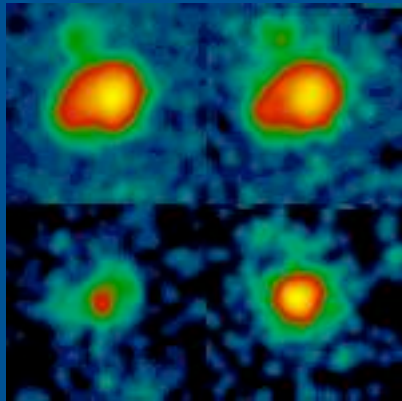


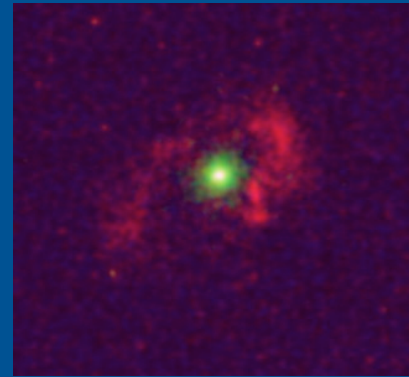
Eta Carinae: X-ray Emission and New Developments

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NASA/Goddard Space Flight Center

With much help from: Bish Ishibashi (MIT), Julian Pittard (Leeds), Ian Stevens (Birmingham), Jean Swank (LHEA/ GSFC), Andy Pollock (C&S Ltd), Laura Brenneman (USRA)



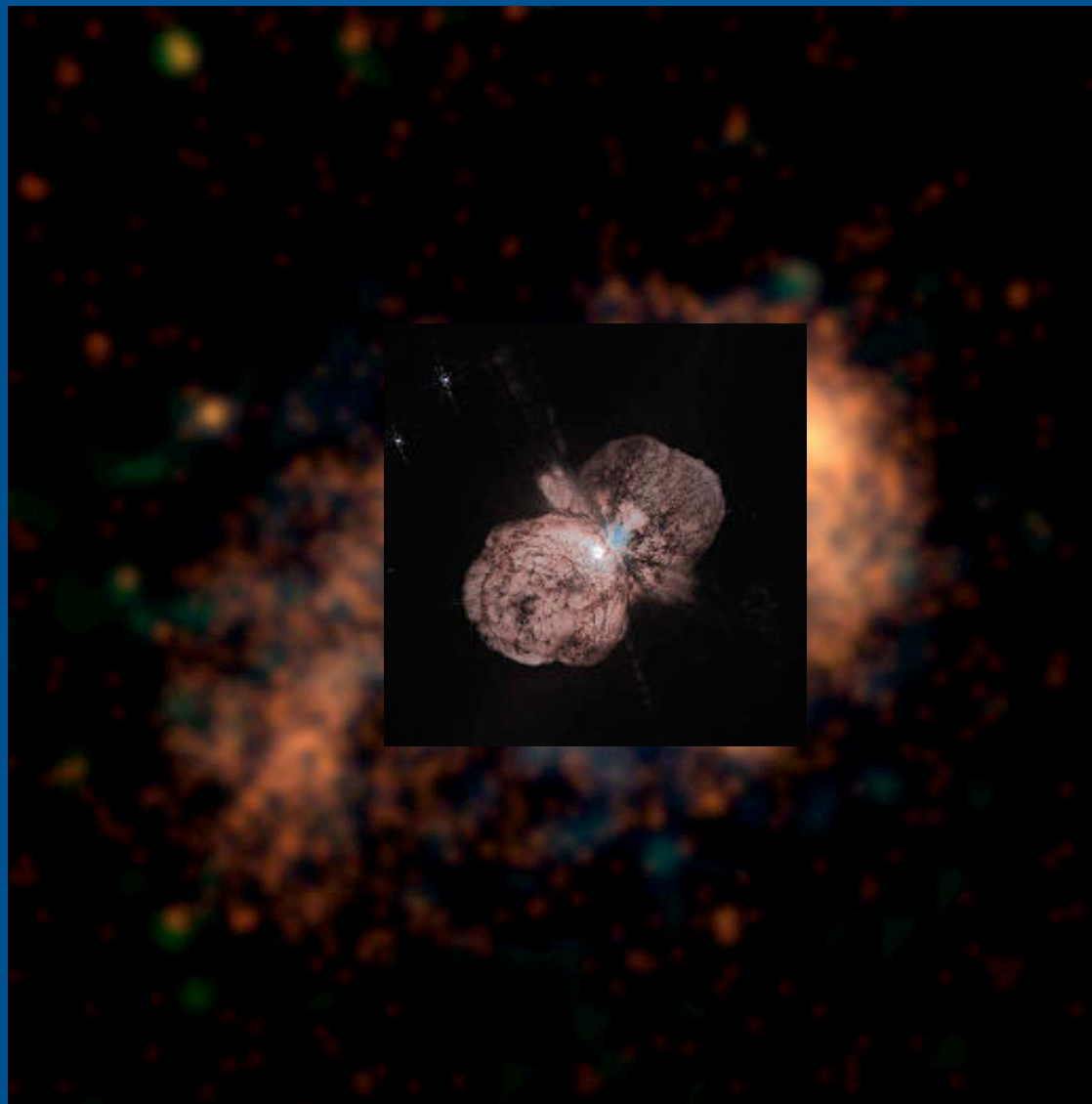
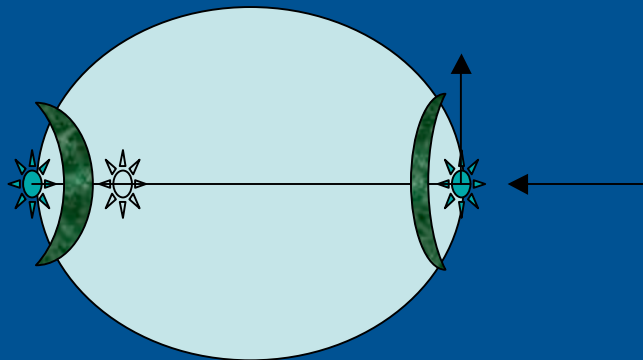
ROSAT detection
of X-ray variability



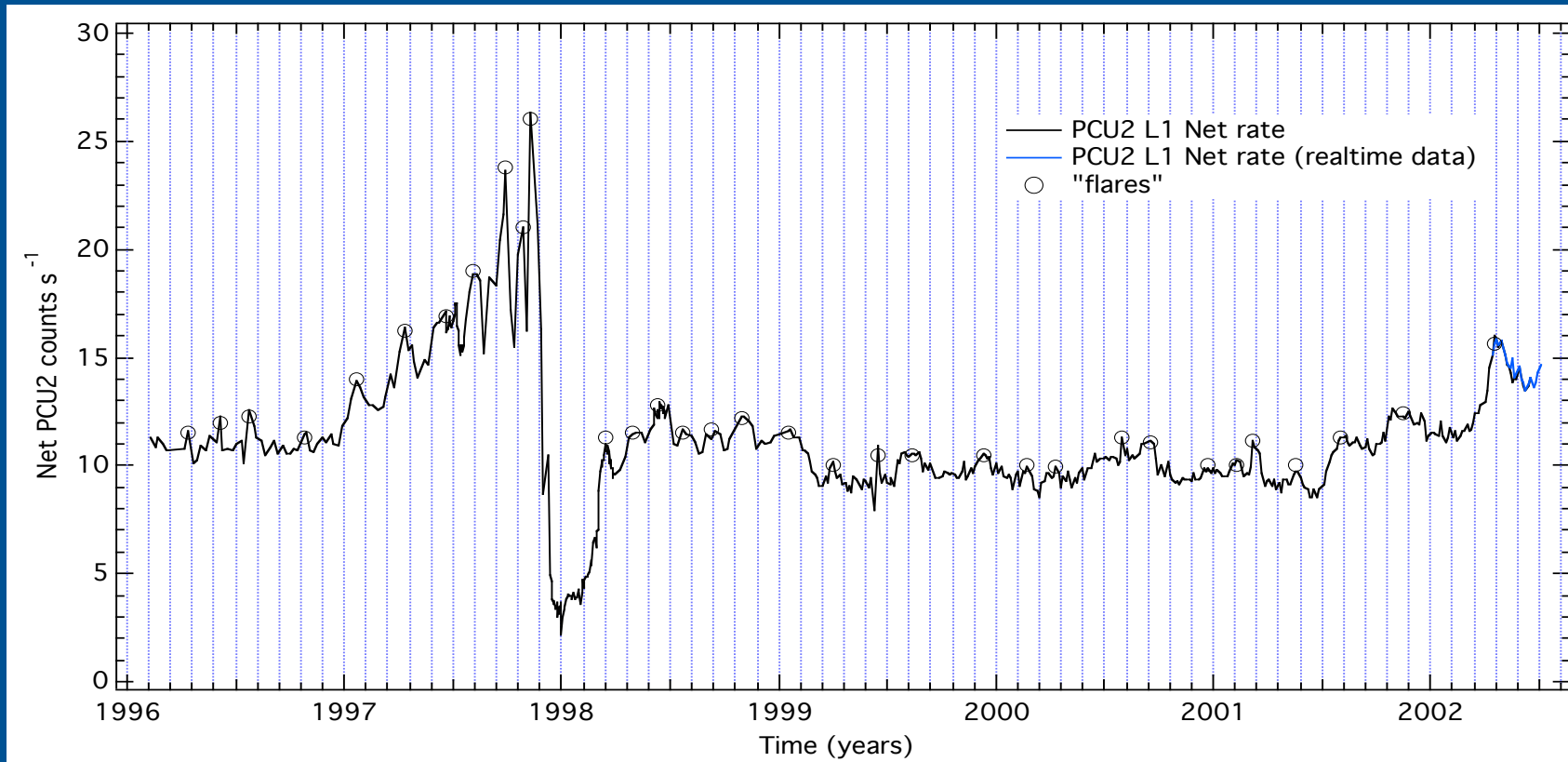
Chandra X-ray Image

Chandra X-ray imaging

Seward et al. 2001,
Weis et al. 2001
(Chandra Workshop
Proceedings)



The RXTE Lightcurve



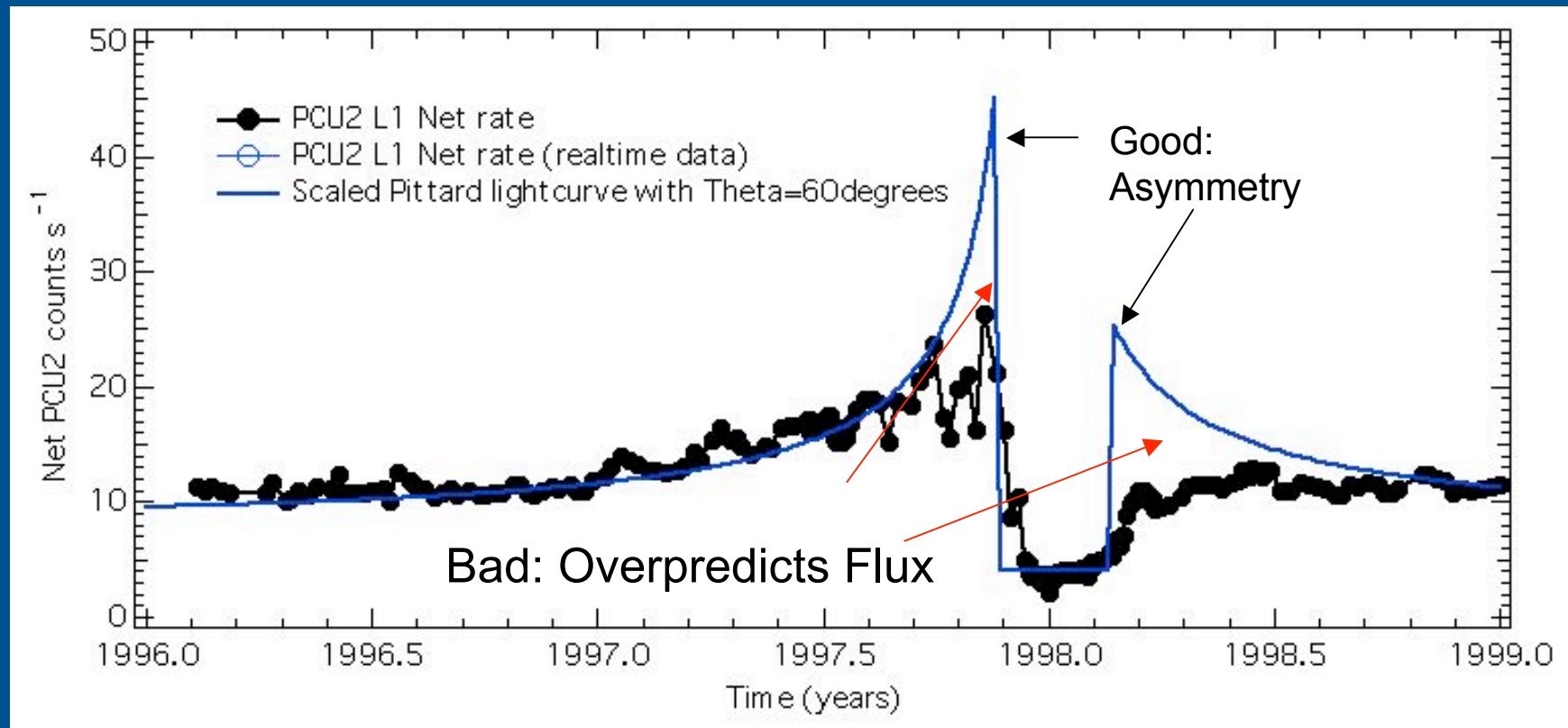
Last datum: July 6, 2002

Currently: 1 observation every 4-5 days

PCU2: most complete lightcurve

“Flares”: complex shapes

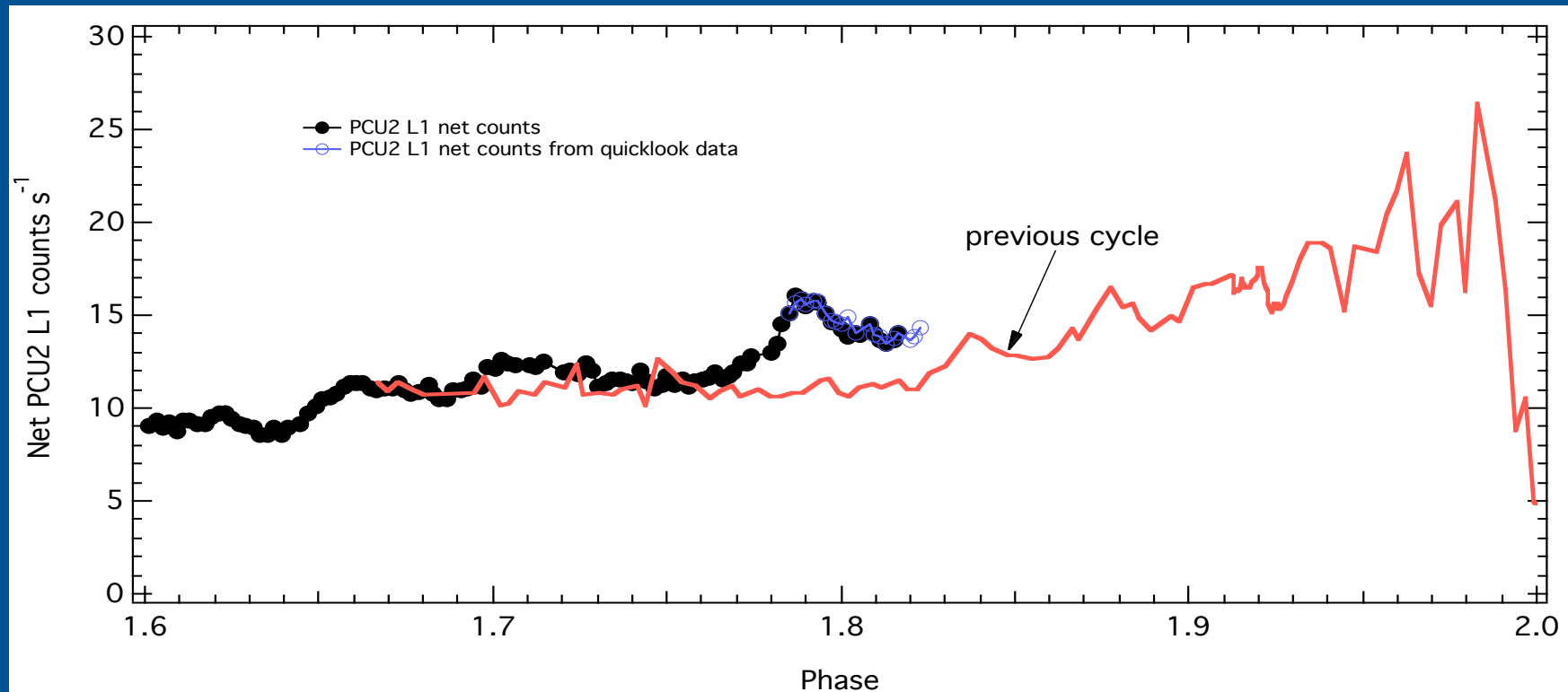
Lightcurve Modelling



Attempt to fit RXTE 2-10 keV lightcurve with hydro colliding wind model + skewed shock cone

Other attempts: Pittard et al. 1998; Ishibashi et al. 1999; Corcoran et al. 2001; Ishibashi 2001 (Hven meeting)

Cycle-to-Cycle Differences

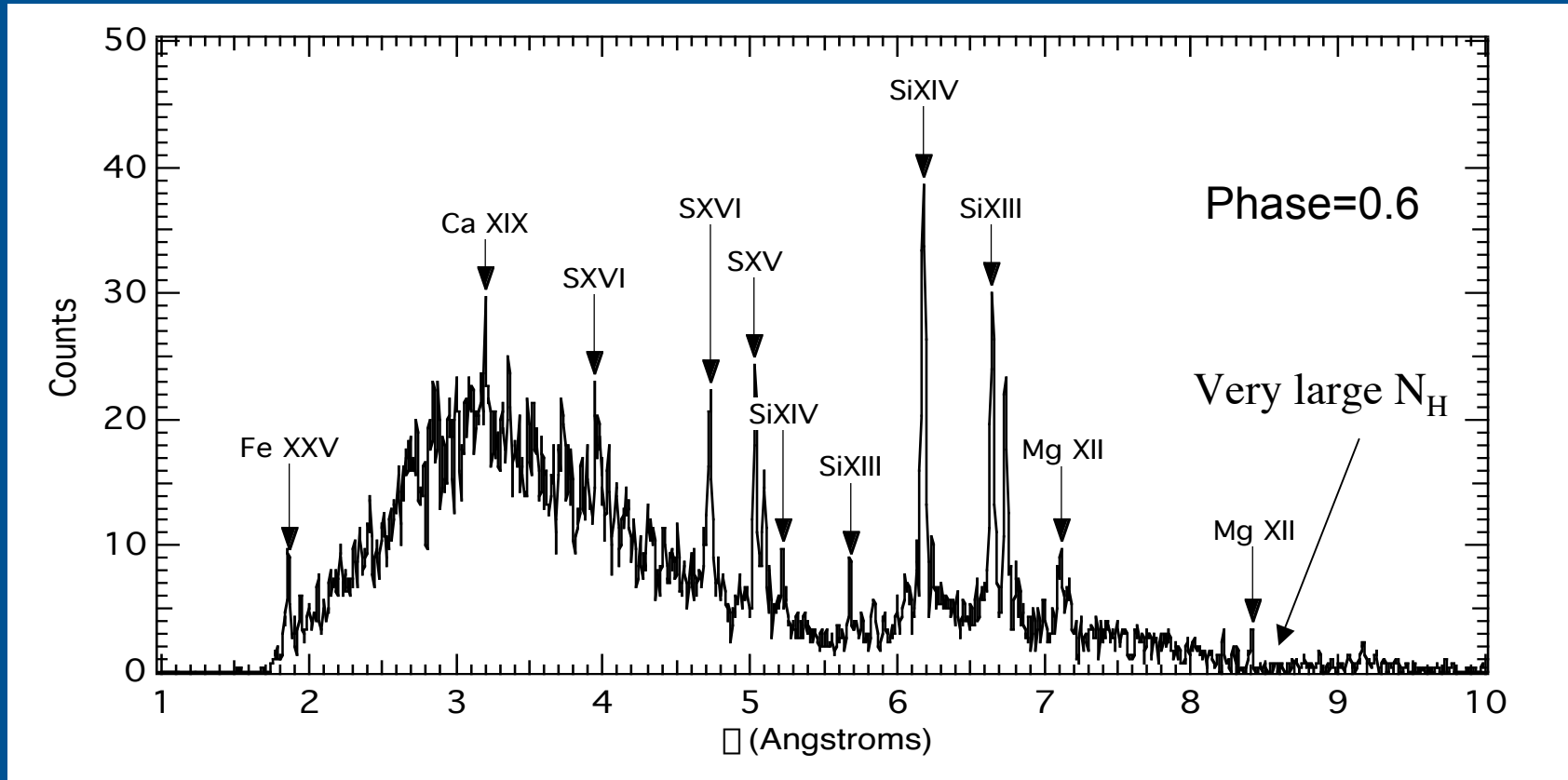


March 12, 2002 - unexpected brightening in 2-10 keV flux

- abnormally strong “flare”?
- starting “activity” stage sooner than in past cycle? (will it start “eclipse” sooner too?)

“Flare” has apparently ended but flux is still brighter than previous level!

The Chandra High Energy Grating Spectrum

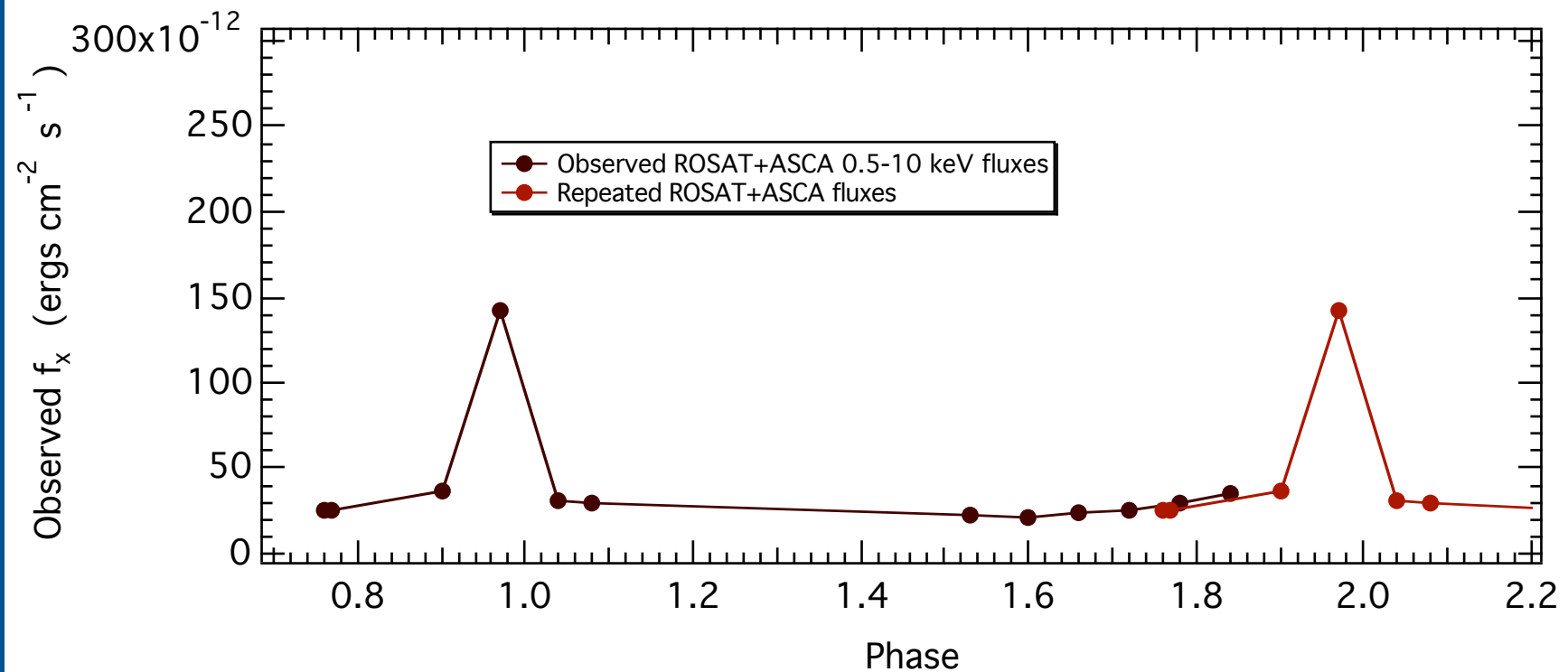


Corcoran et al., 2001; Pittard & Corcoran 2002 (see poster by Julian)

- Strong Lines (inc. Fe K thermal + fluorescence)
- Multi-T and high T (near 10^8 K) => measuring shocked wind of companion?

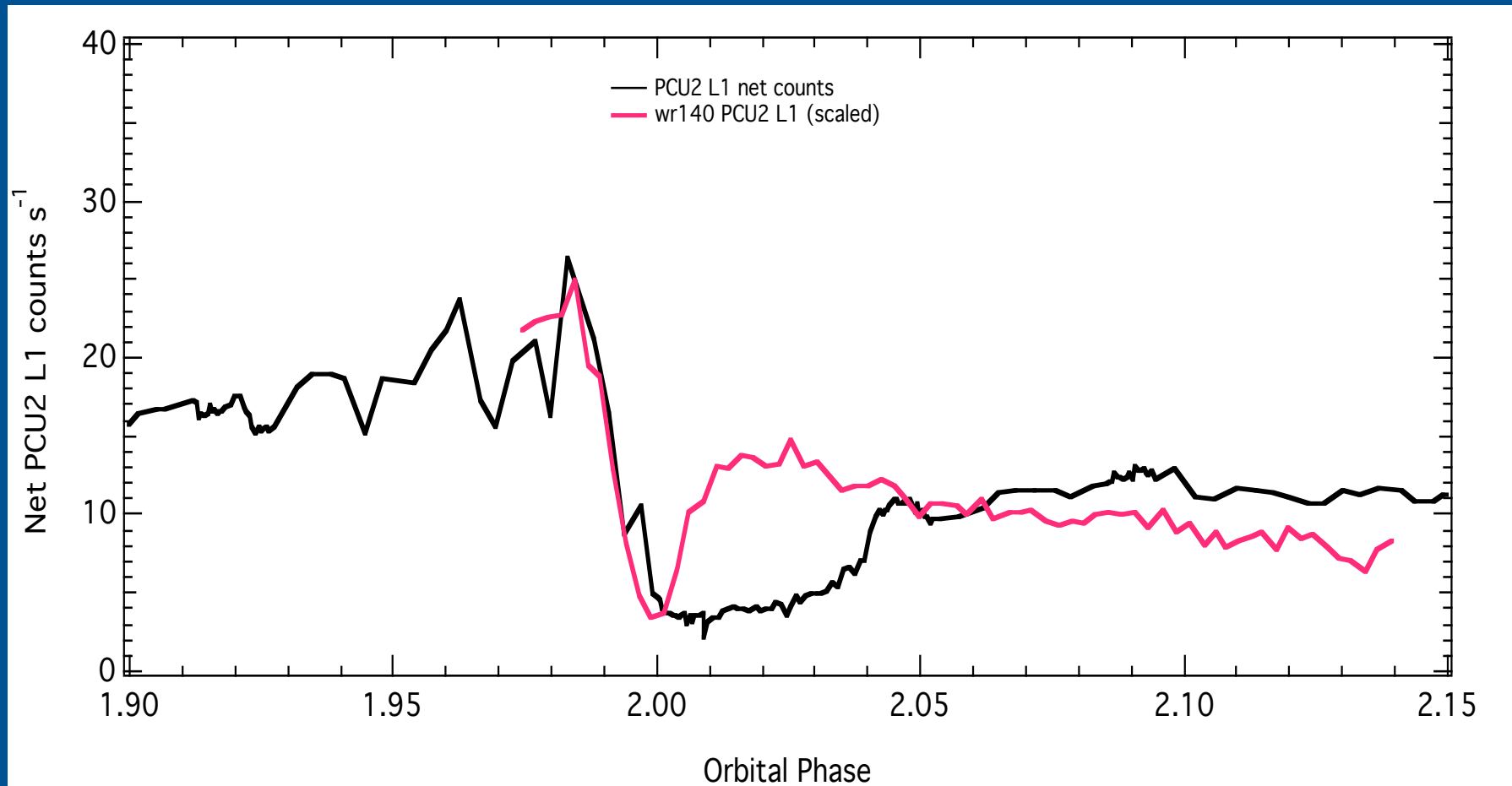
WR 140 X-ray Variability

WR 140 is a long period ($P=2900^d$) eccentric ($e=0.8$) WC7+O4-5 binary. It shows periodic dust formation (near periastron), strong radio variations, and strong X-ray variations.



RXTE observations near periastron (phase 2.0) show a rapid decline along with an X-ray “eclipse” similar to that in Eta Car

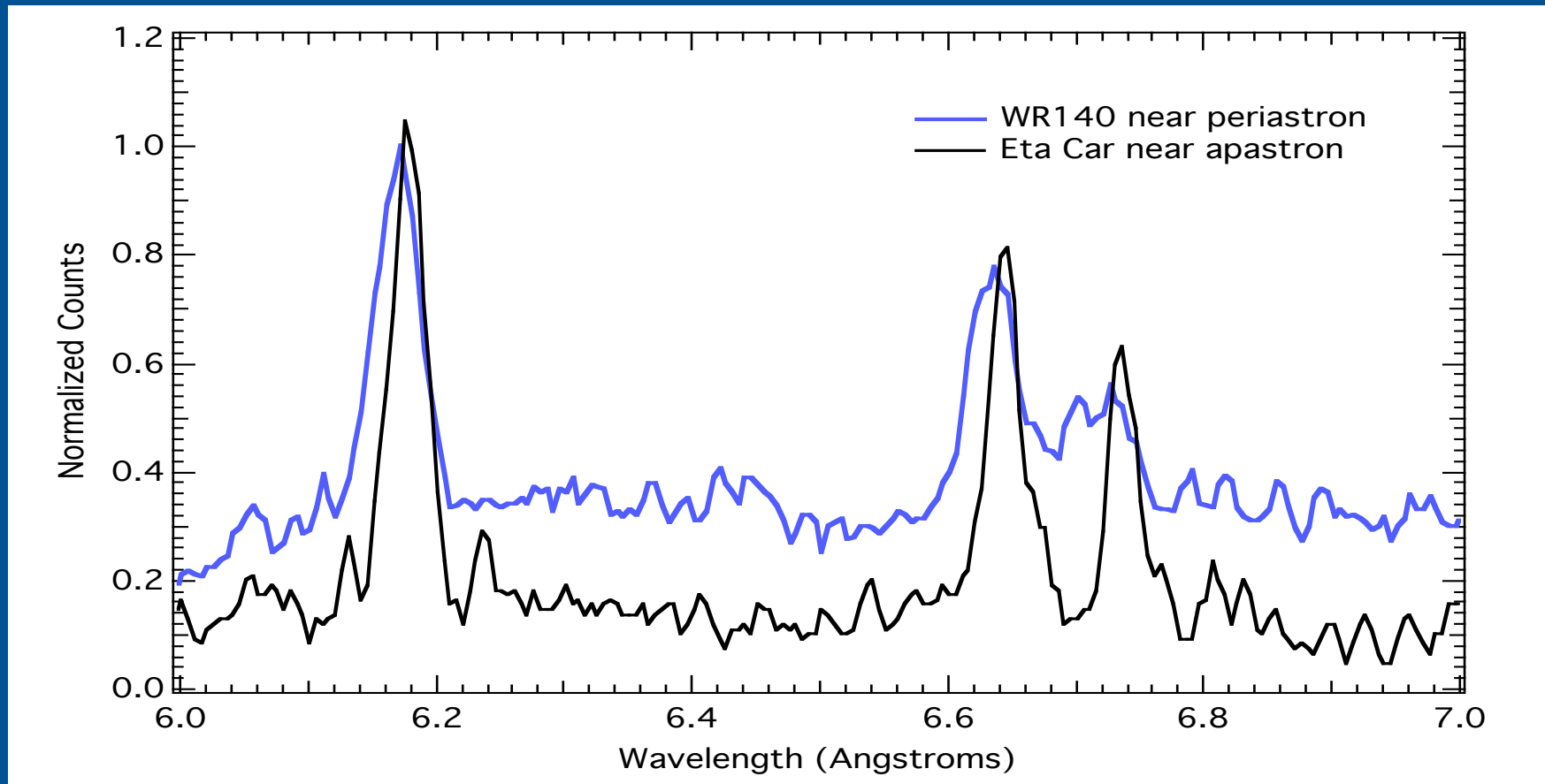
Direct comparison of WR 140 & Eta Car



Similarities: eclipse depth,
rate of decline,
asymmetry

Dissimilarities: width of
eclipse, rate of decline
after eclipse

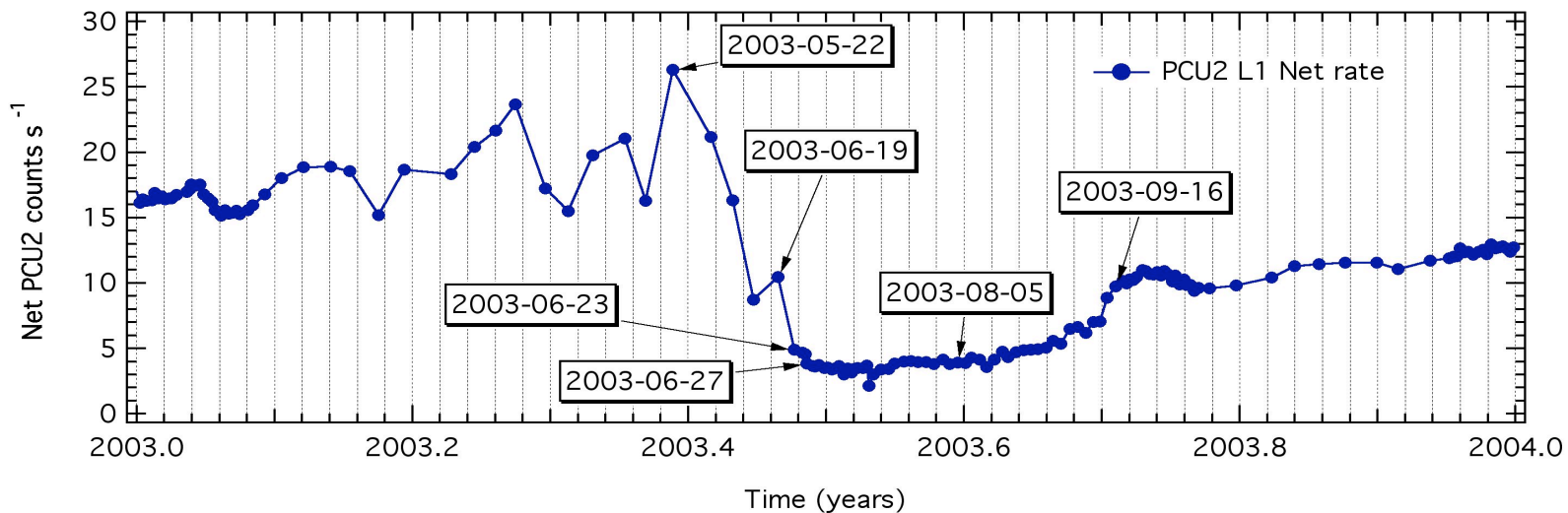
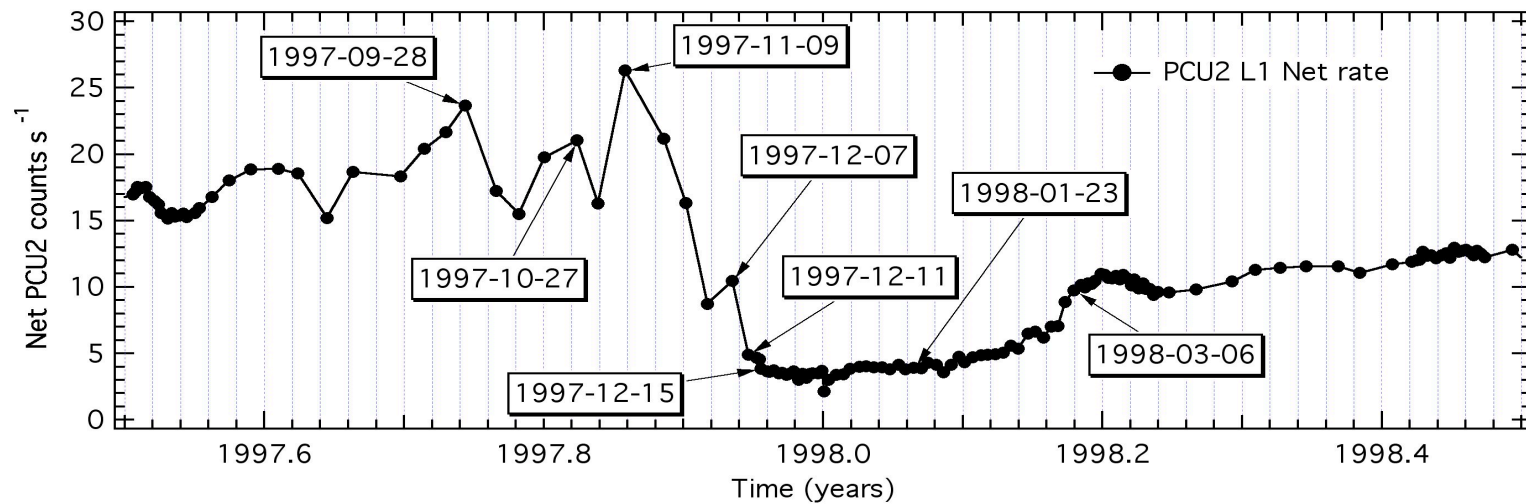
Eta Car And WR 140: Line shapes



WR 140: broad, blueshifted lines, low f/i ratio

Eta Car: Narrow, unshifted, large f/i ratio

Expected Behavior during the Next Event



The Fate of Eta Carinae?

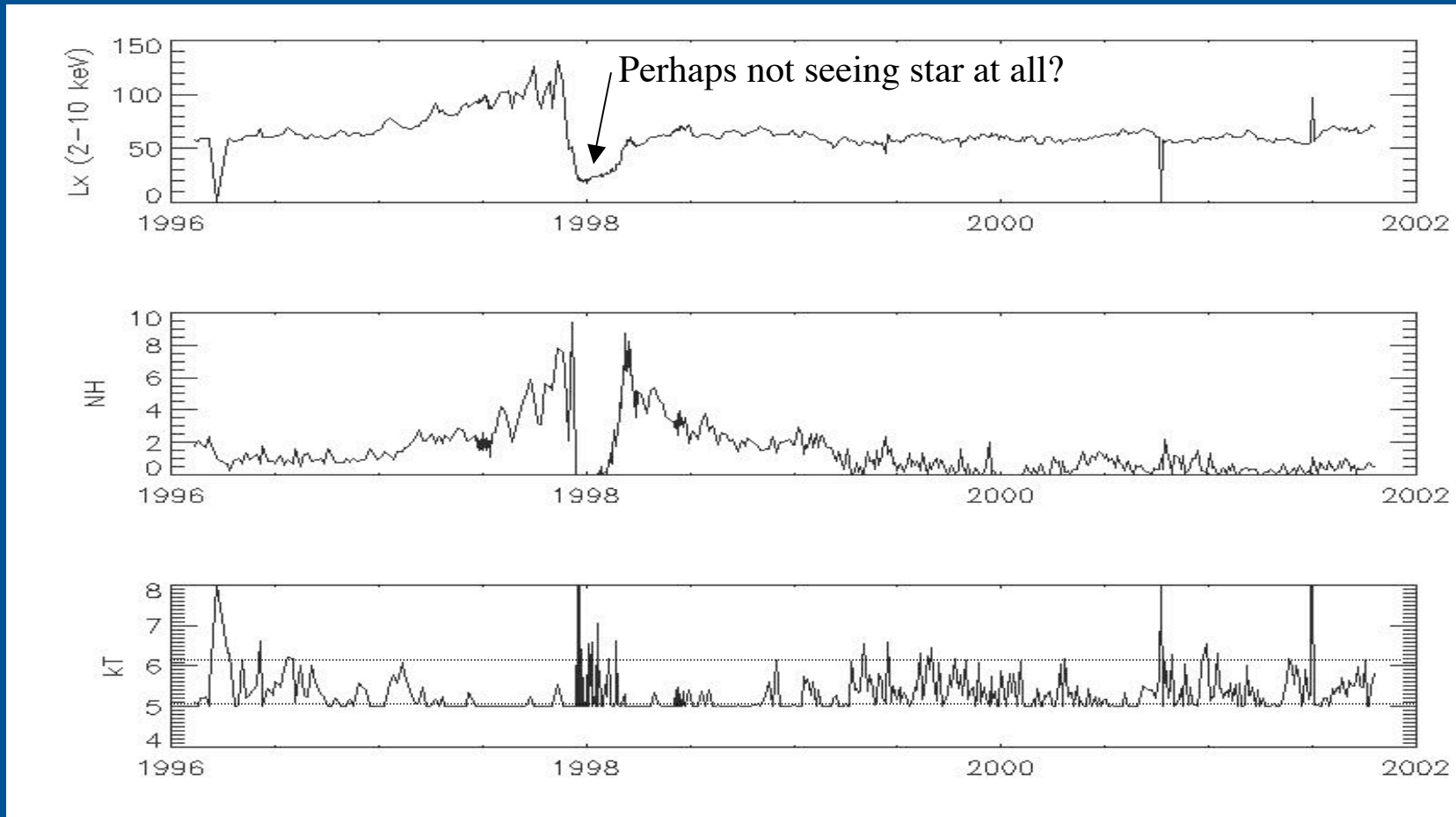


“They finally came together in a fearful last death grip, in the midst of thick clouds and tempestuous elements; they fell to the ground with such force that they shook the whole world.”

SPEELYAI FIGHTS EENUMTLA

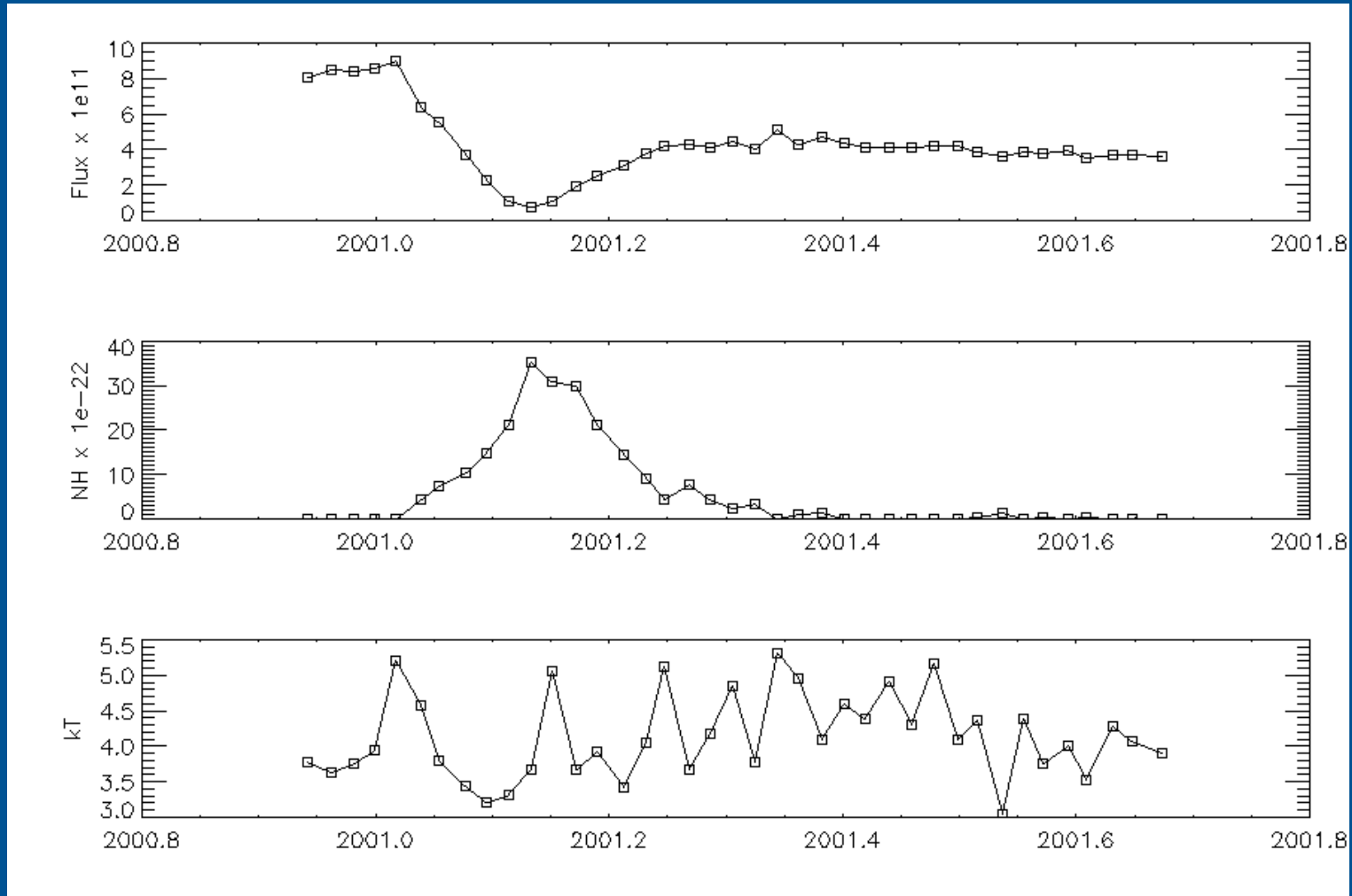
From: George Benson Kuykendall, 1889, in *History of the Pacific Northwest: Oregon and Washington*, Volume II, Part VI, Elwood Evans, North Pacific history company, Portland, Oregon, pp. 60-95.
Reprinted in: Clarence B. Bagley, 1930, "Indian Myths of the Northwest", Lowman and Hanford Co., Seattle, WA.

Spectral Variations - Eta Car



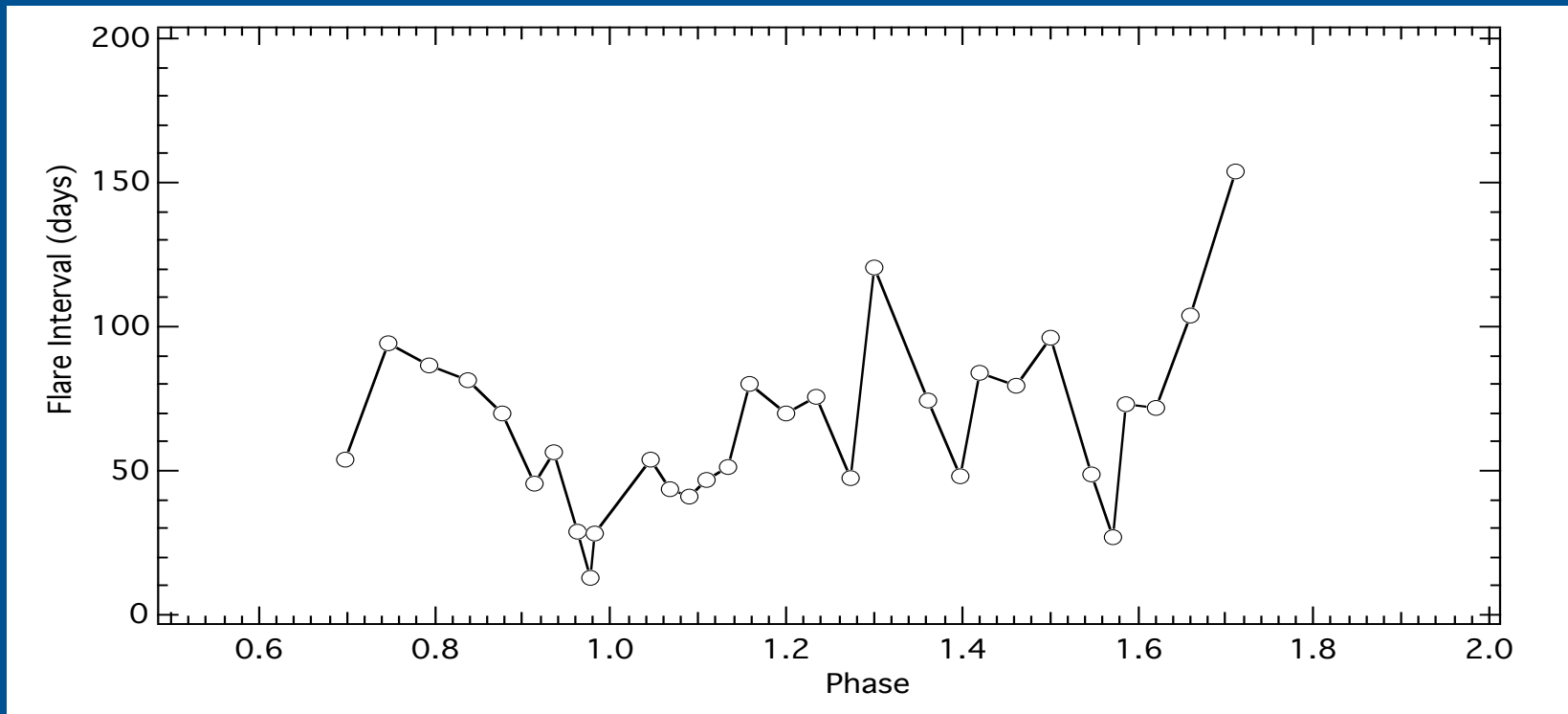
Using absorbed 2-T Mekal model based on Chandra Spectrum

Spectral Variations - WR 140



Using 1-T Bremsstrahlung model

“Flare” Timings



Gradual shortening of flare interval on approach to periastron?

“In a broad class of models, the 85-day recurrence interval is predicted to lengthen drastically in 1998 after the two stars pass periastron”, (Davidson, Ishibashi & Corcoran, 1998, NewA, 3, 241)