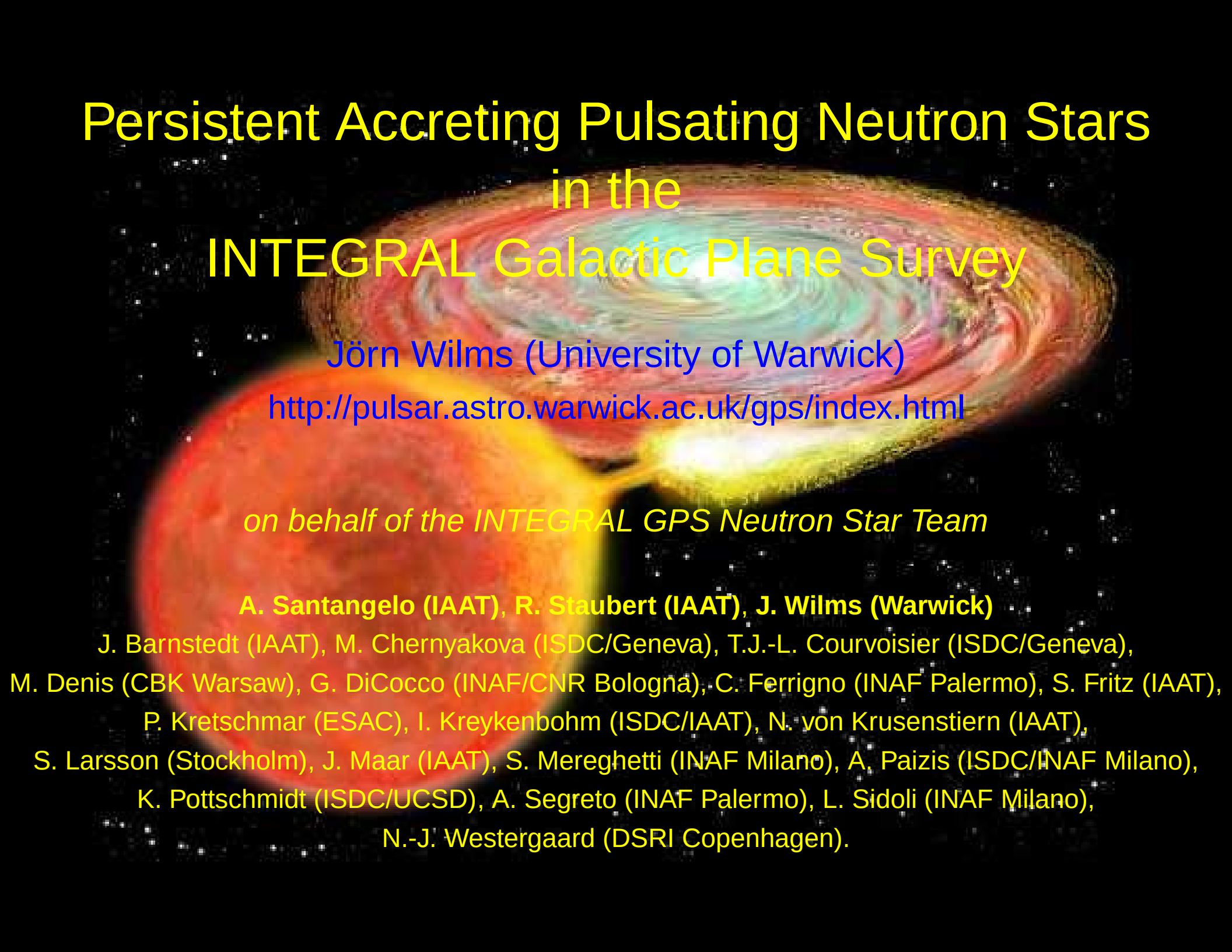


Persistent Accreting Pulsating Neutron Stars in the INTEGRAL Galactic Plane Survey

Jörn Wilms (University of Warwick)

http://pulsar.astro.warwick.ac.uk/gps/index.html

on behalf of the INTEGRAL GPS Neutron Star Team

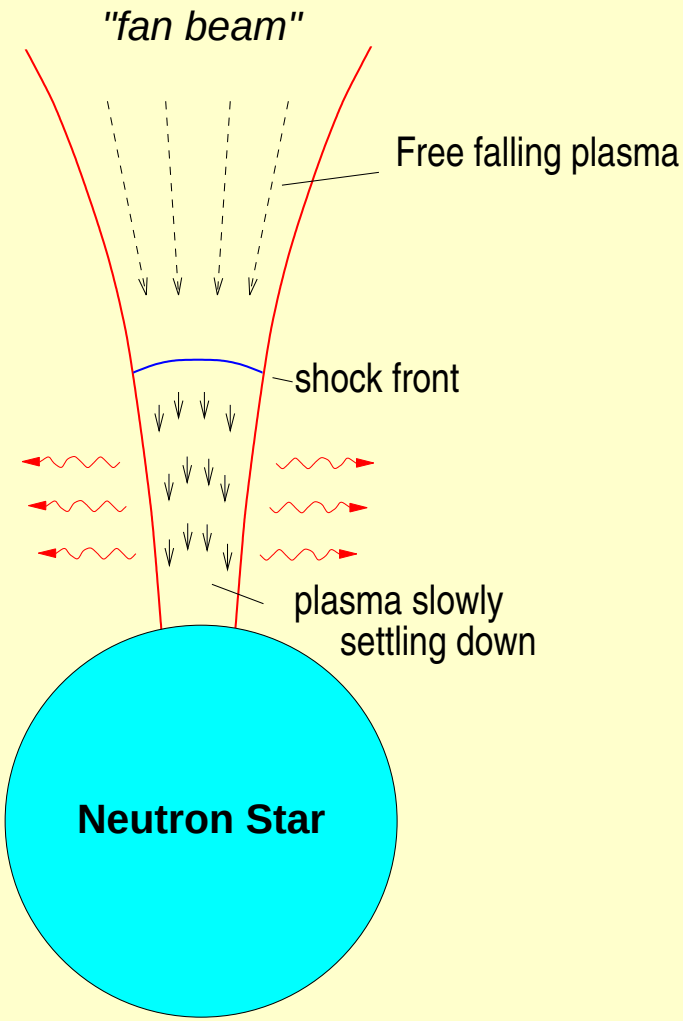
A. Santangelo (IAAT), **R. Staubert (IAAT)**, **J. Wilms (Warwick)**

J. Barnstedt (IAAT), M. Chernyakova (ISDC/Geneva), T.J.-L. Courvoisier (ISDC/Geneva), M. Denis (CBK Warsaw), G. DiCocco (INAF/CNR Bologna), C. Ferrigno (INAF Palermo), S. Fritz (IAAT), P. Kretschmar (ESAC), I. Kreykenbohm (ISDC/IAAT), N. von Krusenstiern (IAAT), S. Larsson (Stockholm), J. Maar (IAAT), S. Mereghetti (INAF Milano), A. Paizis (ISDC/INAF Milano), K. Pottschmidt (ISDC/UCSD), A. Segreto (INAF Palermo), L. Sidoli (INAF Milano), N.-J. Westergaard (DSRI Copenhagen).

Why Monitor Neutron Stars?

We monitor 26 persistent pulsating NS in field of GPS, such as Vela X-1, Cen X-3, (4U 0115+63), GX 1+4, GX 301−2,...

- Measure fluxes in several energy bands
- Measure Long-Term Lightcurves
- Measure spectrum at $\lesssim 200\,\mathrm{keV}$
- Determine pulse periods and profiles
- Determine pulse period evolution
- Pulse Phase Spectroscopy
- Search for Cyclotron Lines



WWW Pages

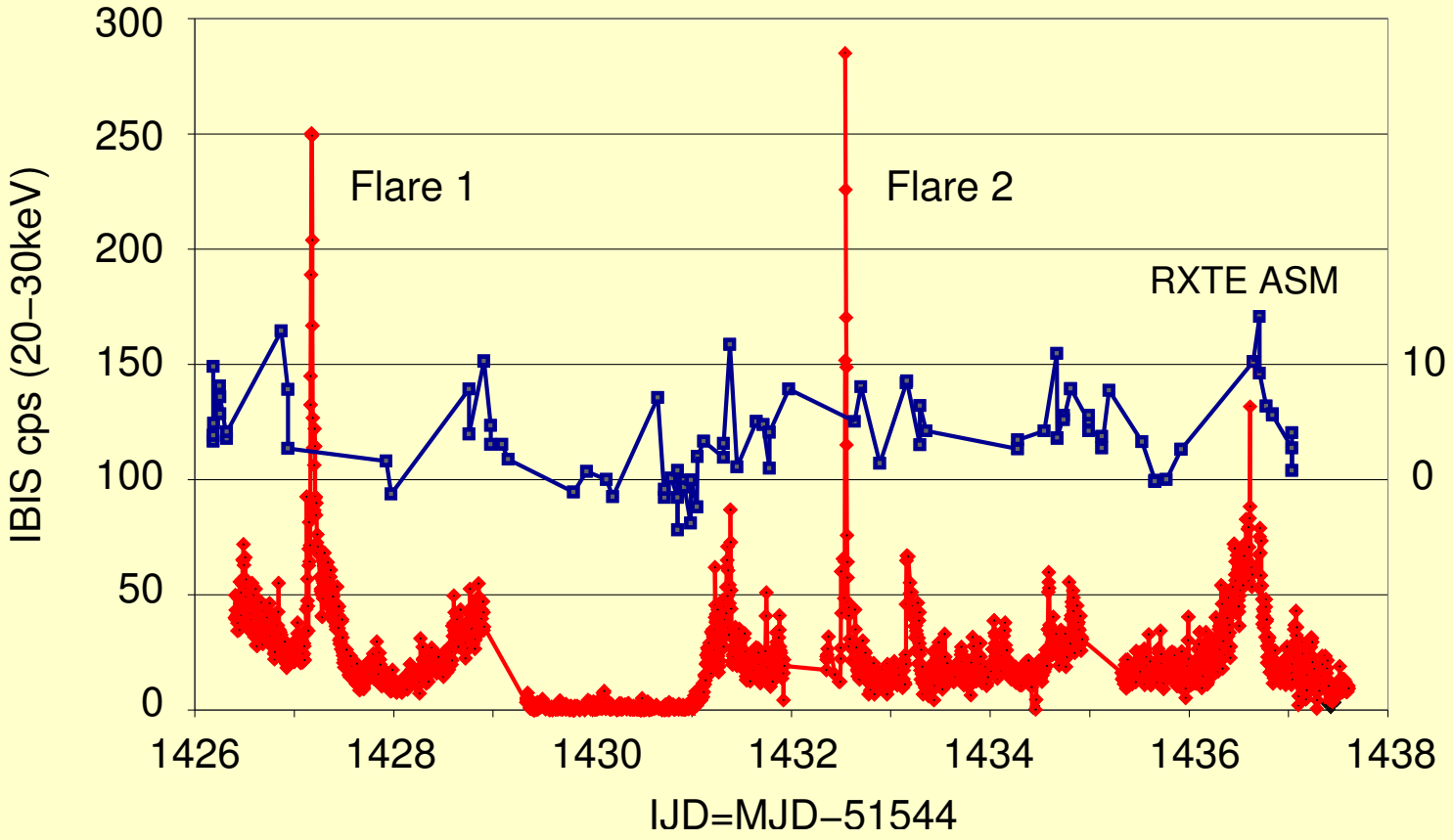
The following data are currently presented:

- overall source flux
- info on spectral shape (fluxes in several bands)
- detection significance (including $< 2\sigma$)

Furthermore, studies of individual objects are performed separately and background information on all monitored objects is given:

`http://pulsar.astro.warwick.ac.uk/gps/index.html`

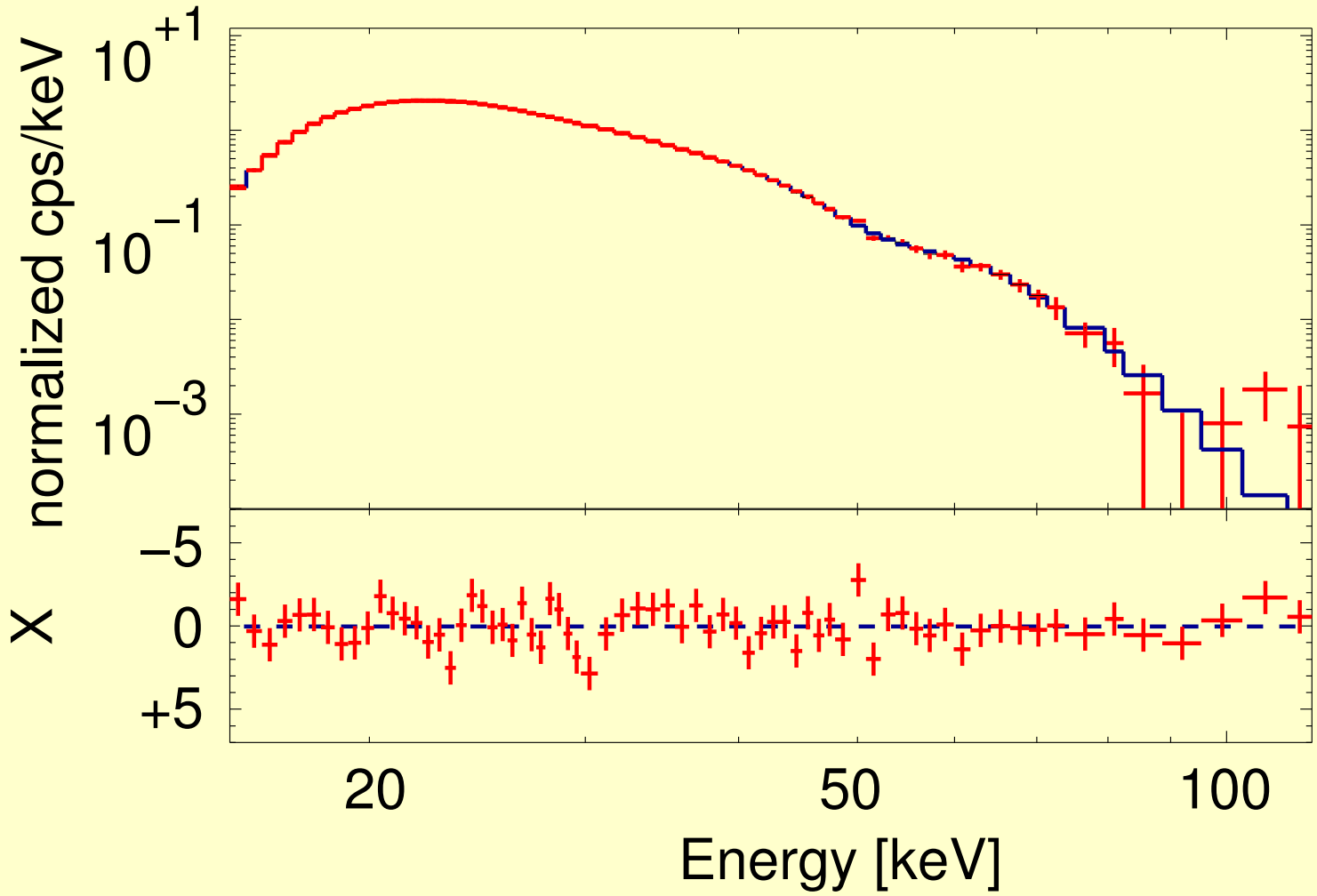
Gigantic Flares from Vela X-1



Staubert et al., 2004

Largest flares from Vela X-1 ever observed

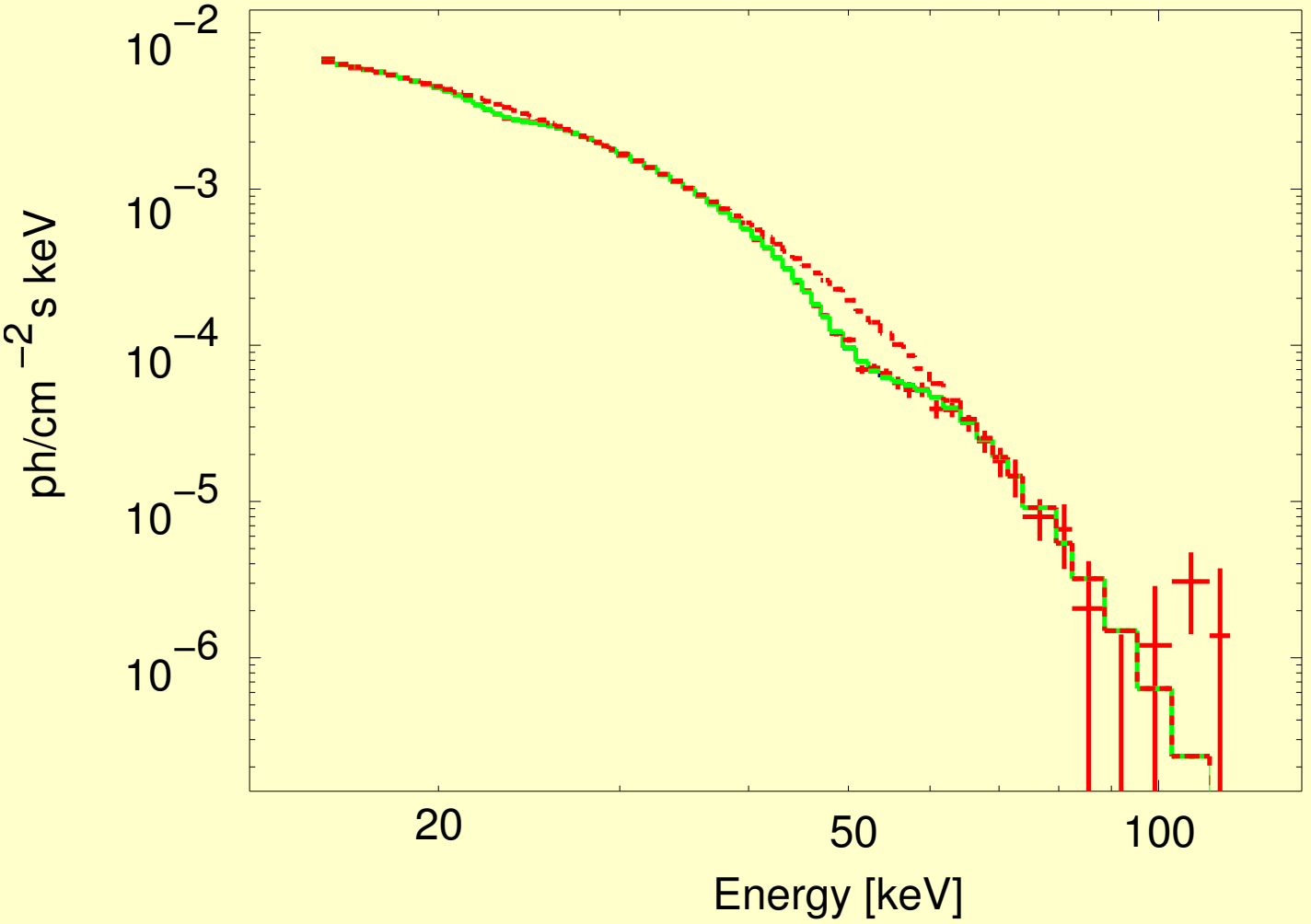
Cyclotron Lines in Vela X-1, I



Segreto & Ferrigno

Vela X-1: Confirmation of the ∼50 keV cyclotron line

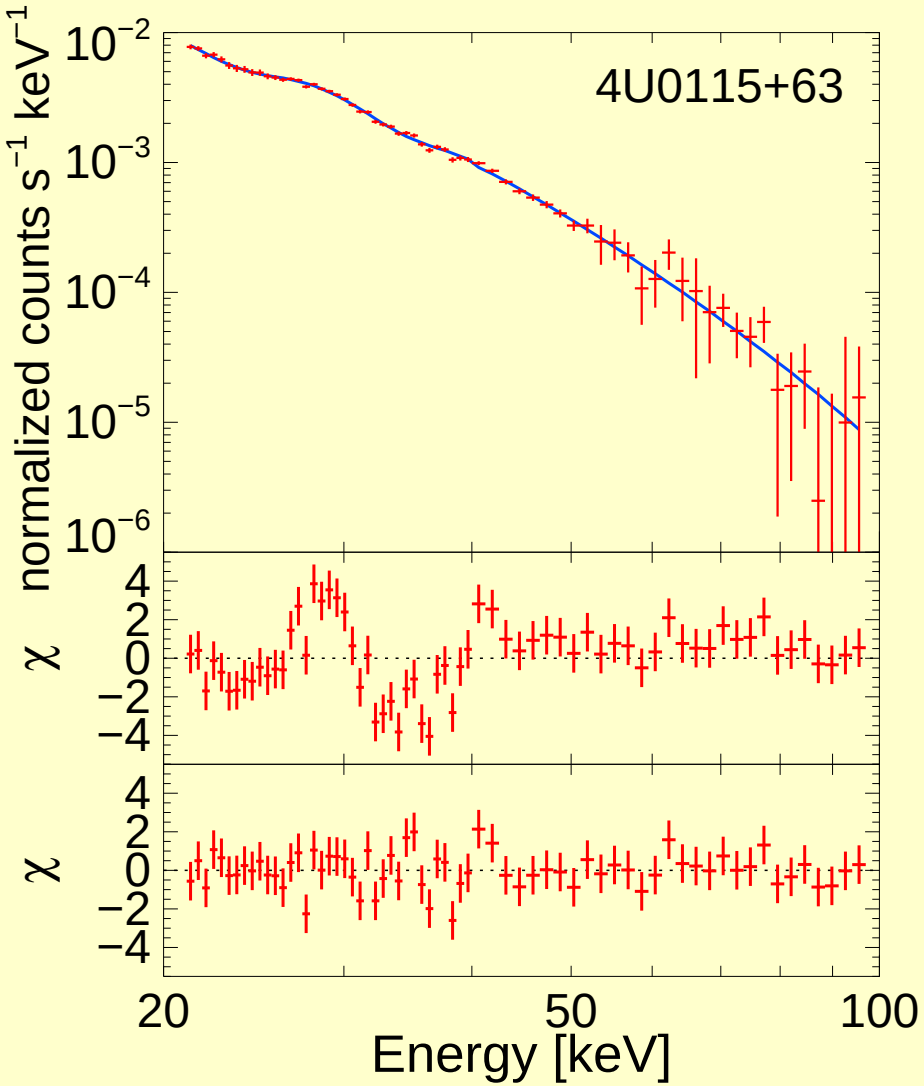
Cyclotron Lines in Vela X-1, II



Segreto & Ferrigno

Vela X-1: Tentative confirmation of $\sim$25 keV fundamental?

Cyclotron Lines in 4U0115+63

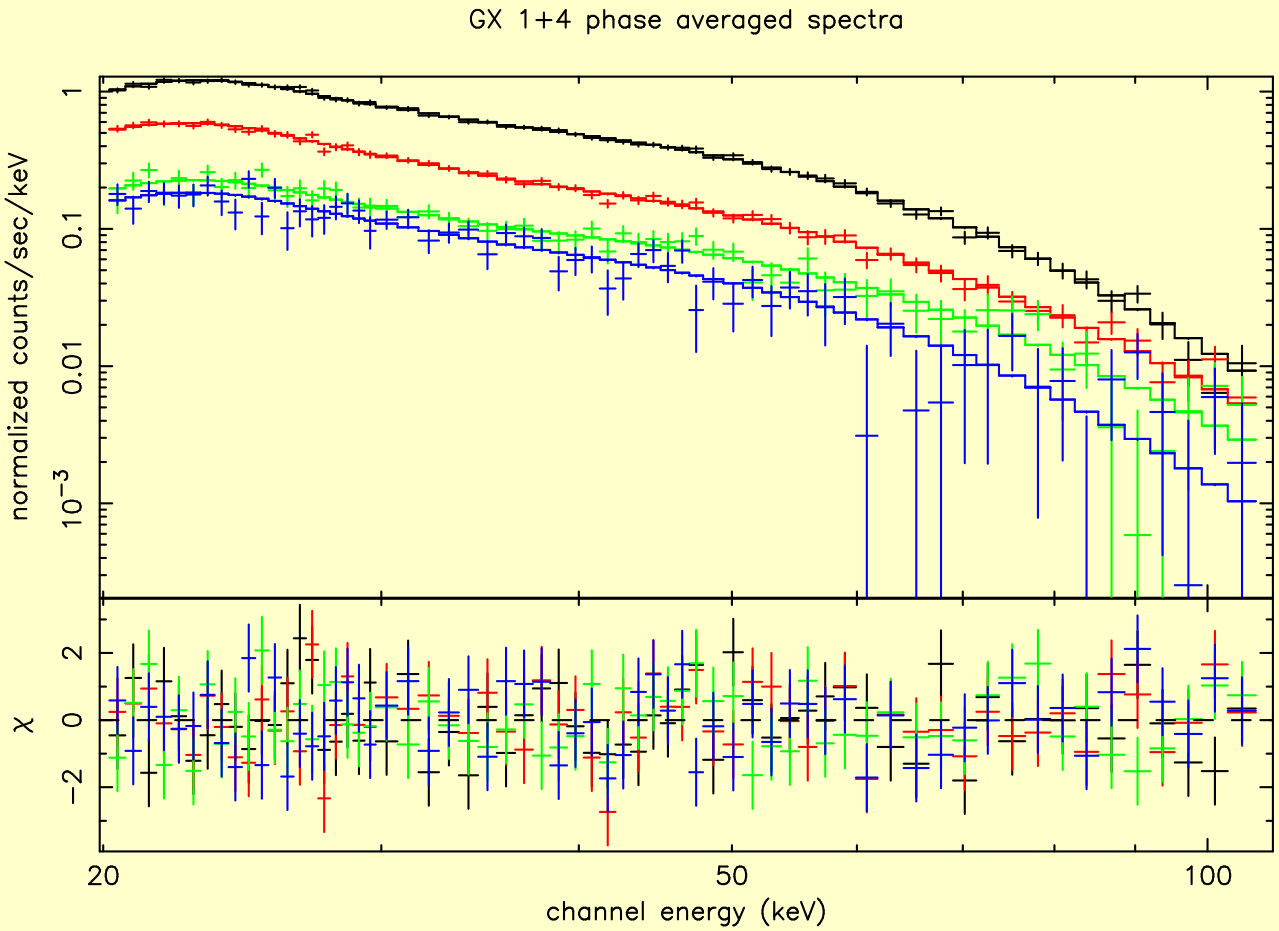


(I. Kreykenbohm; 0.5 keV bins, 86 ksec)
Santangelo et al., in prep.

October 2004 outburst of the Be system 4U0115+63: Highest resolution observation of a cyclotron line ever.

. . . see talk by C. Ferrigno

Phase Averaged Spectra from GX 1+4

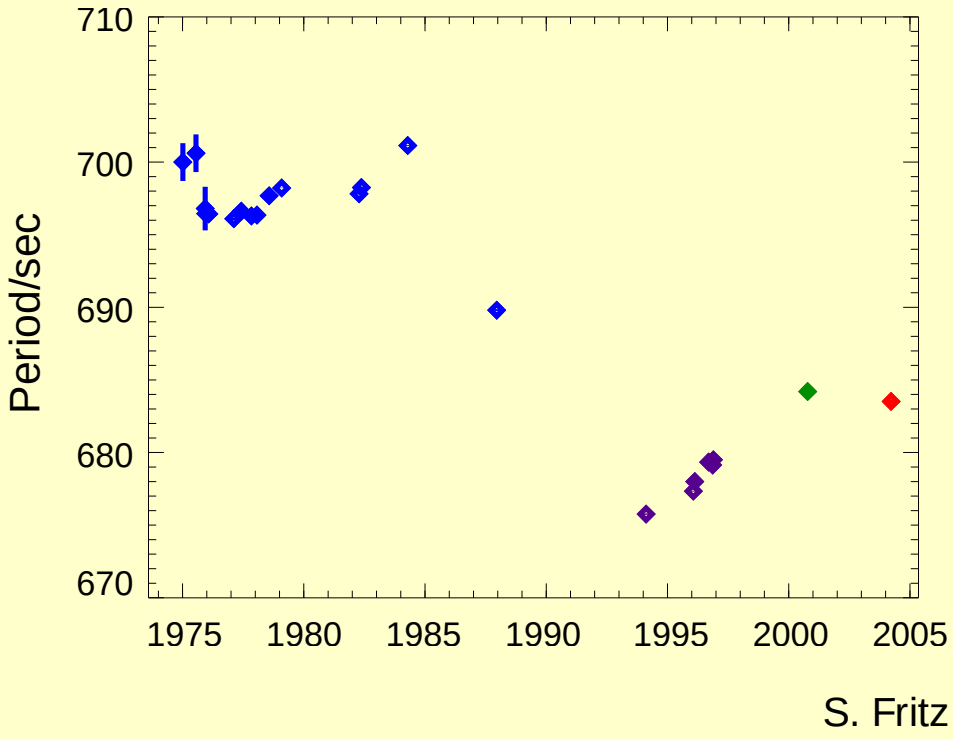


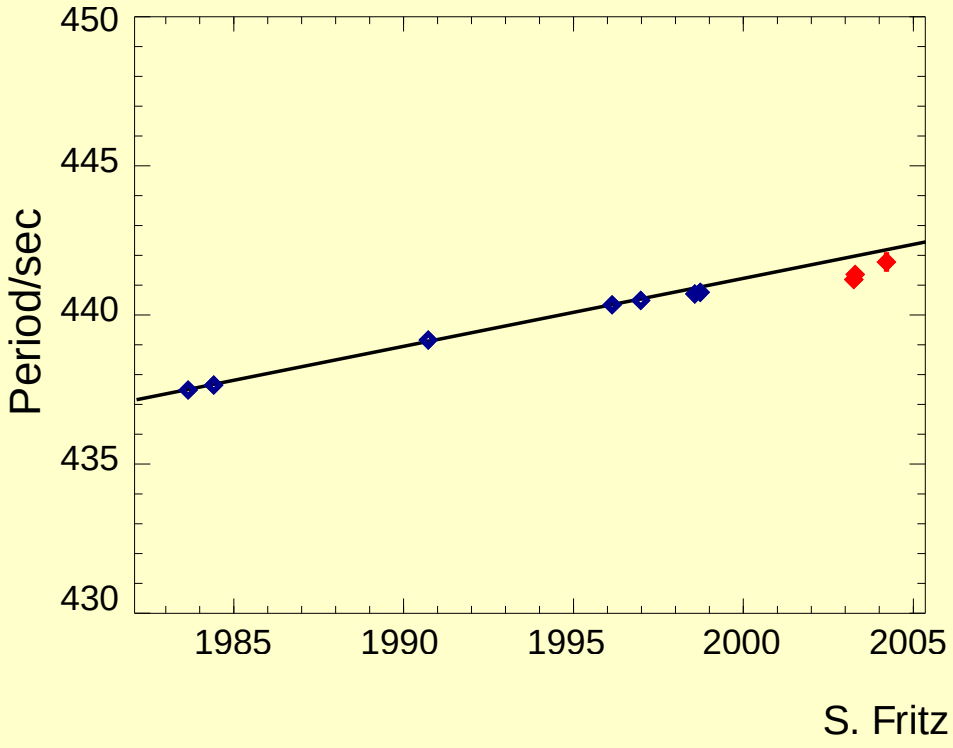
courtesy C. Ferrigno

GX 1+4: Brightness correlated spectral variability ($\Delta\Gamma \gtrsim 0.5$)

. . . see talk by C. Ferrigno

Pulse Period Evolution





GX 301−2:

complex period evolution

4U1907+097:

spin down trend continues

see also talk by Lara Sidoli on interesting spin up behavior in SAX J2103.5+4545. . .

Summary

Summary:

- only current long-term project to monitor accreting neutron stars
- best spectra currently available for $\gtrsim 20$ keV: first *resolved* cyclotron lines
- many unexpected results

`http://pulsar.astro.warwick.ac.uk/gps/index.html`

Planned work:

- improvements on WWW pages:
  - color-color diagrams and general correlations,
  - pulse period evolution,
  - selected pulse profiles in several energy bands,
- inclusion of LMXB monitoring results (w/A. Paizis)
- mirrors at ISDC and elsewhere.