An optical and X-ray view of the changing look AGN HE 1136-2304

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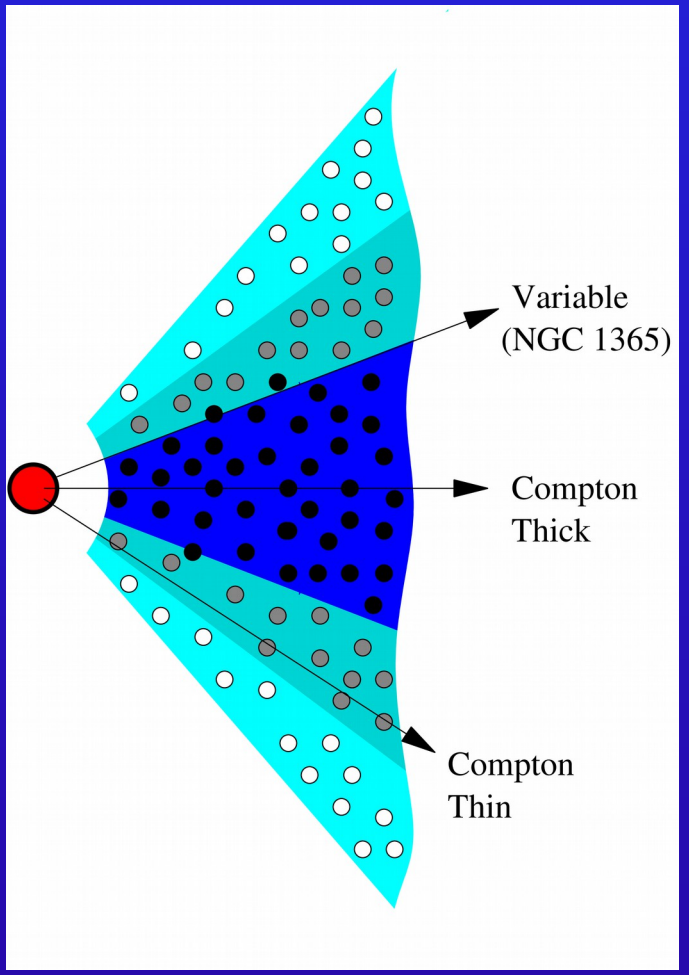
Changing look AGN

Changing look AGN:
- strong X-ray variations.
- one idea: X-ray variability due to variabel column density. A Compton-thick AGN becomes Compton-thin and vice-versa (on time scales of weeks to months): Compton thickness associated with dust torus?

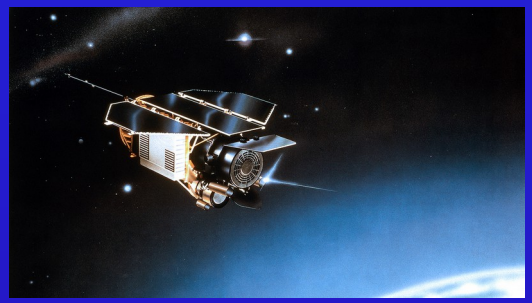
Guainazzi et al., 2002

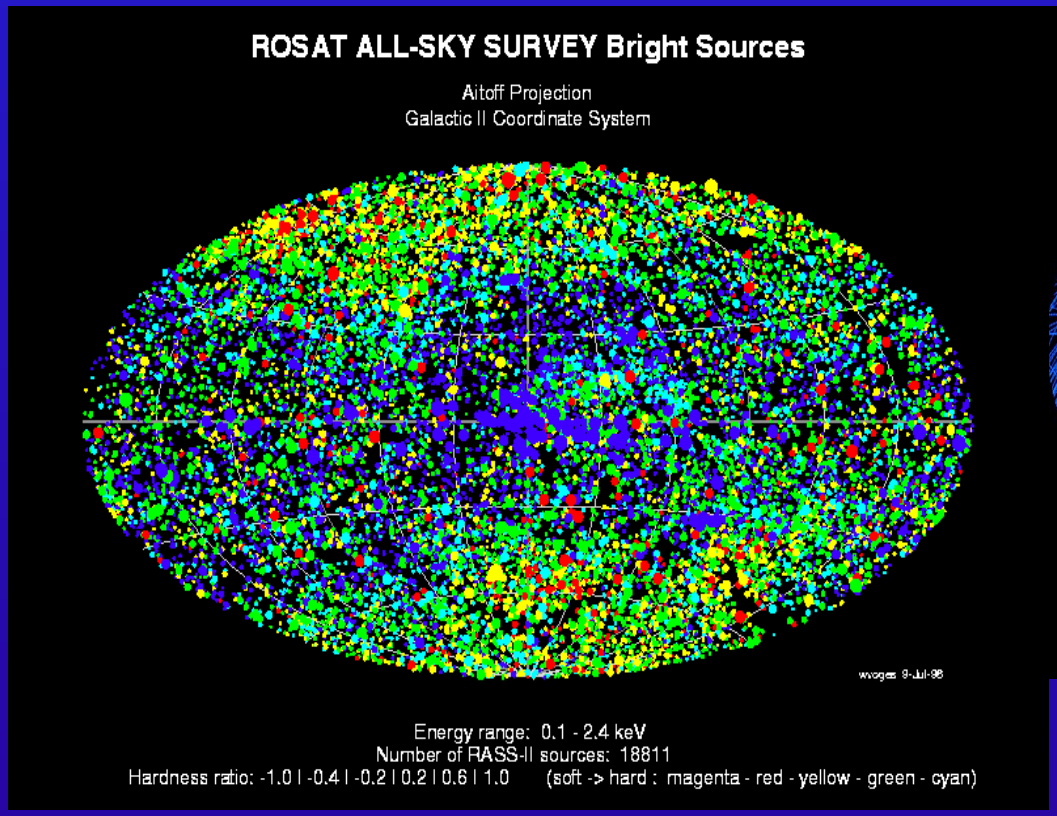
- or variability connected with accretion rate.
- optical spectra of AGN move to different Seyfert classifications.



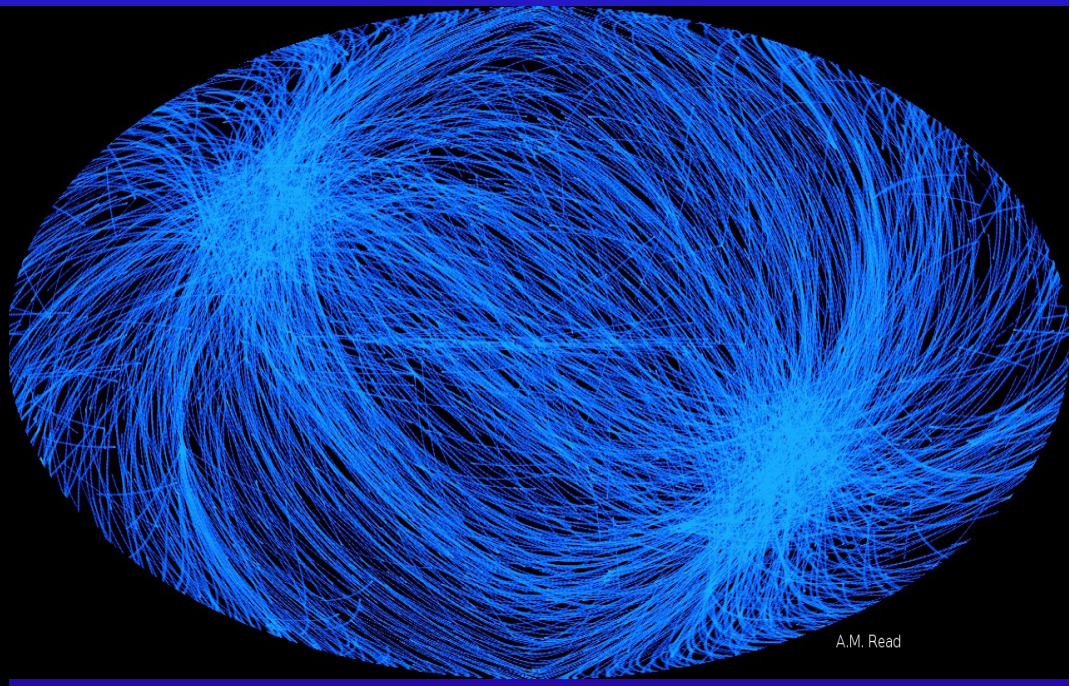
Risaliti et al., 2006

X-ray variability: ROSAT All-Sky Survey, XMM-NEWTON Slew Obs.



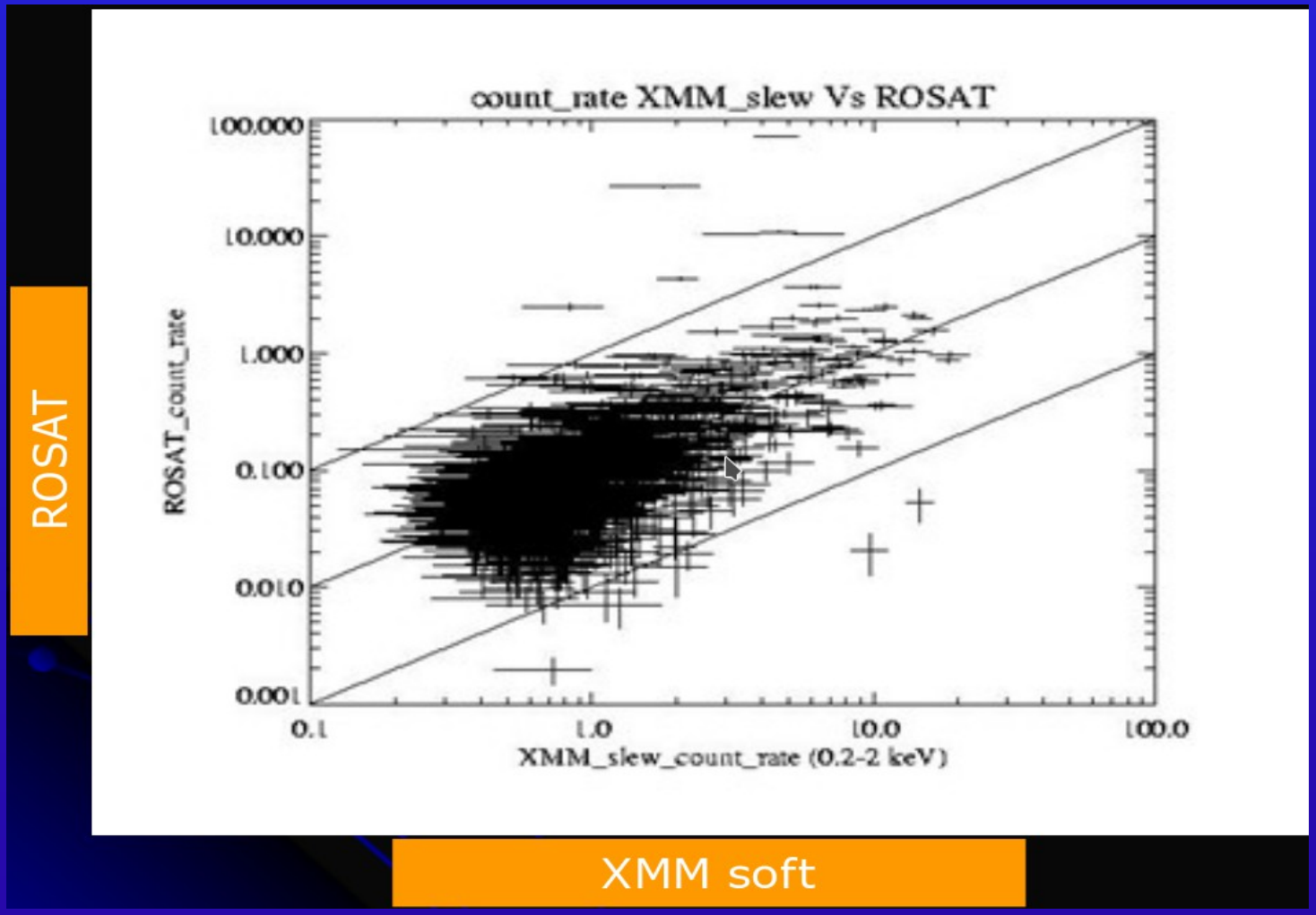


RASS performed 1990/91



- XMM performs slewing maneuvers between targets with the EPIC cameras open
- open-slew speed = 90 deg/hour, i.e. on-source time ~ 14 sec
- area covered to date > 60% of sky

Correlations XMM-slew survey with ROSAT



Mean XMM/ROSAT count-rate ratio . If deviations > 10: strong X-ray variability

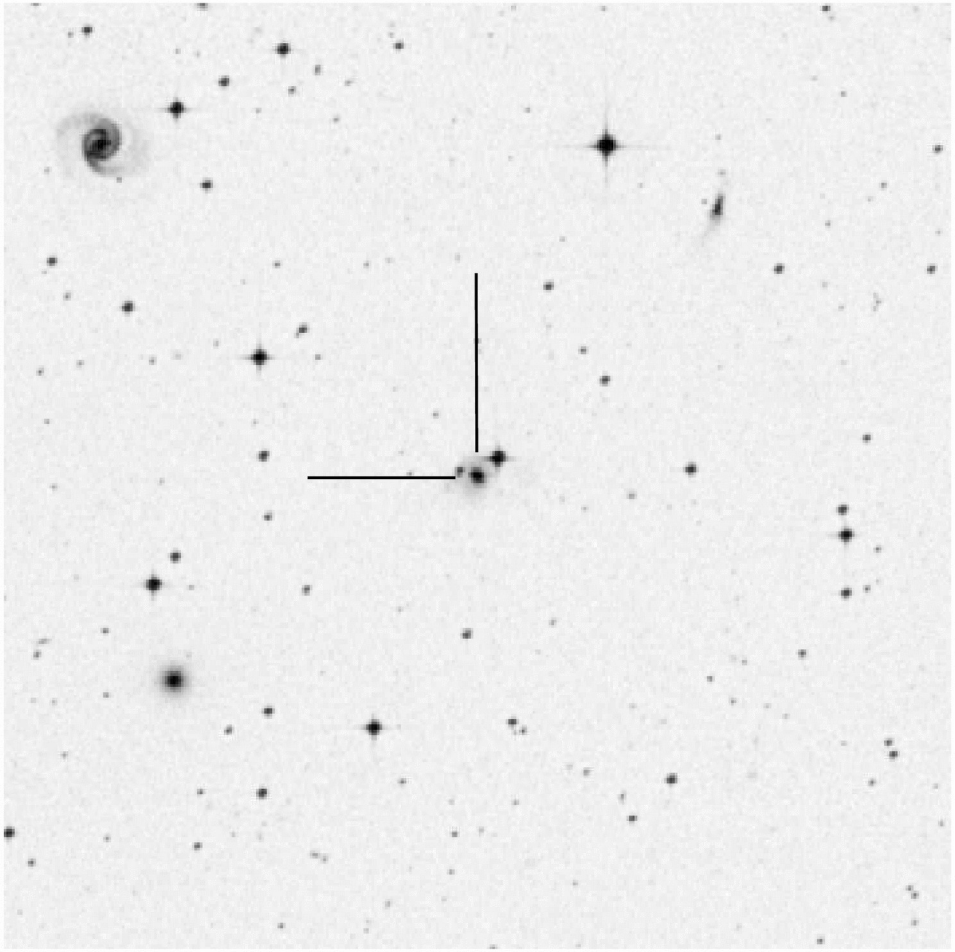
M. Pilar Esquej et al., 2006

Changing look AGN program

Program of Norbert Schartel (ESA):

- Search for flaring X-ray AGN within XMM Slew Survey: Source flux should be in excess of 10 -15 times the flux observed with ROSAT.
- Outburst of HE1136-2304 detected in 2010 : flux ratio of 13.3
- Follow up observations with Swift in 2014: flux ratio 15 – 29
- And deep follow up XMM observations in 2014
- simultaneous optical spectral analysis in 2014

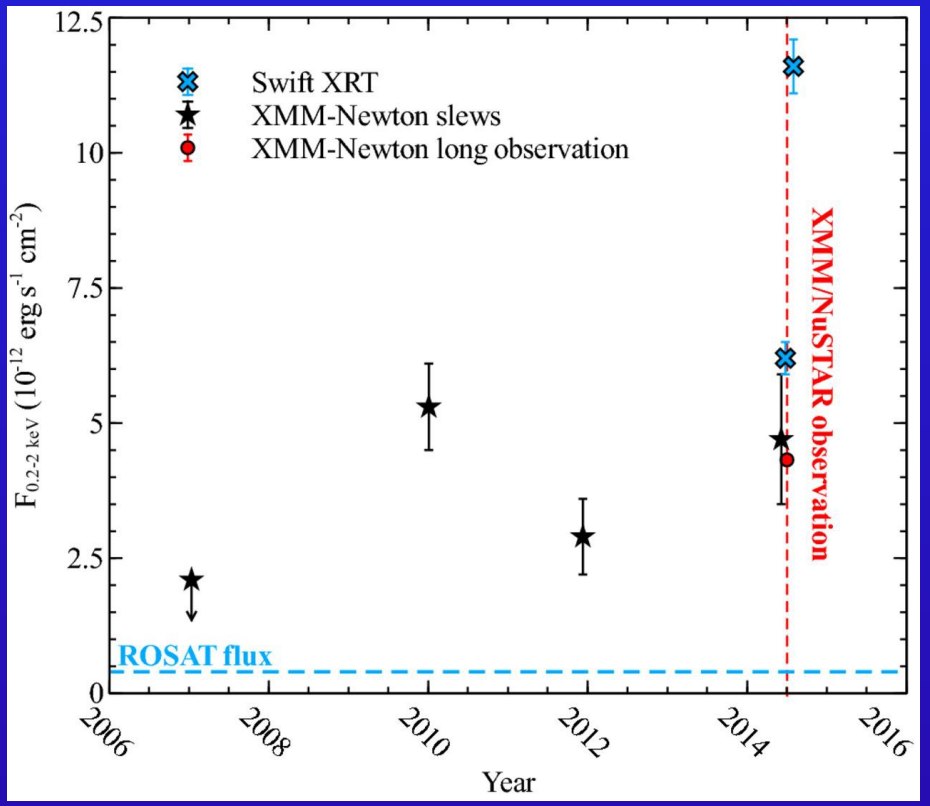
Optical image of HE 1136-2304

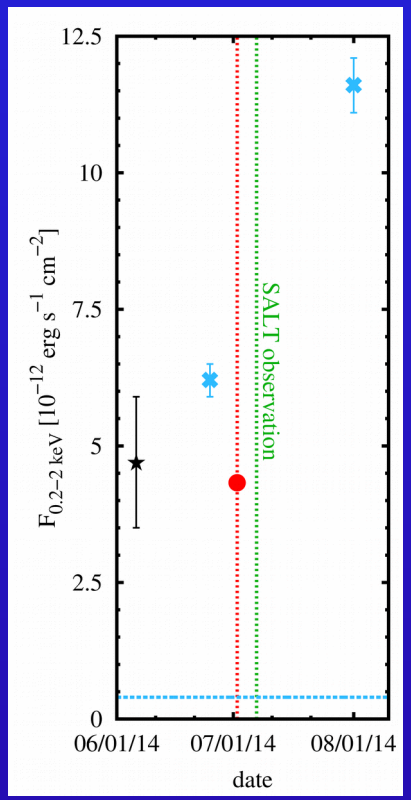


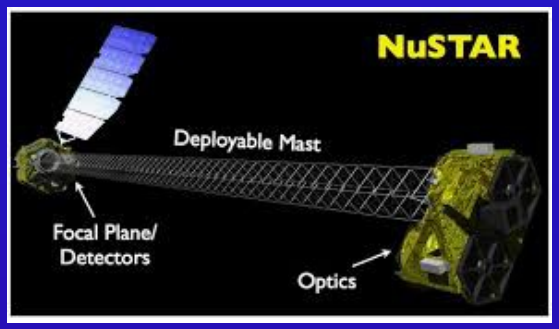
ESO/SRC image

- z = 0.027 (115 Mpc)
- app. mag : $m_v \sim 17.2$
- abs. mag : $M_v = -18.$

X-ray light curve of HE 1136-2304 (1990, 2007 - 2014)



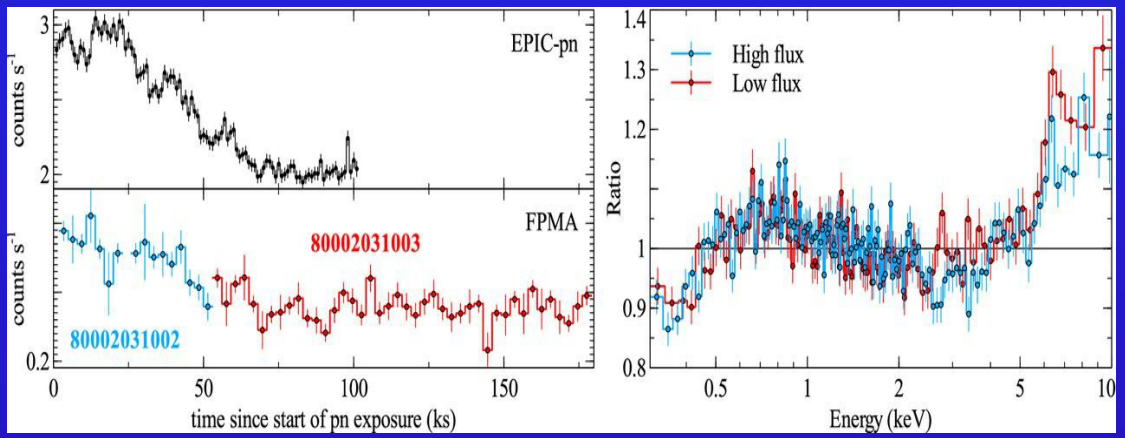




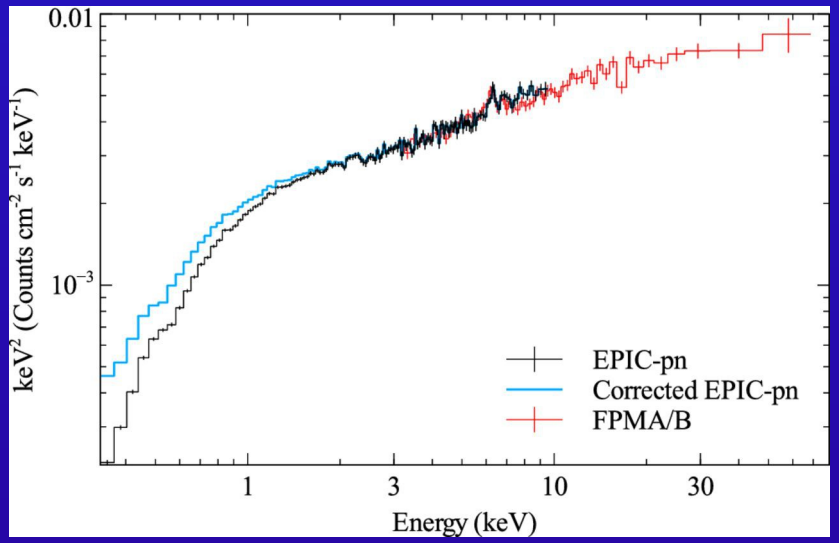
X-ray light curve from 2007 to 2014. The 1990 ROSAT flux is shown by the horizontal dashed line. Time of deep XMM+NuSTAR and optical SALT observations is shown by the vertical dashed lines.

Parker, Komossa, Kollatschny et al., 2016

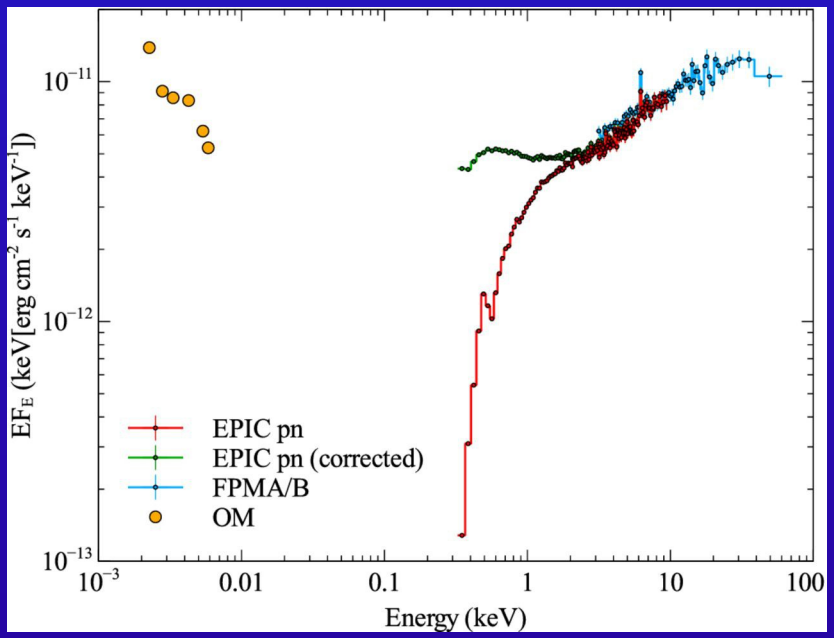
X-ray spectrum, short term variations of HE 1136-2304



Short term X-ray variations (XMM/NuSTAR) on 2014-07-02: 30% drop in 100 ksec.

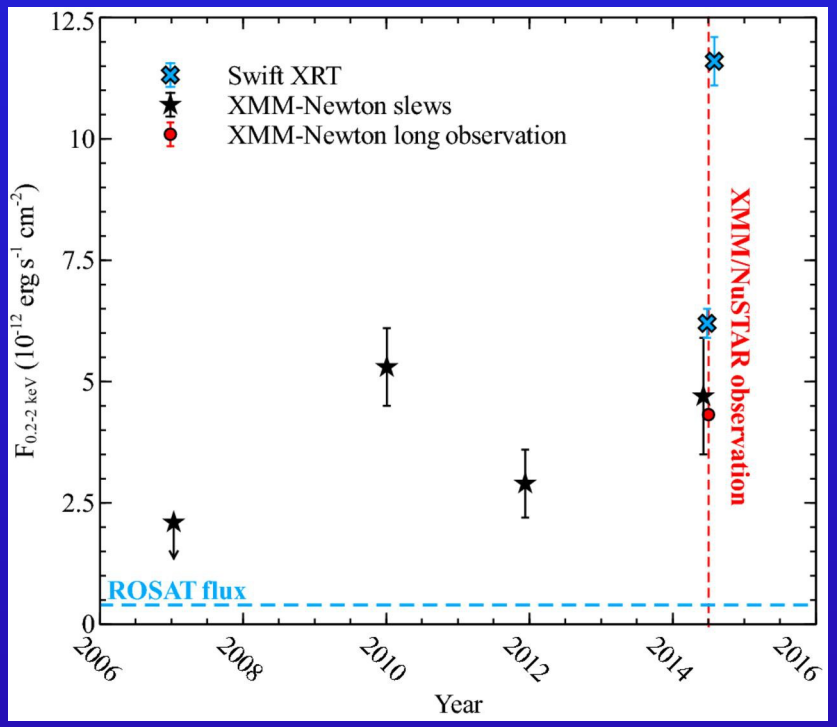


Fairly hard spectrum with significant Fe emission line at 6.4 keV.



Opt./UV photometry and X-ray spectrum after correction for Galactic and intrinsic absoption.

Spectral variations of HE 1136-2304 (1993 - 2014)



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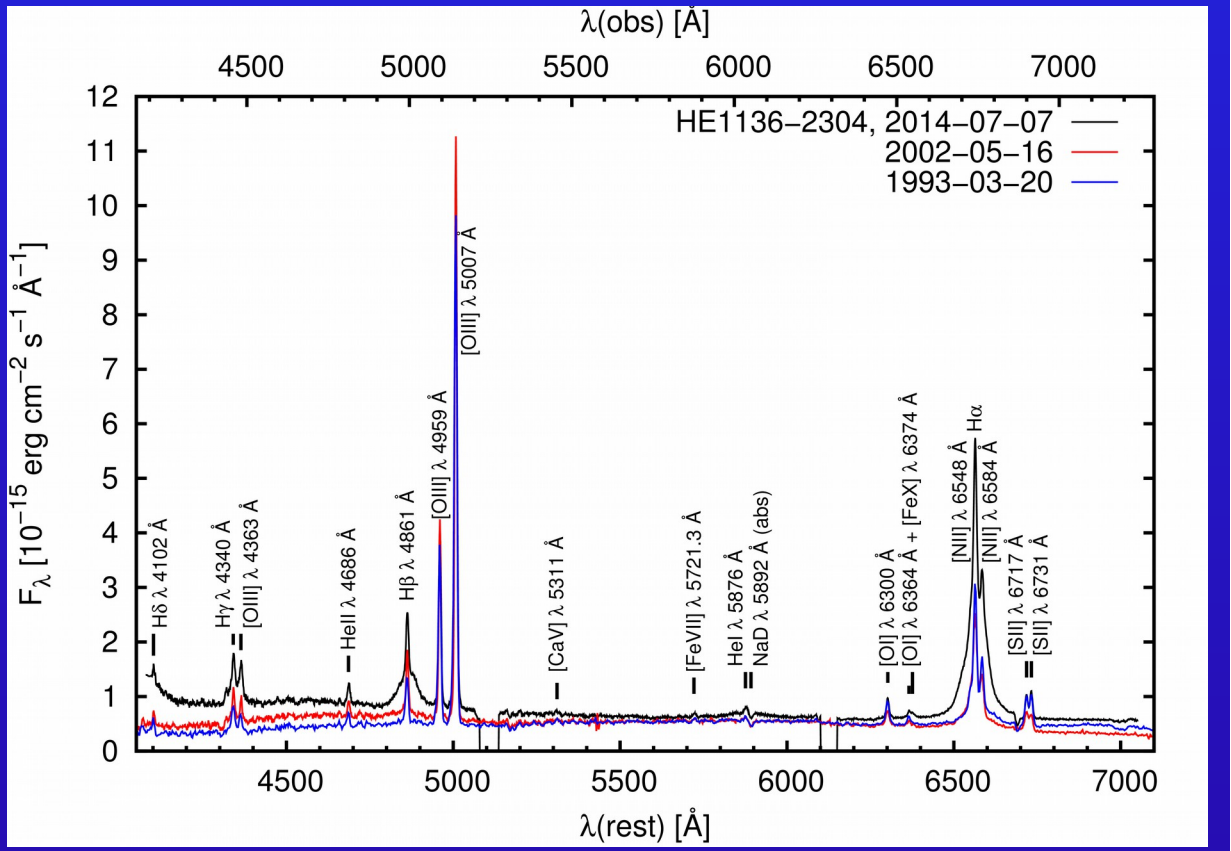

Optical spectrum of HE 136-2304 taken with SALT in 2014 (black line): Seyfert 1.5 type
For comparison the spectra from the Hamburg/ESO survey in 1993 (Reimers et al., 1996) and from the 6dF Galaxy Survey in 2002 (Jones et al., 2004): Seyfert 1.95

Optical, X-ray variability of HE 1136-2304

Until Outburst in June 2014:
The variability with respect to historical observations:
- X-ray flux increased by a factor of ~ 30
- appearance of broad Balmer lines: Sey 1.95
→ Sey 1.5 - increase in blue optical continuum by a factor of 4
- tidal disruption event (TDE)?