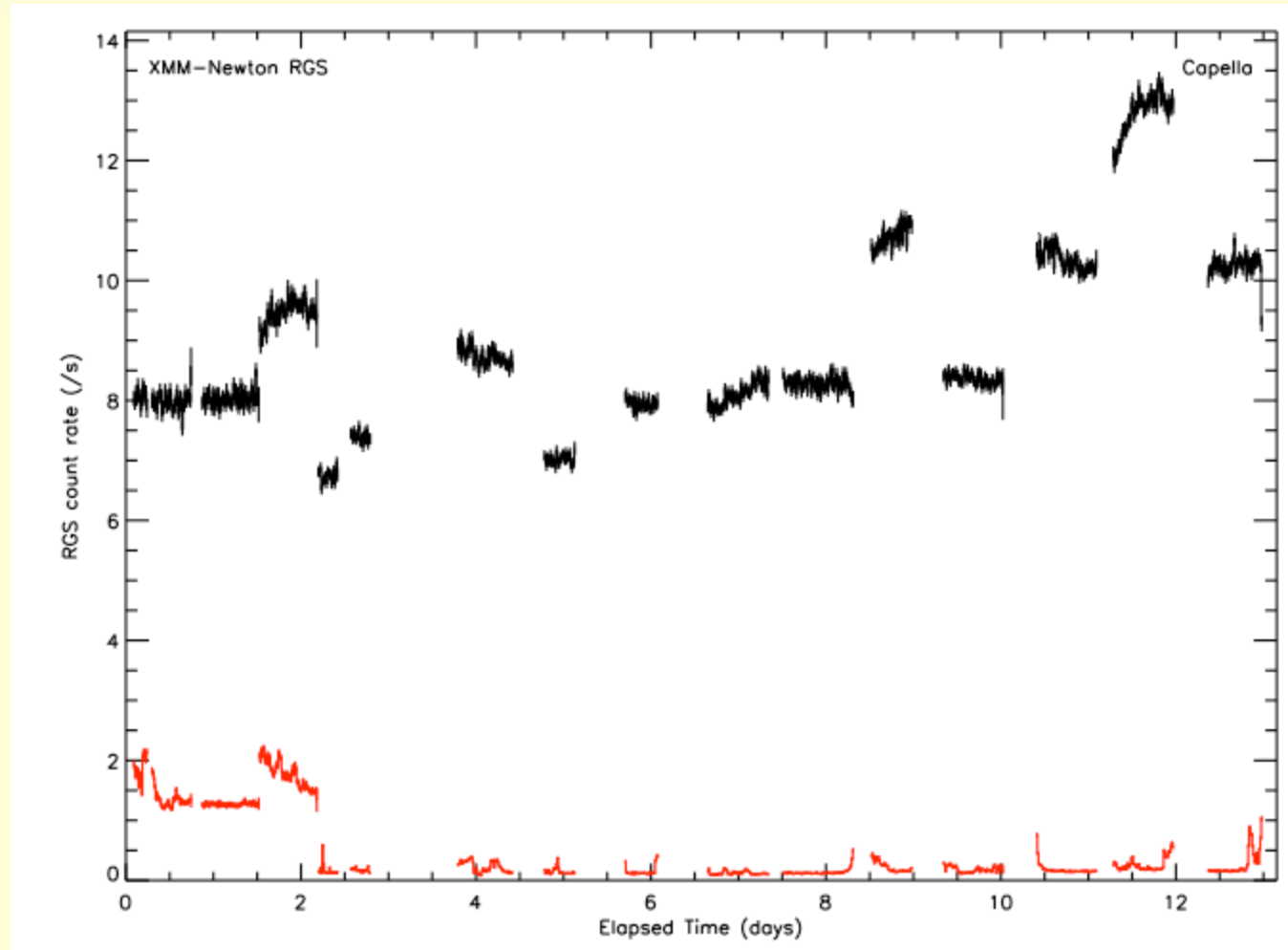


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Capella's rgs1ccorr lightcurve



cf Raassen & Kaastra 2007

Questions for the IACHEC WG

- General questions
 - Review of methods
 - IACHEC signature of observational line measurements
 - Other objects
 - Publication plan
- Particular Capella HETG questions
 - Any inner-shell FeXVI lines ?
 - Na or P ?
 - Doublet nature of FeXVIII λ 14.208 ?