

Pulse profile decomposition of A0535+26

Isabel Caballero
CEA Saclay

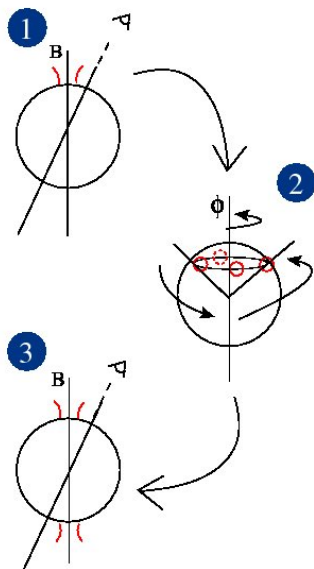
U. Kraus, A. Santangelo, M. Sasaki, P. Kretschmar

CRSF Meeting
Tübingen 30 March 2010

Decomposition analysis (Kraus et al. 1995)

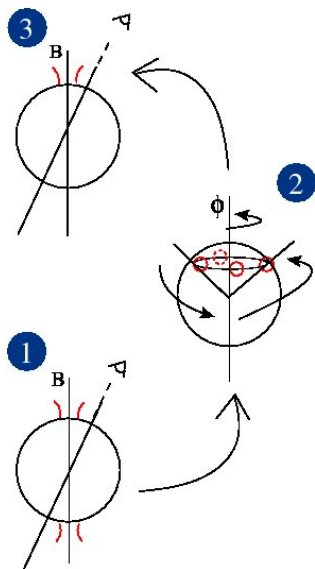
Pulse profile formation

- 1 model emission of *beam pattern*
- 2 rotation \Rightarrow *single-pole pulse profile*
- 3 add two poles to obtain *total pulse profile*



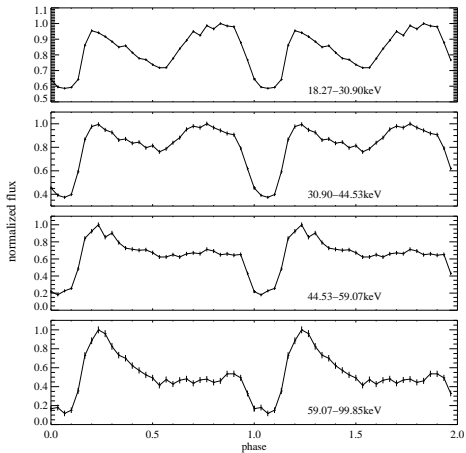
Decomposition analysis: backwards process

- 1 observed pulse profile \Rightarrow decomposition in two single-pole pulse profiles
- 2 single-pole pulse profiles \Rightarrow reconstruct beam pattern
- 3 interpret beam pattern in terms of emission model

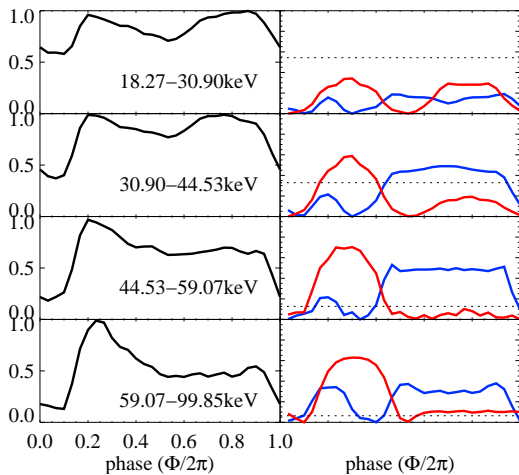


Application to A0535+26 pulse profiles

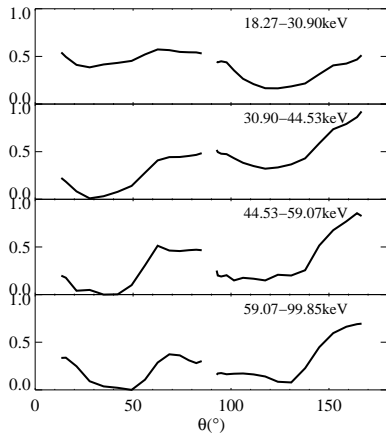
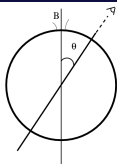
RXTE HEXTE pulse profiles (2005 normal outburst)



Best decomposition



Reconstructed beam pattern

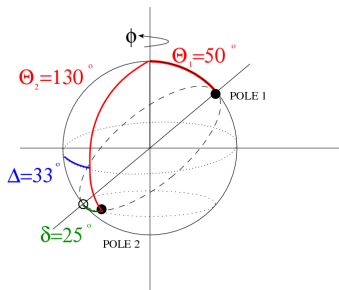


Geometry:

Location of the poles:

$$\Theta_1 \sim 50^{\circ}, \Theta_2 \sim 130^{\circ}$$

$$\delta \sim 25^{\circ} \text{ offset}$$

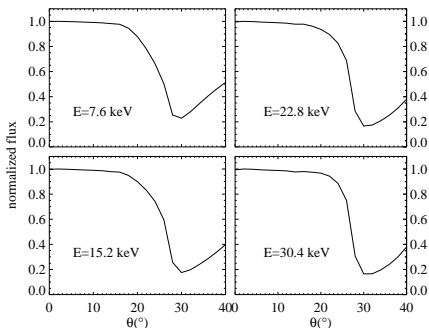
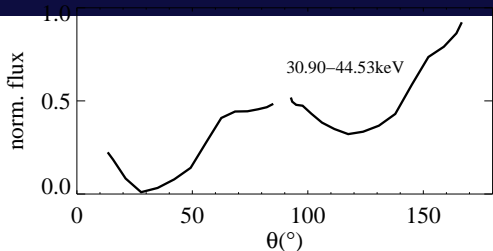
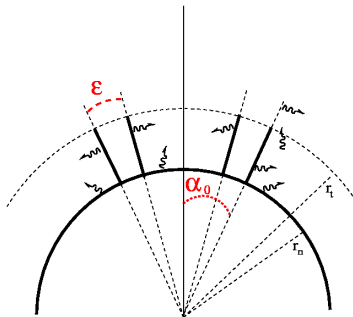


Interpretation of beam pattern

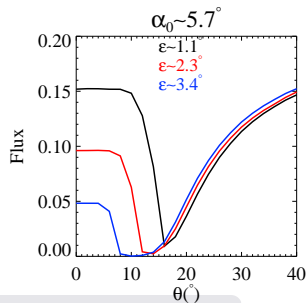
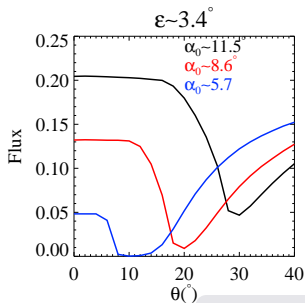
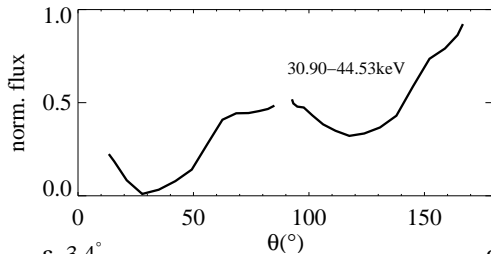
Geometrical model

Hollow column

Thermal halo (scattered radiation at NS surface)



Interpretation of beam pattern



Best guess: $\alpha \sim 11.5^{\circ}, \epsilon \sim 3.4^{\circ}$

Conclusions

- Possible decomposition of energy dependent pulse profiles, constraints on neutron star geometry:
Location of the poles: $\Theta_1 \sim 50^\circ$, $\Theta_2 \sim 130^\circ$
Poles $\delta \sim 25^\circ$ apart from antipodal position
- Possible solution for the beam pattern
- Interpretation of beam pattern in terms of geometrical model of hollow column that includes the formation of a halo of scattered radiation on the neutron star surface

Caballero et al. 2010, to be submitted