

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

Wolfram Kollatschny, M. Zetzl., N. Schartel (ESA, XMM) , et al.

Sabac, 11th SCSLSA, 2017



University Observatory



Institute for Astrophysics

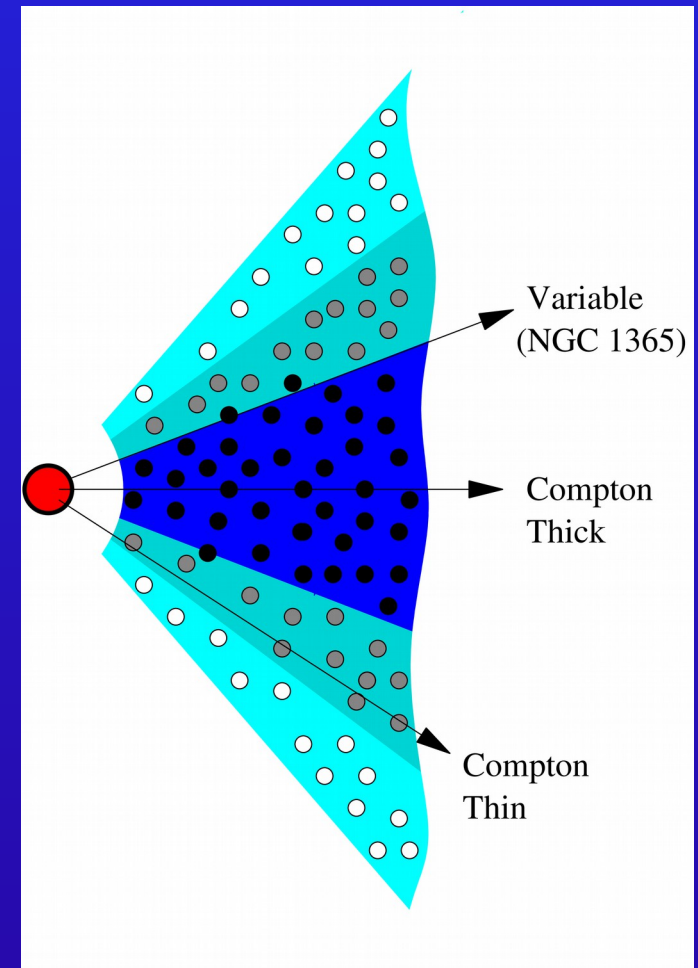
Changing look AGN

Changing look AGN:

- strong X-ray variations.
- one idea: X-ray variability due to variable 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.



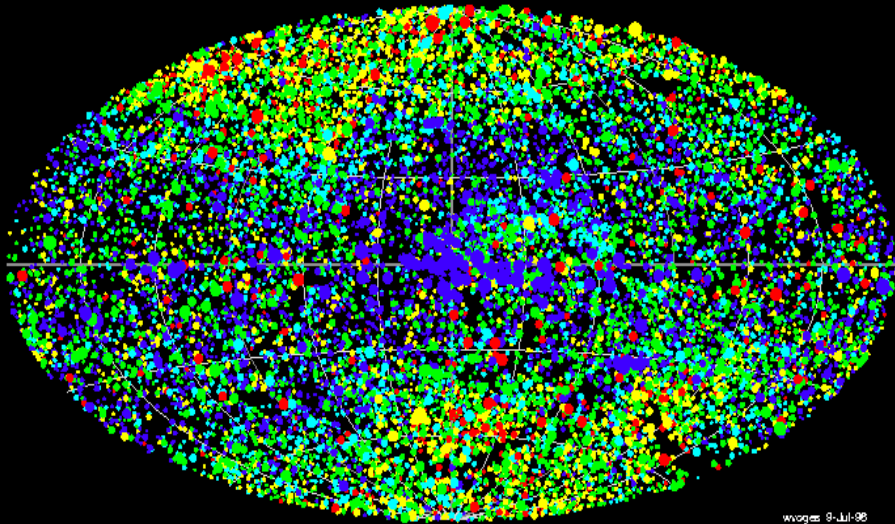
Risaliti et al., 2006

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



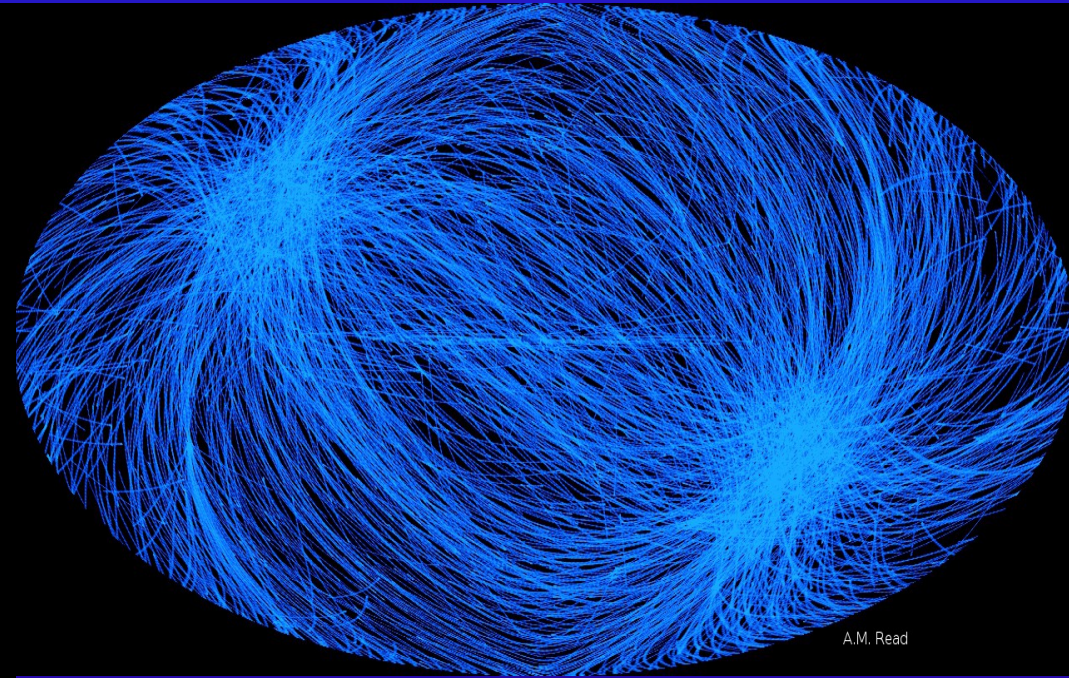
ROSAT ALL-SKY SURVEY Bright Sources

Aitoff Projection
Galactic II Coordinate System



wvogel 8-Jul-98

Energy range: 0.1 - 2.4 keV
Number of RASS-II sources: 18811
Hardness ratio: -1.0 | -0.4 | -0.2 | 0.2 | 0.6 | 1.0 (soft -> hard : magenta - red - yellow - green - cyan)

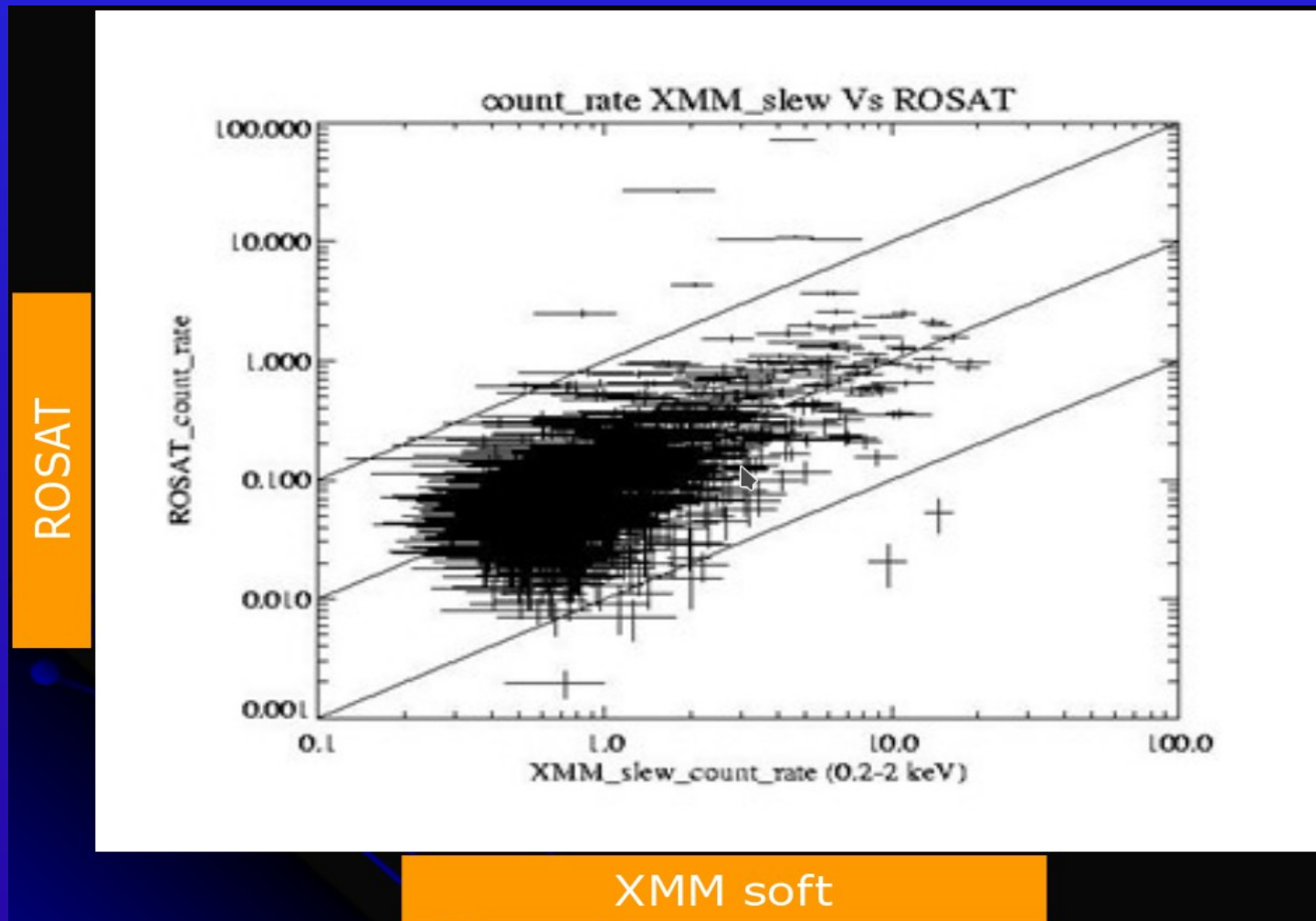


A.M. Read

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

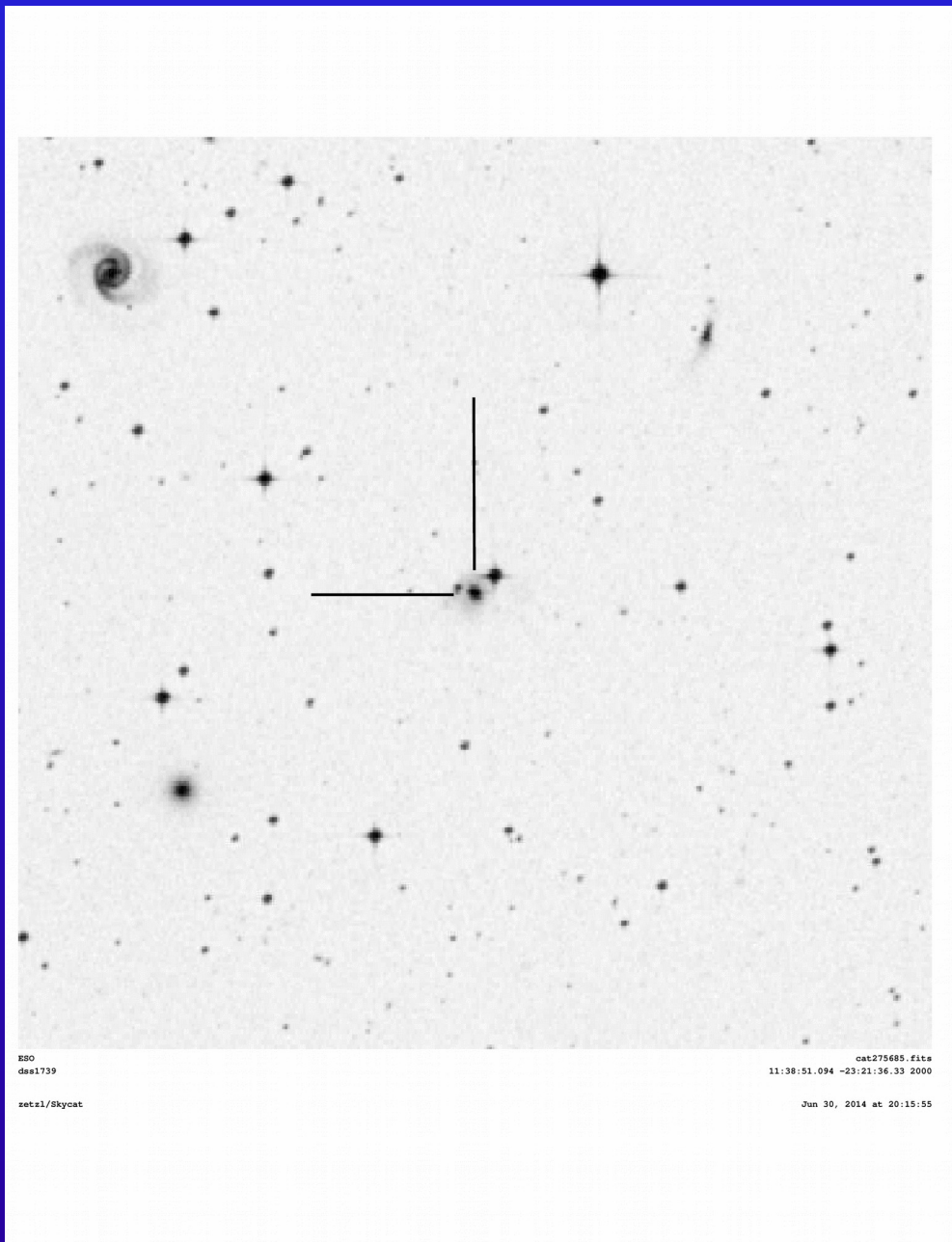
*M. Pilar Esquej et al.,
2006*

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

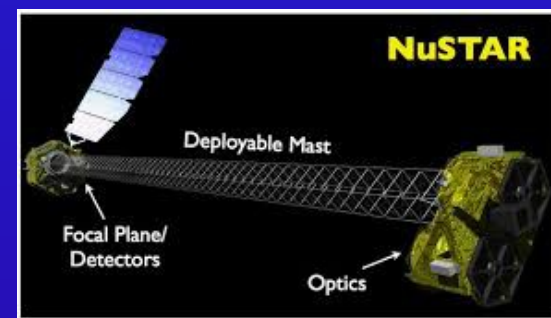
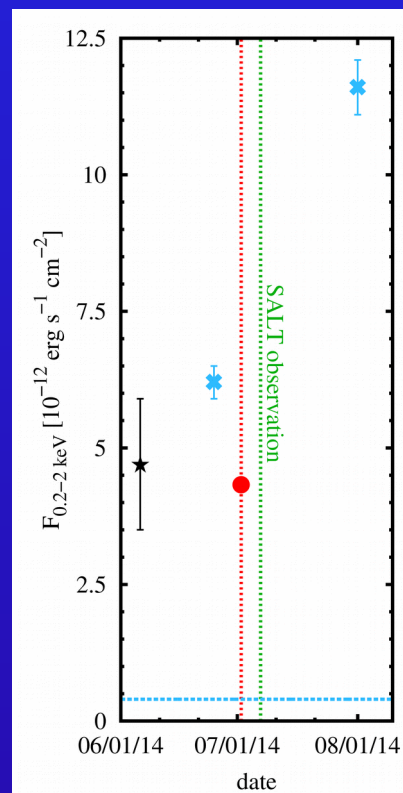
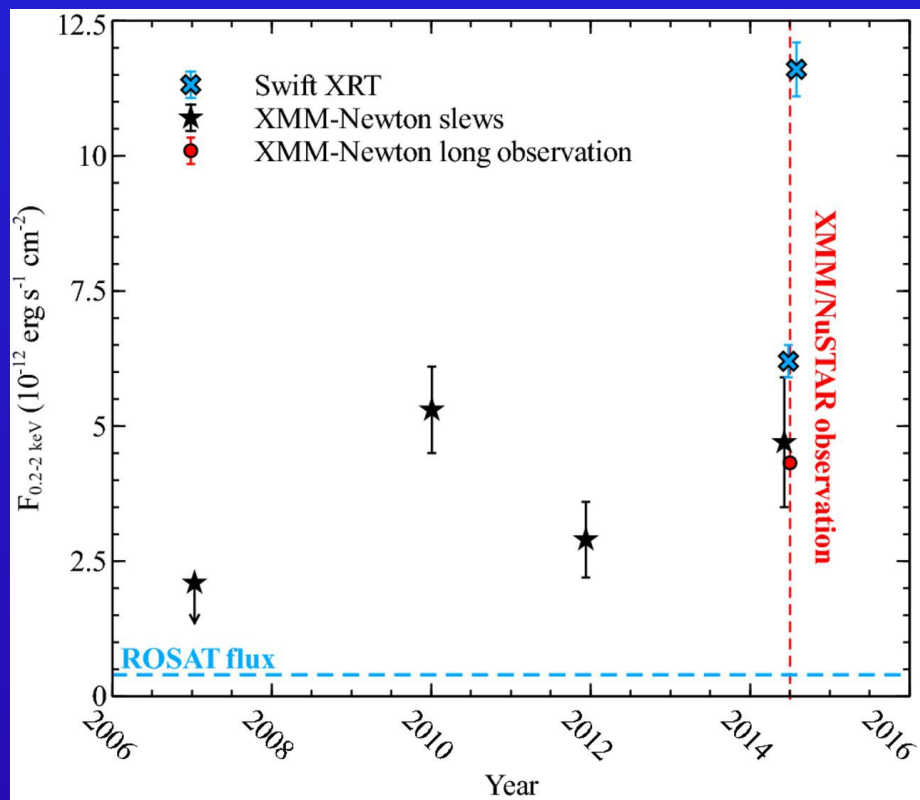
Optical image of HE 1136-2304



ESO/SRC image

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

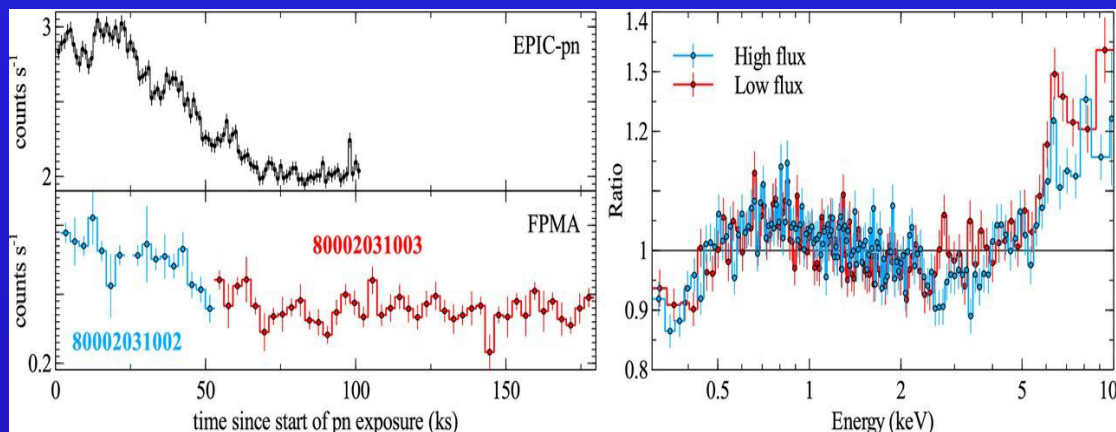
X-ray light curve of HE 1136-2304 (1990, 2007 - 2014)



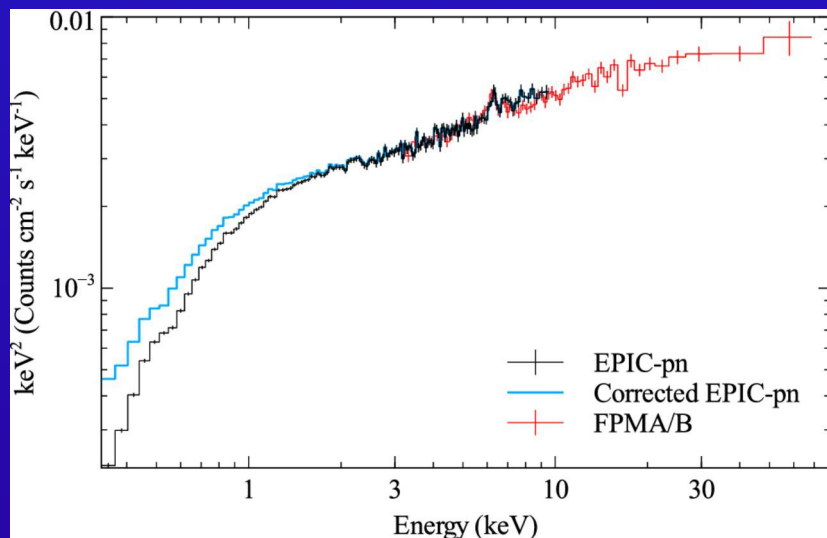
X-ray light curve from 2007 to 2014. The 1990 ROSAT flux is shown by the horizontal dashed line. Time of deep XMM+NuSTAR and optical SALT observations is shown by the vertical dashed lines.

Parker, Komossa, Kollatschny et al.,
2016

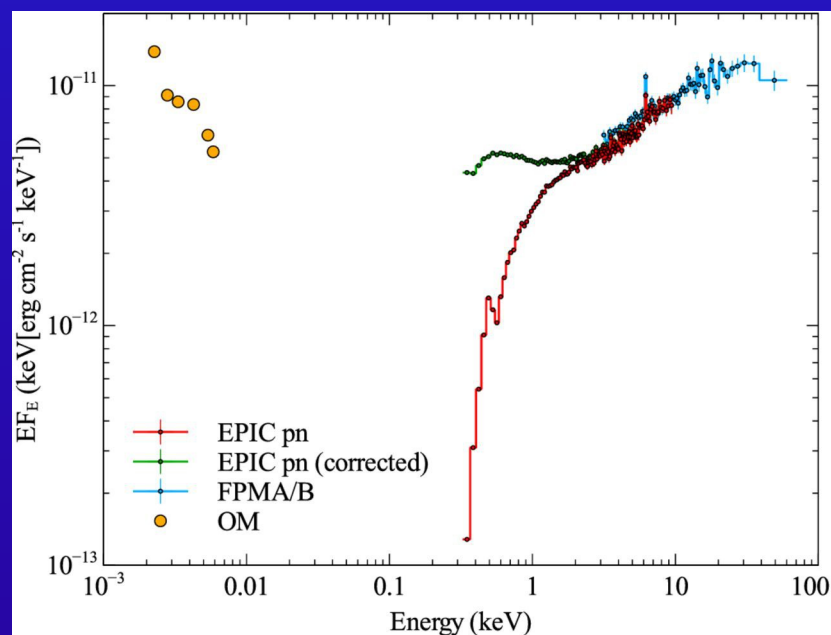
X-ray spectrum, short term variations of HE 1136-2304



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

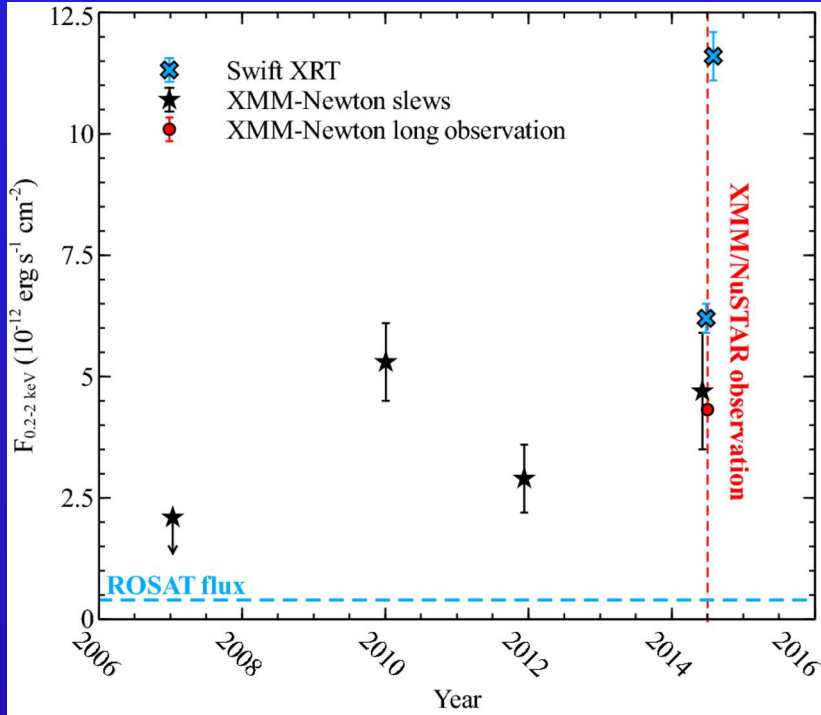


Fairly hard spectrum with significant Fe emission line at 6.4 keV.

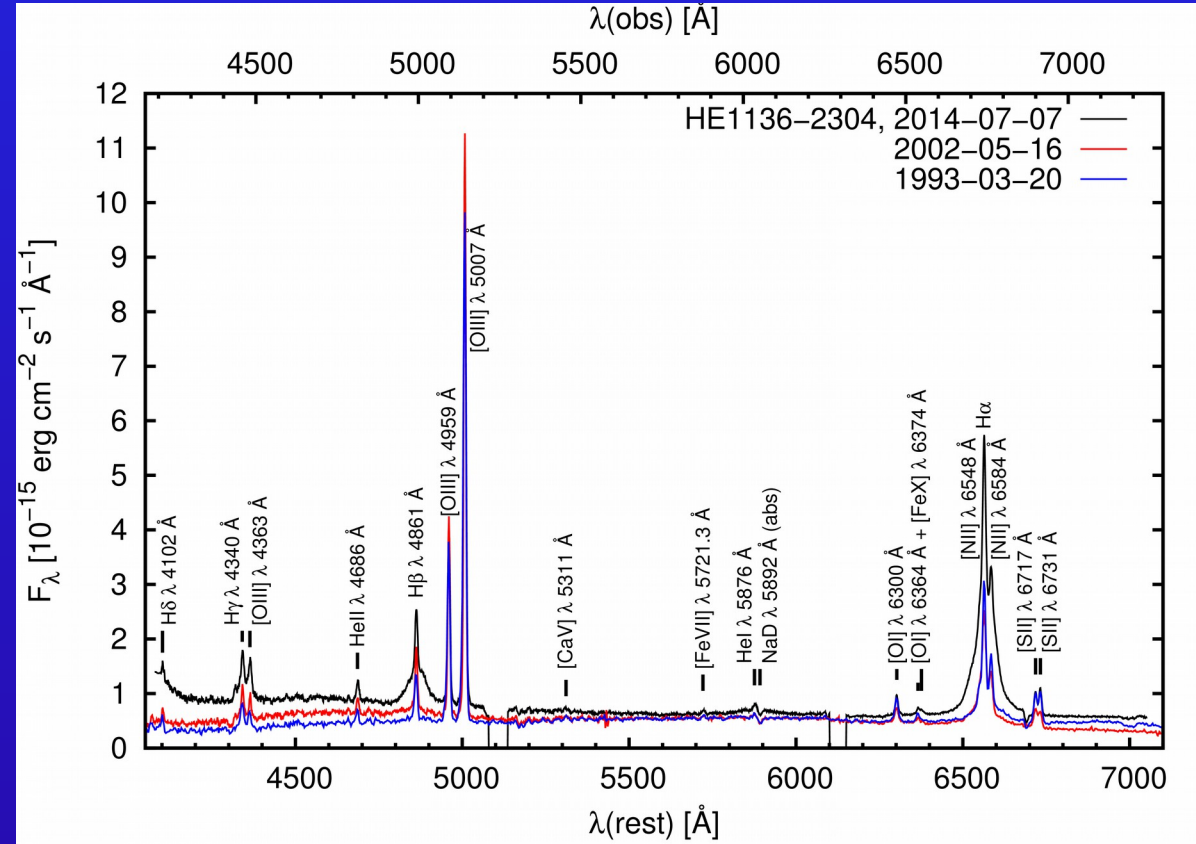


Opt./UV photometry and X-ray spectrum after correction for Galactic and intrinsic absorption.

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



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



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)?