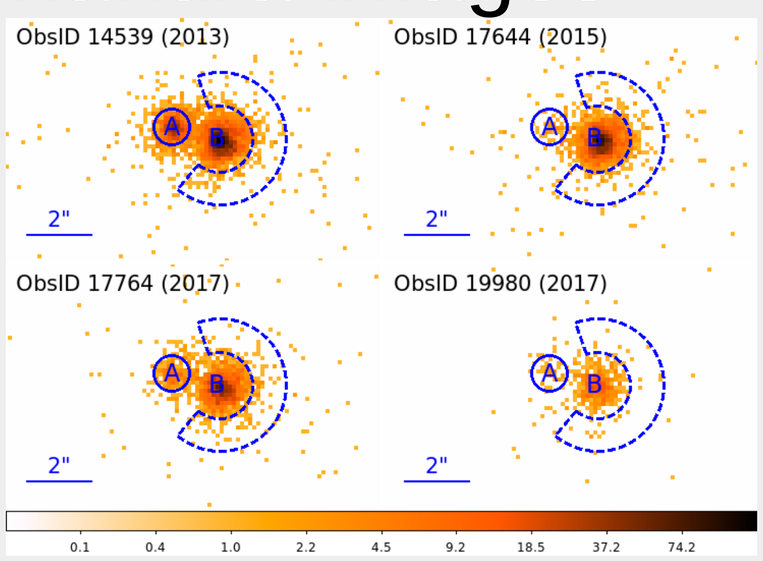
RW Auriga: Iron rich corona and high absorbing column density

Hans Moritz Günther (1); T. Birnstiel (2); D. P. Huenemoerder (1); D. A. Principe (1); P. C. Schneider (3); S. J. Wolk (4); Franky Dubois (5, 6); Ludwig Logie (5, 6); Steve Rau (5,6); Sigfried Vanaverbeke (5,6,7)
(1) MIT (2) LMU (3) Hamburger Sternwarte(4)Harvard-Smithsonian Center for Astrophysics (6)Astrolab IRIS, (6)Vereniging voor Sterrenkunde (7) University of Leuven

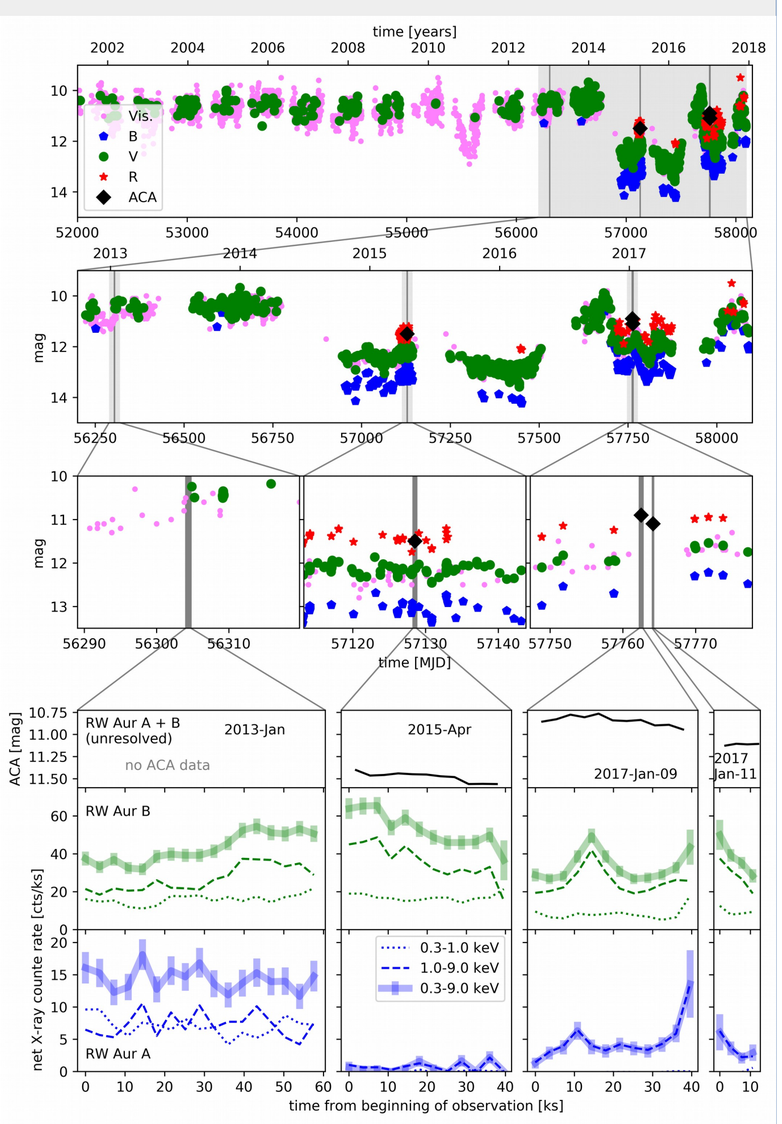
RW Aur A

- Phsically bound with RW Aur B (semi-major axis 200 au)
- Age: 10 Myr
- Distance: 140 pc
- Mass: 1.4 solar masses
- Active accretion disk

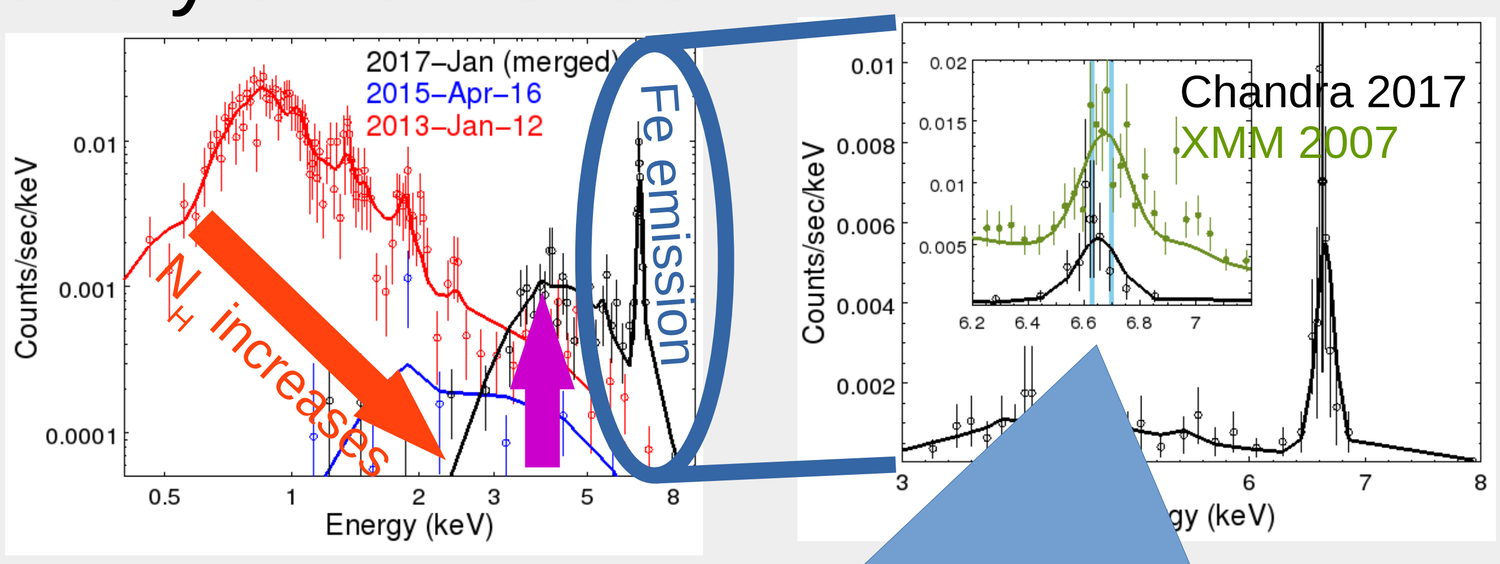
Chandra images



Optical and Chandra lightcurve



Chandra spectra: Vastly different every time we look



Green: hot plasma (here: flare on RW Aur) **peaks at 6.7 keV**
Black: **Fe feature peaks at 6.63 +/- 0.03 keV**
→ Relatively cool plasma with high Fe abundance

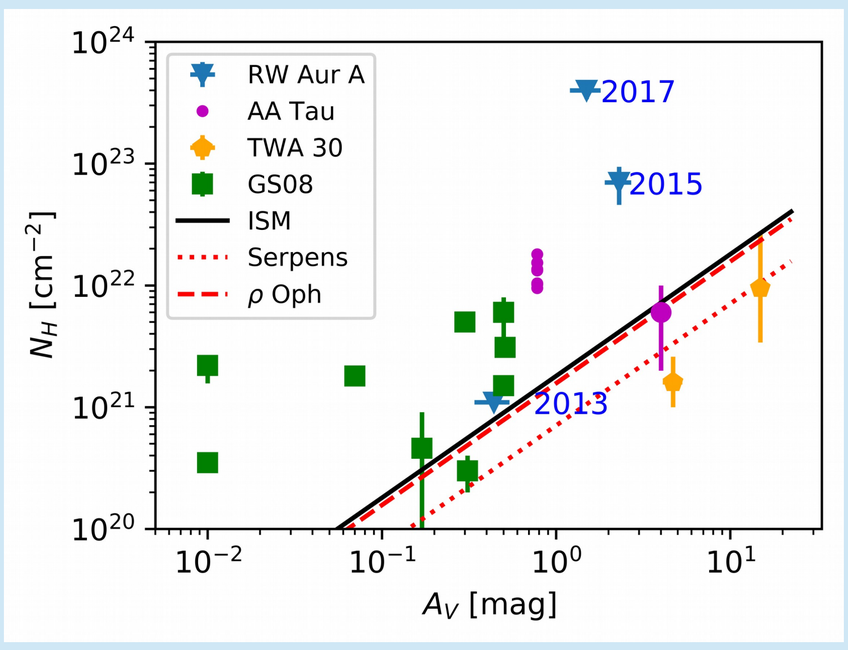
In the spectrum we observe: between 2013 and 2017

- emission at high energies multiplies
- absorbing column density N_H increases from $1*10^{21}$ to $4*10^{23}$ cm^{-2}
- Fe abundance in corona increases from 0.5 to 15 times solar

We infer a large supply of Fe rich, large grains in the inner disk.

Absorber

- Optical extinction is gray → thick absorber or large grains
- N_H/A_V skyrockets: gas rich absorber? (or at least non-ISM grains)



Where does it come from? Ideas:

1) Break up planet(esimal) with Earth-like Fe core (e.g. due to collision).
2) Collect dust in dust trap, then release due to some massive disturbance in the inner disk.

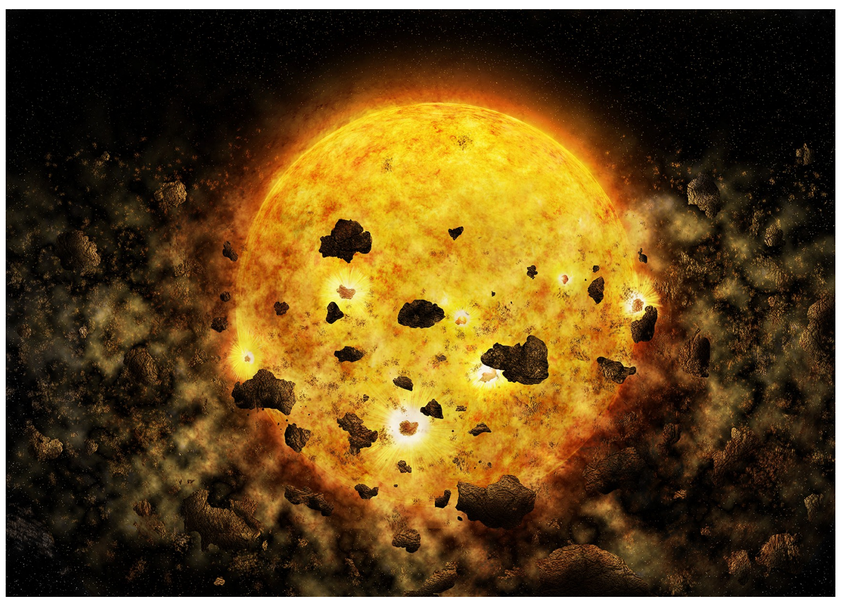


Image credit: NASA/CXC/M. Weiss

Published in:
Günther, Birnstiel, et al.
AJ 156, 56 (2018)