INTEGRAL monitoring of OAO 1657-415: Gamma Ray tomography of a B supergiant

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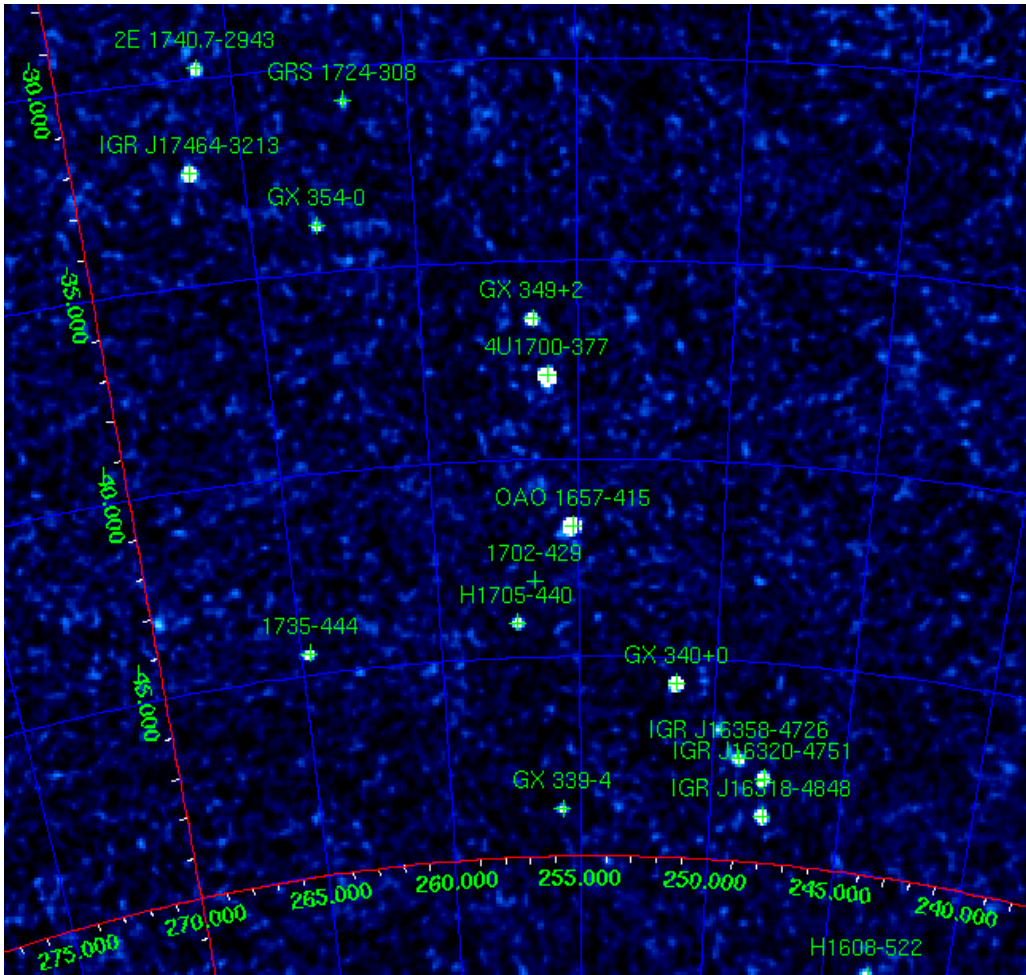


OAO 1657-415

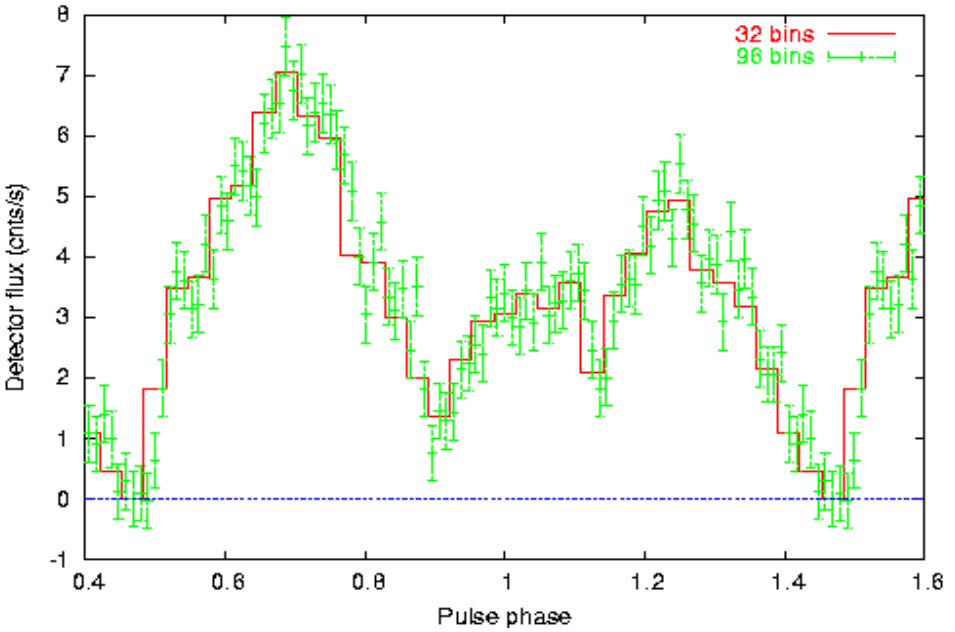
- Discovered by Copernicus (Polidan 1978)
- Wind powered
- Eclipses found by BATSE (Chakrabarty et al. 1993) P=10.44 days
- Companion - unidentified probably OB giant
- Pulse period variability stochastic: changes on 10-200 day scale
- Pulsed flux in BATSE 20-50 keV range 0.4 10^{-9} erg cm^{-2} s^{-1}
- Distance ~ 6.5 kpc
- Spectrum PL with a cutoff at 16-20 keV, absorbed at low energies
- Beppo SAX indicates probable cyclotron line at approx 35-40 keV

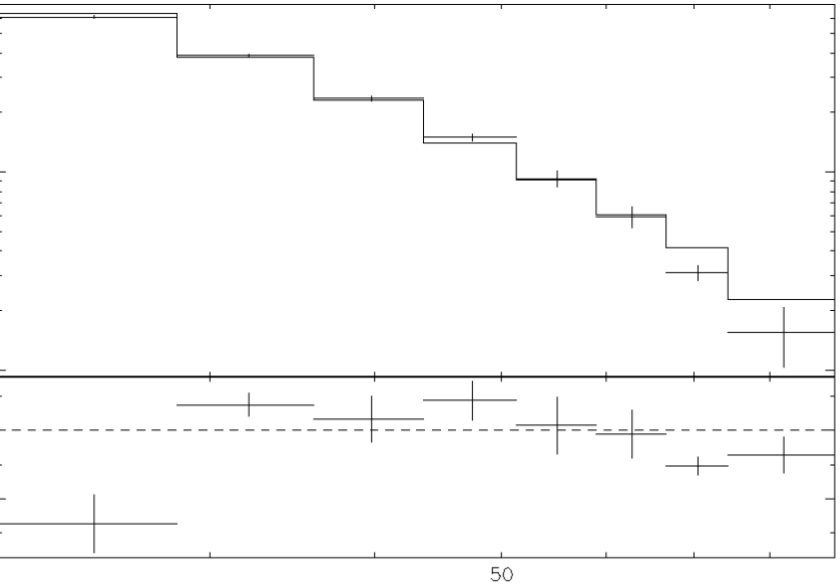
Properties:

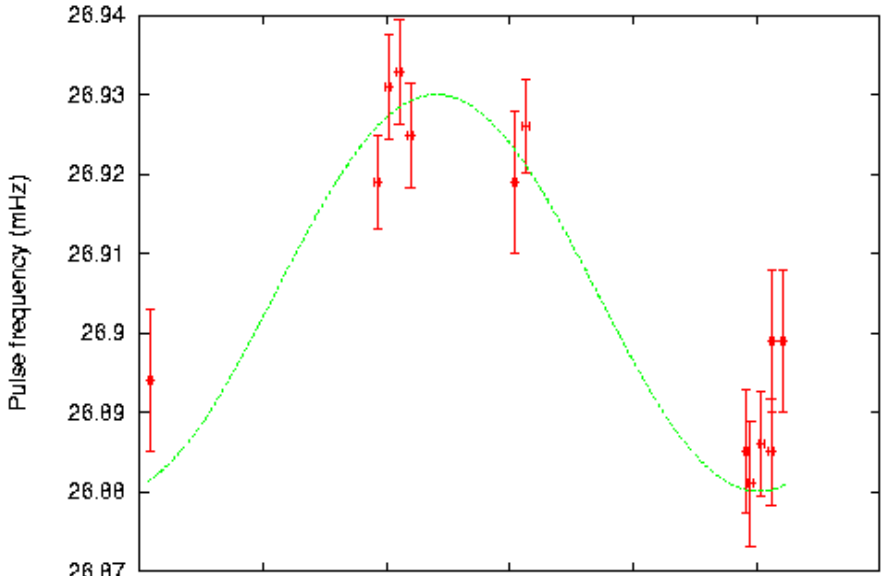
ulse period 37.41 s

iming residuals

pectrum
T = 31.6 ± 0.9 keV







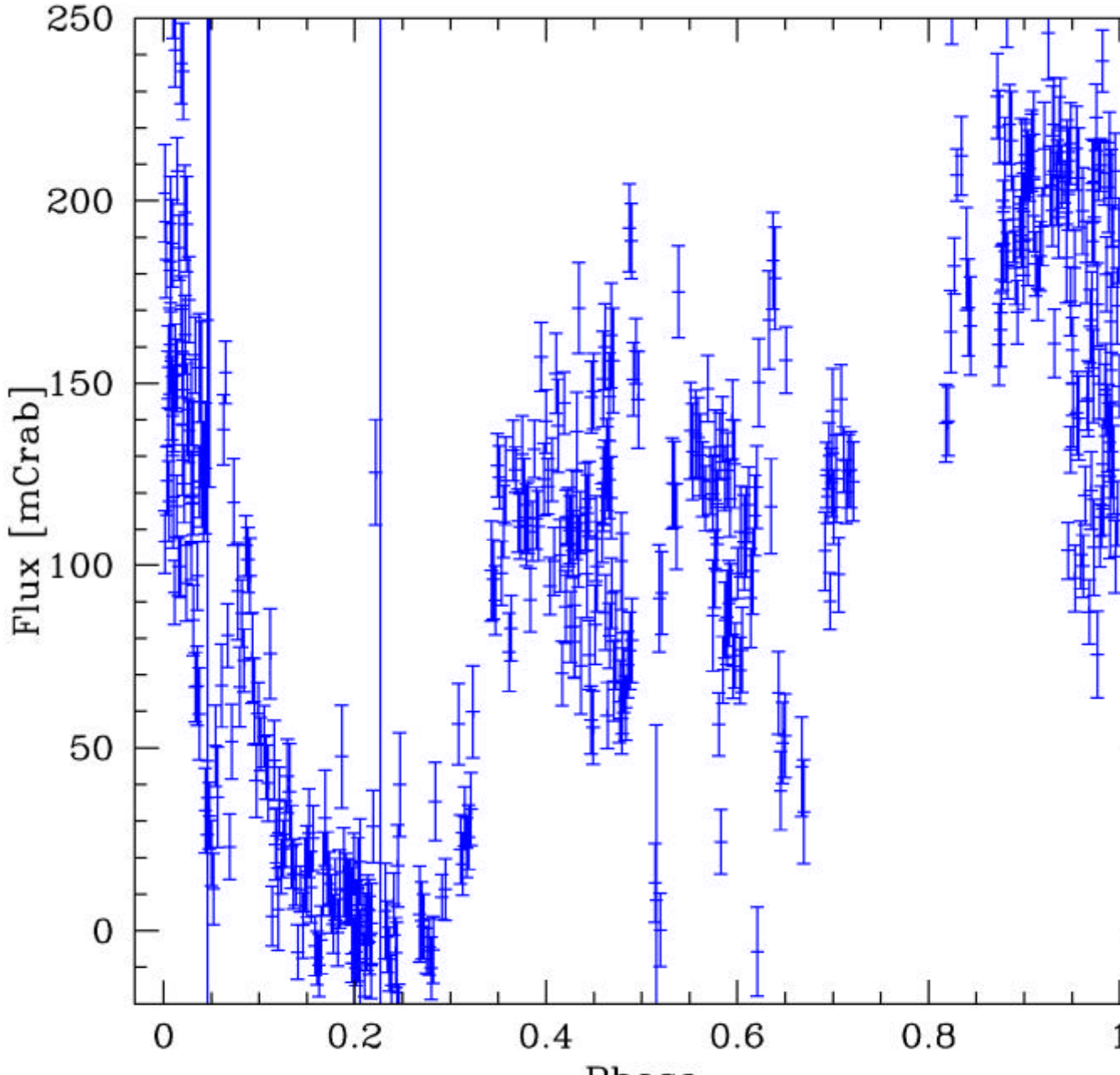
olded Lightcurve

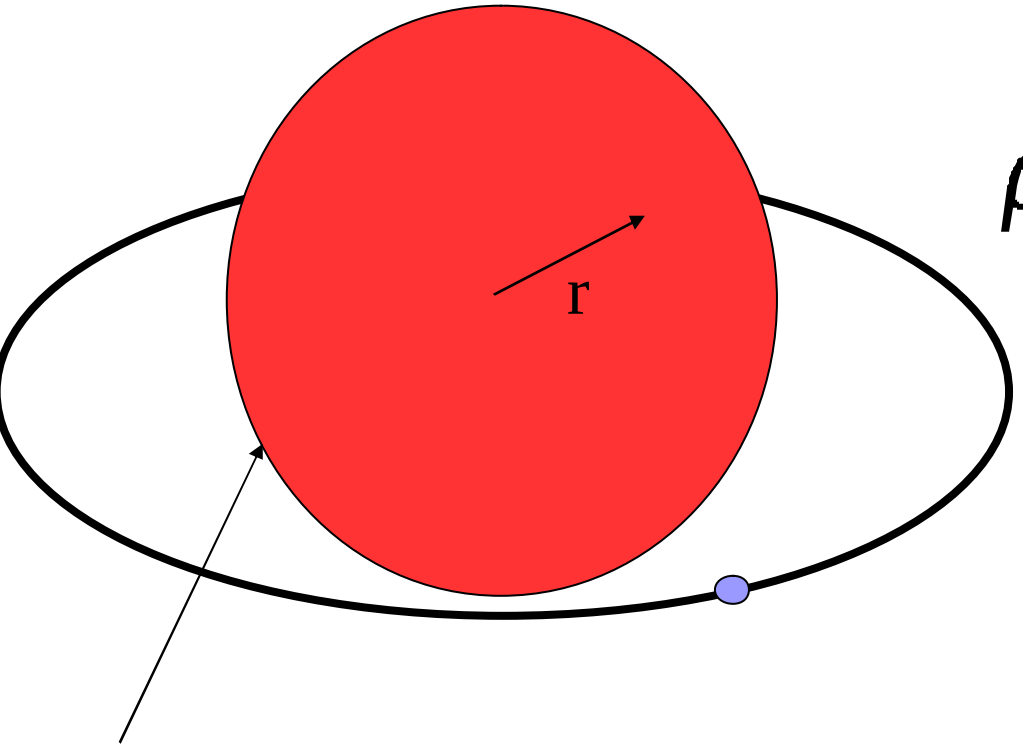
480 ScW's

Normalized to Crab, v.170

most off axis

Gradual – not sharp clipse





$$\rho(r) = \rho_0 (r/r_0)^{-}$$

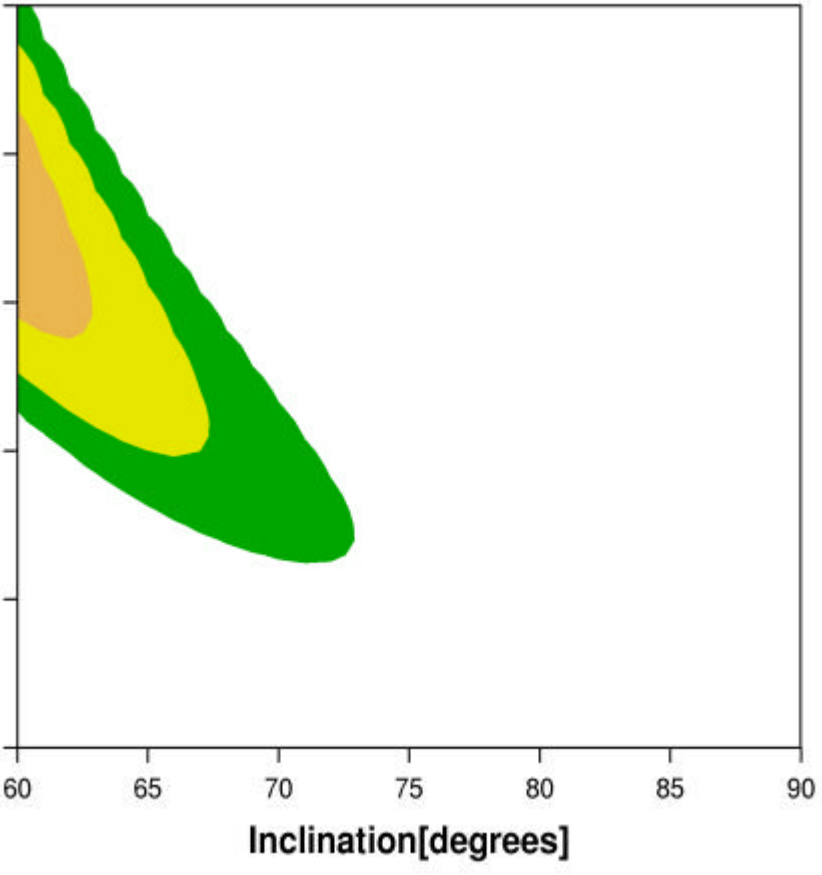
$$F = F_0 e^{-\sigma_T \int \rho(r)}$$

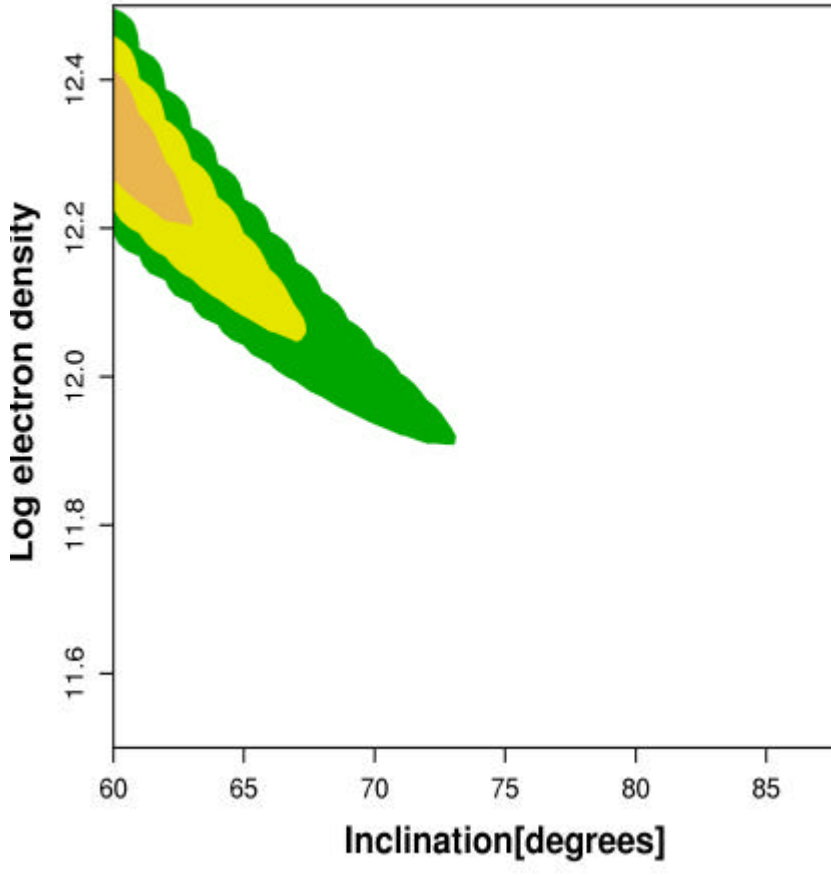
Diffuse edges

Photons in the 20-40keV range

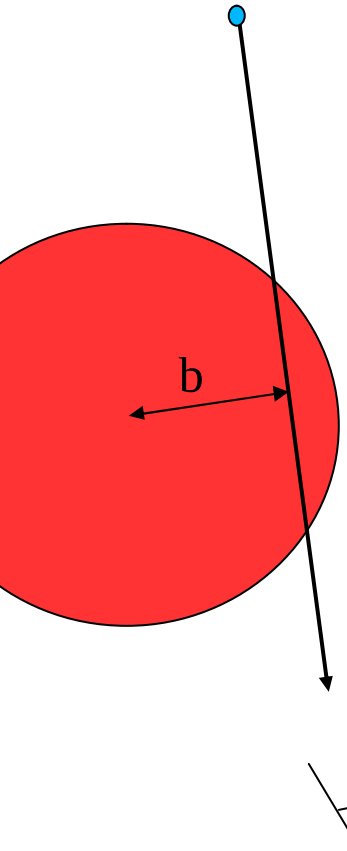
Compton scattering in the atmosphere

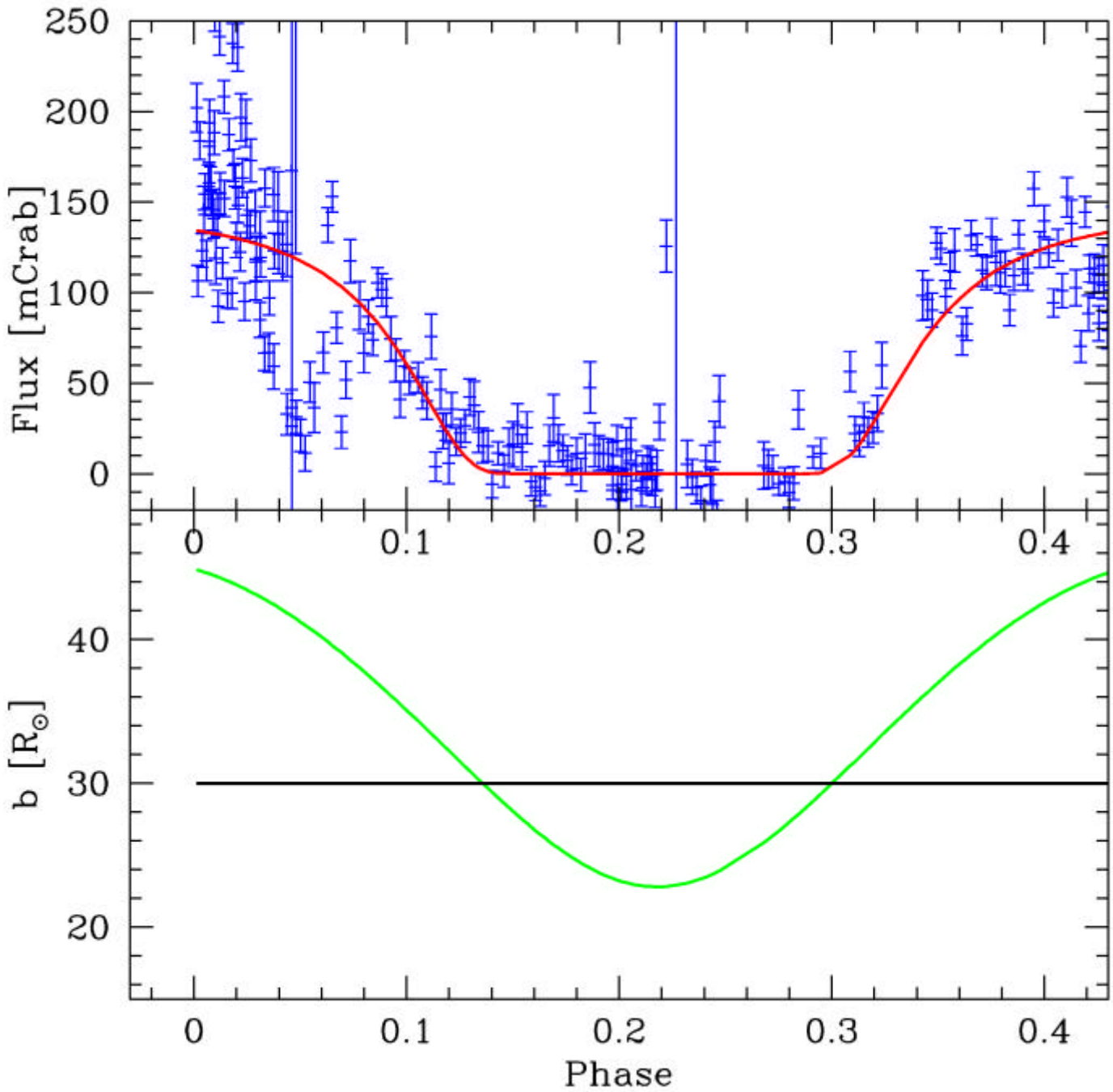
Inclination >60 degrees





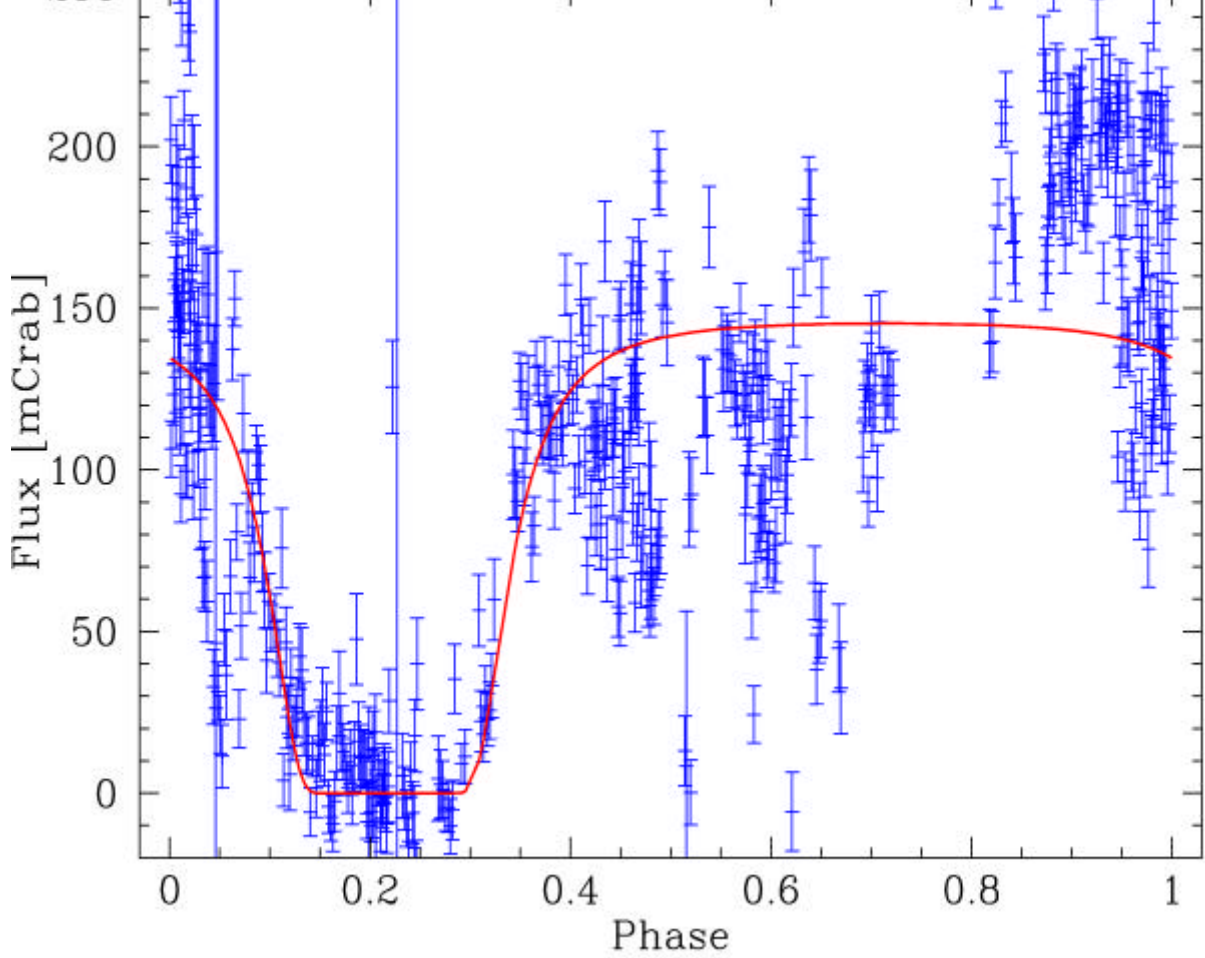
$$\rho = 10^{12.3 \pm^{0.30}_{0.15}} \left| \frac{r}{30 R_{sun}} \right|^{-8.5 \pm^{1.5}_{1.3}} cm^{-3}$$





robing the outer
8 solar
dii of the
supergiant

Gamma rays allow to probe the structure of the companion star!



Stellar wind acceleration? $v \sim r^{6.5}$

Light curve between eclipses -structure of the stellar wind?

Predictions:

Spectral dependence of the eclipse shape: low energy observations: JEM-X monitoring required