

# ATHENA LI SciReq I I 0

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Athena, Madrid, Sept 2015

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ATHENA shall determine the nature of the seeds of the earliest growing SMBH ( $z > 6$ ), characterize the processes that dominated their early growth....

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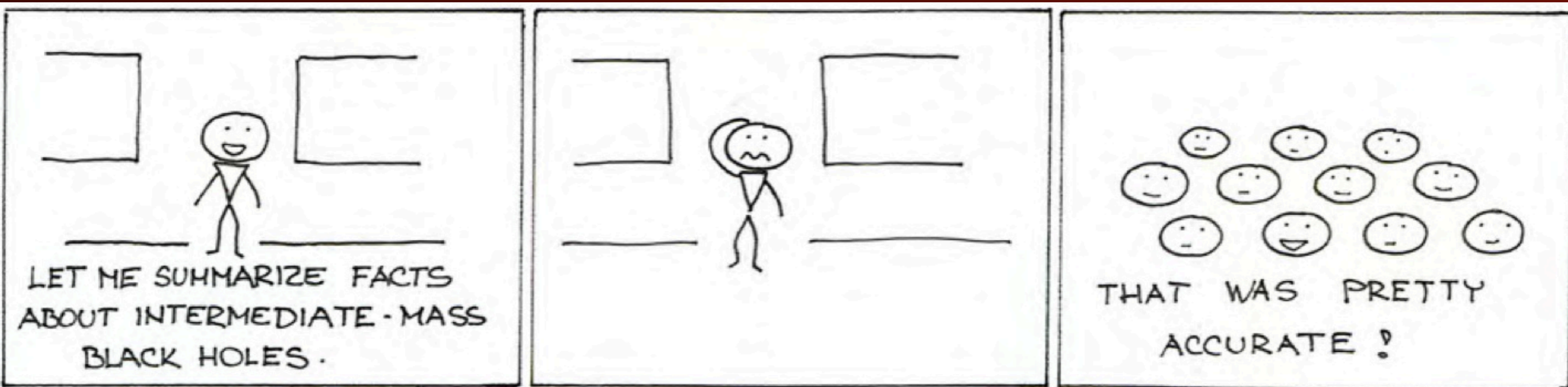


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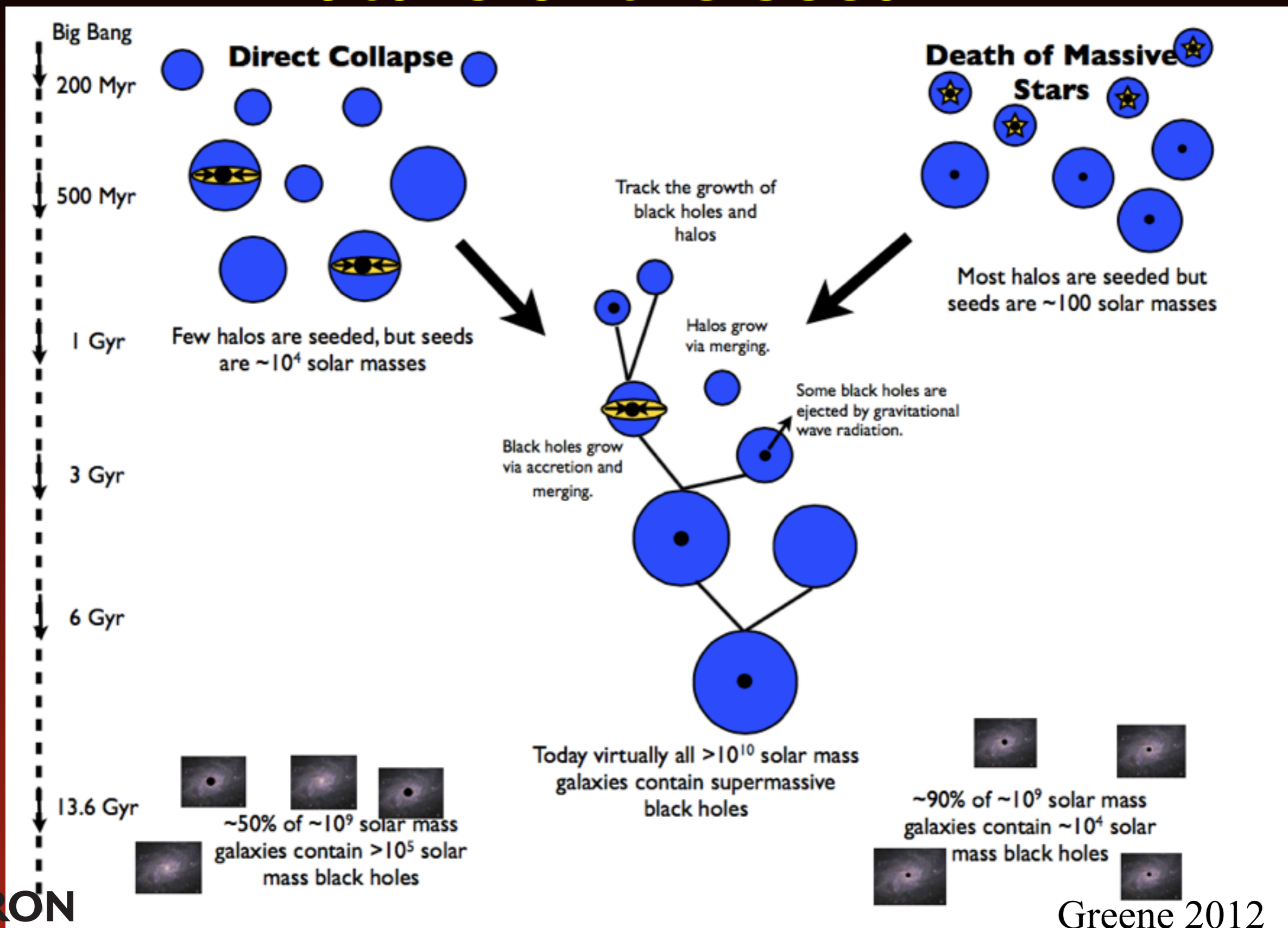


Athena, Madrid, Sept 2015

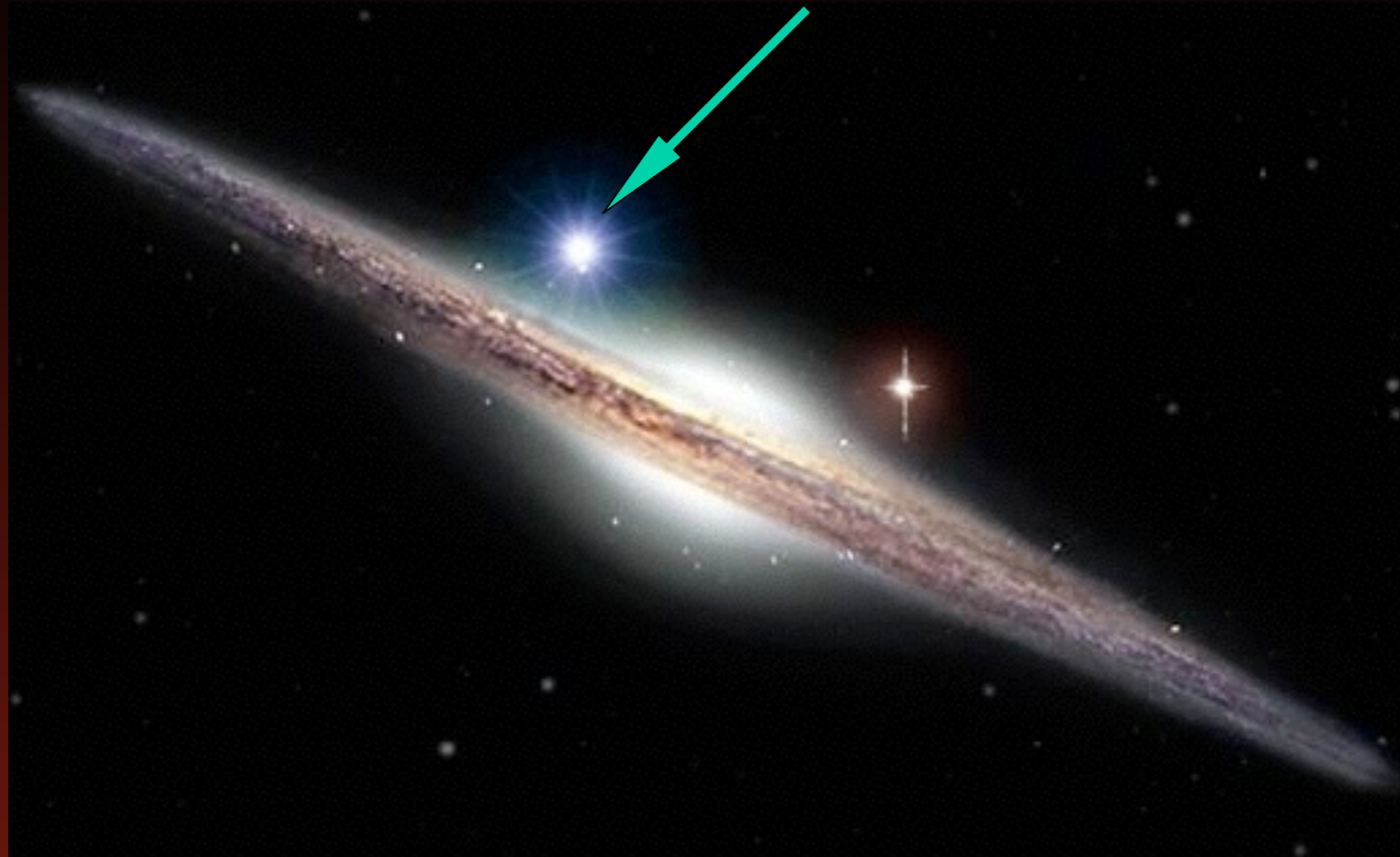
# Do IMBHs exist?



# Occupation fraction depends on the nature of the seed BH



# IMBH candidates?

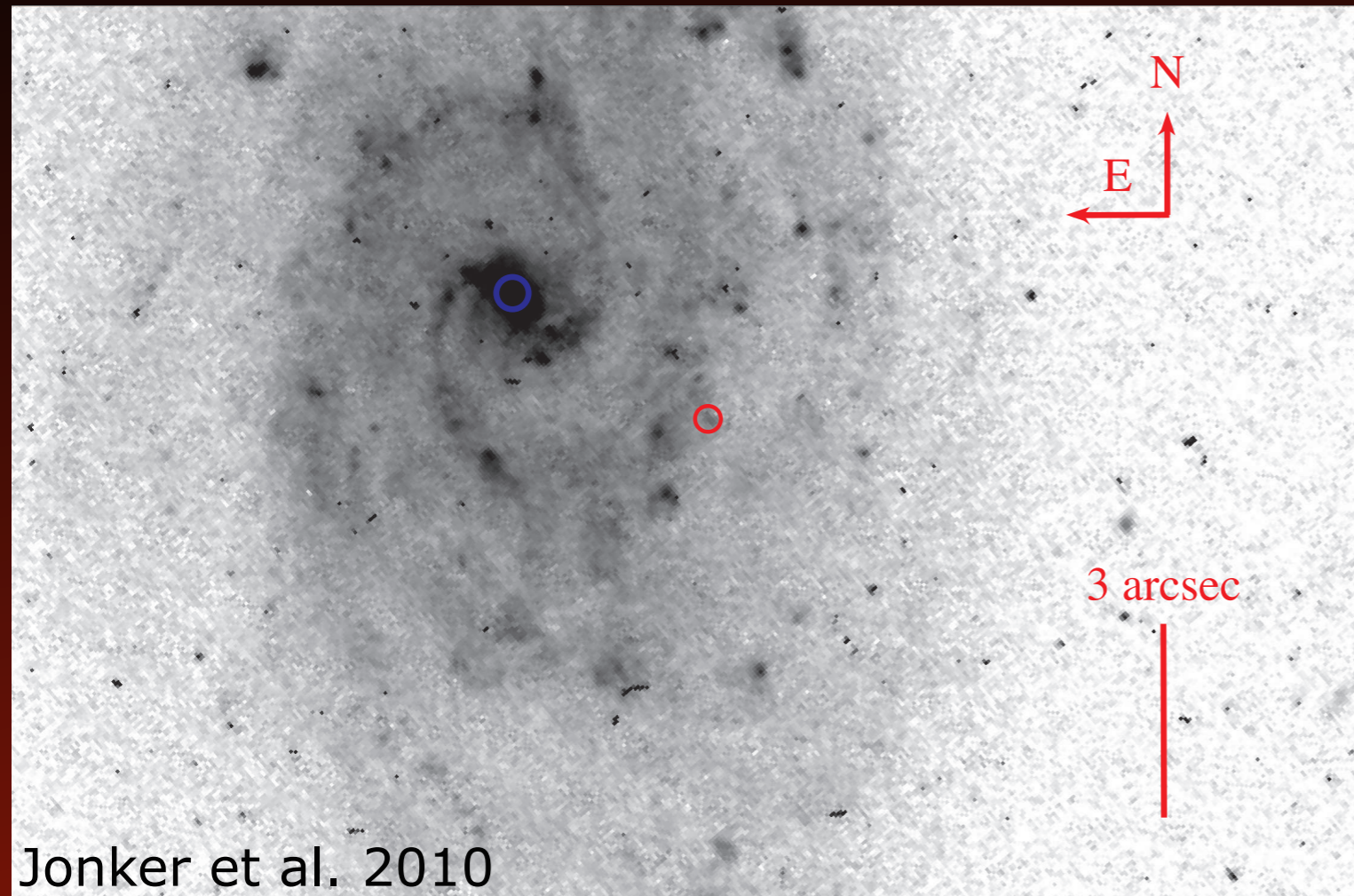


composite, embellished, HST image

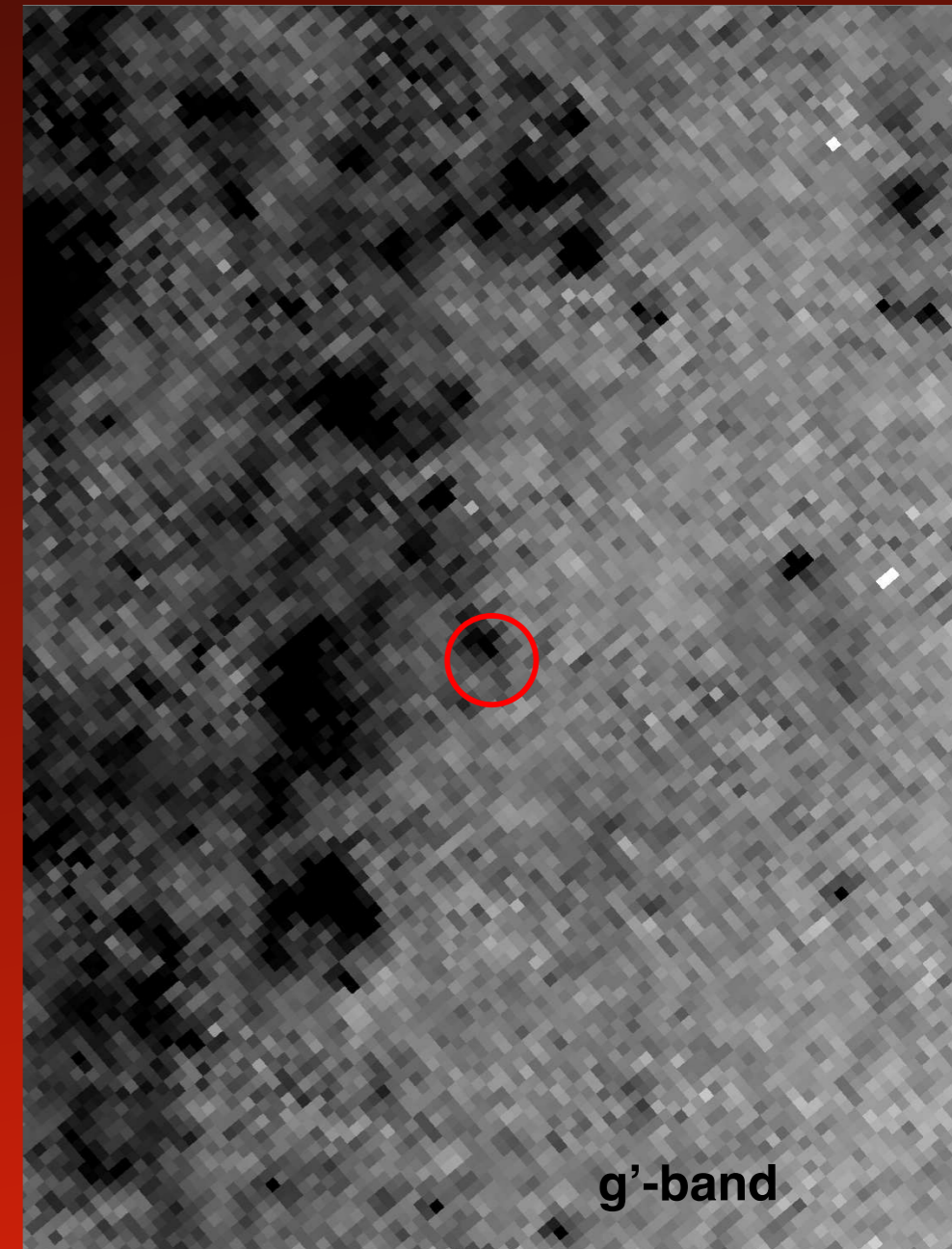
ESO 243-49 HLX-1, a candidate  
intermediate mass black hole  
Farrell et al. 2009; Lasota et al. 2011;  
Servillat et al. 2011; Webb et al. 2012

# HLX2

$$L_{x,peak} = 2E41 \text{ erg s}^{-1}$$



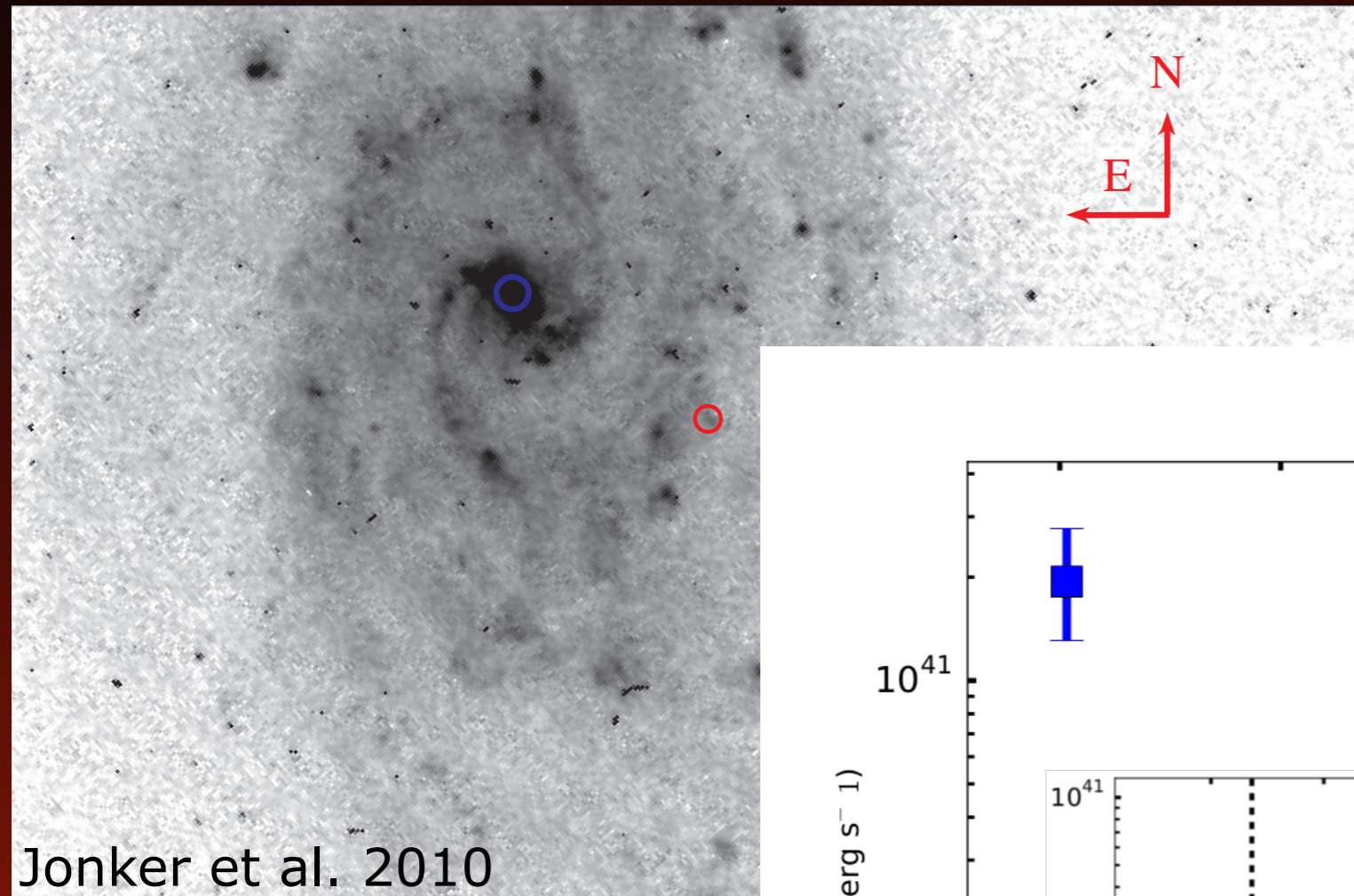
Jonker et al. 2010



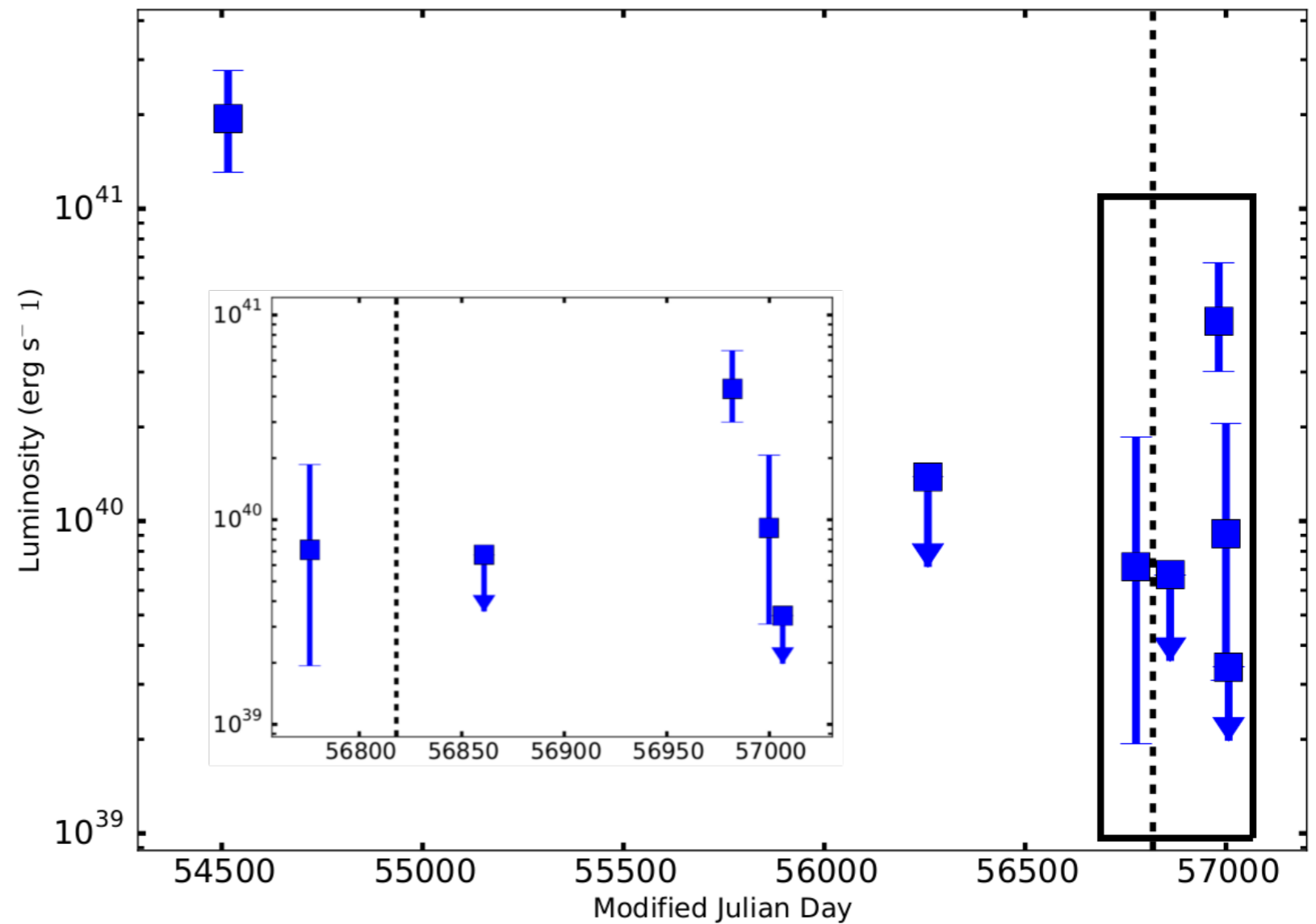
g'-band

# HLX2

$$L_{x,\text{peak}} = 2E41 \text{ erg s}^{-1}$$

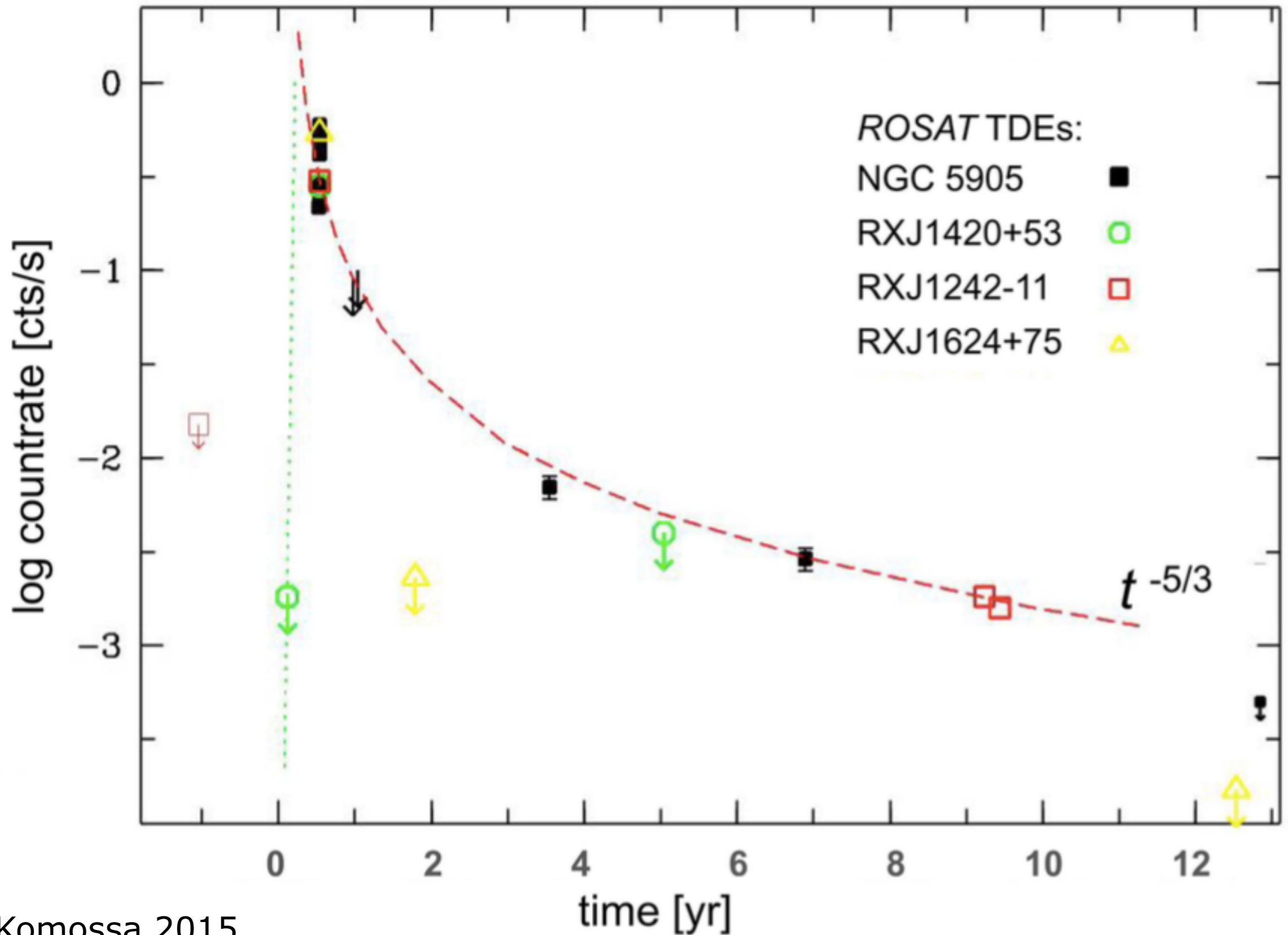


Jonker et al. 2010



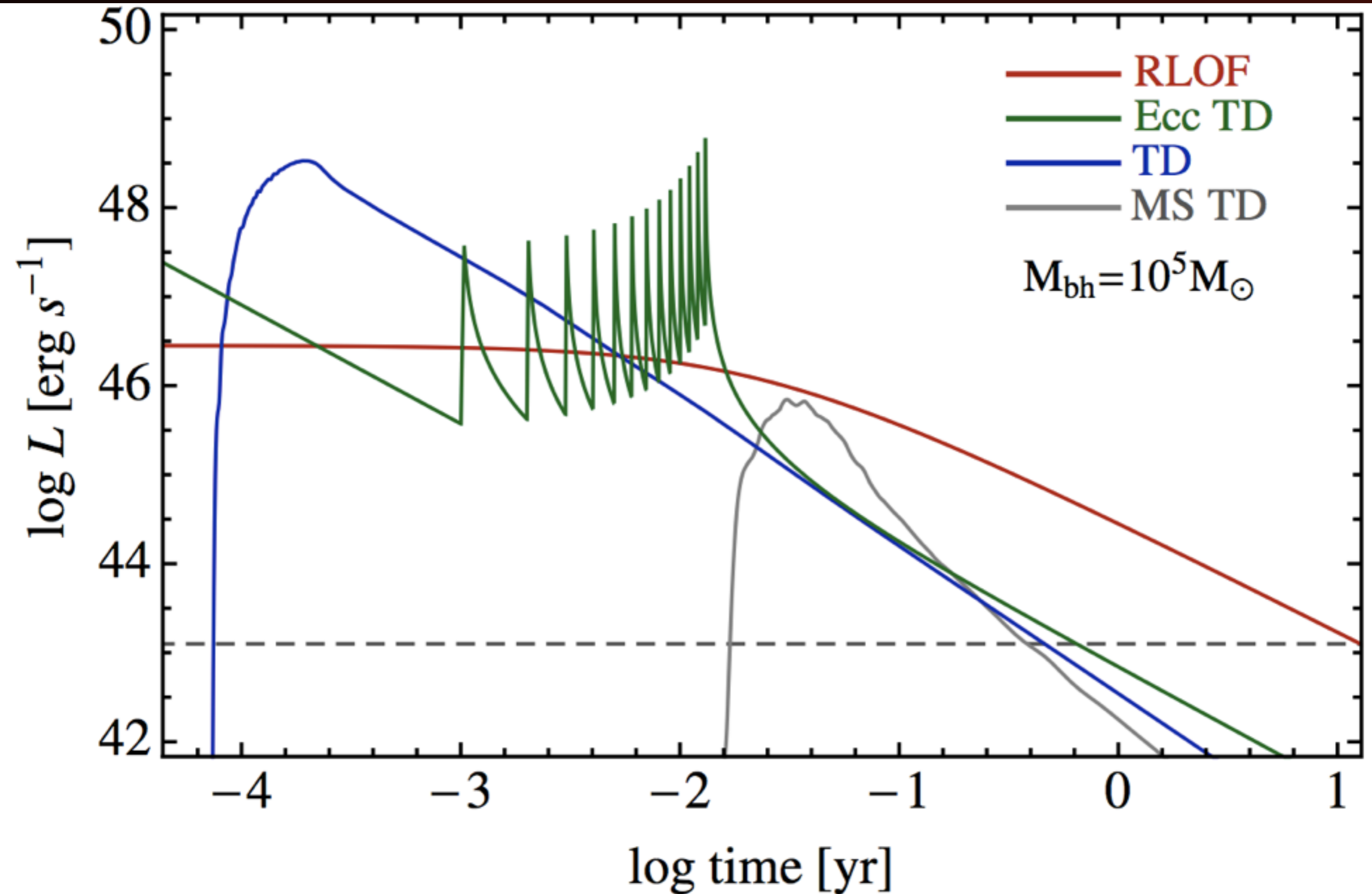


# Tidal disruption events; X-ray

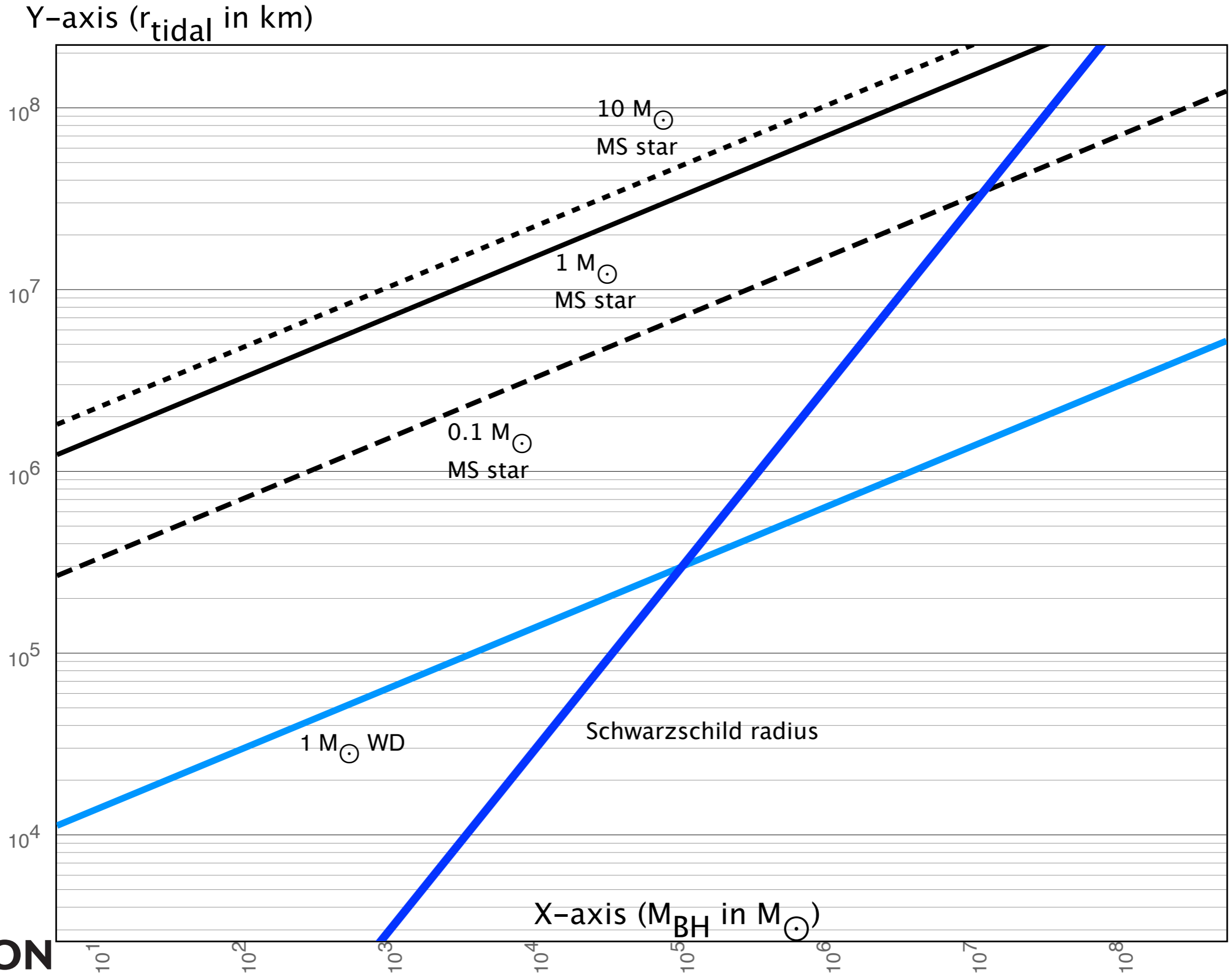


Komossa 2015

# WD orbits IMBH



# Tidal disruption events & IMBHs



# Tidal disruption of a WD by an IMBH

## WD-BH encounter

\*\*\*\*\*

masses (sol.)	0.2 (WD) & 1000 (BH)
in. separation	50 (in 1.E9 cm)
hydrodynamics	SPH (4 030 000 particles)
EOS, gravity	Helmholtz, N
nucl. burning	red. QSE-network (Hix 98)
simul. time	5.4 min
color coded	column density
penet. factor	12

coding, simulation, visualisation: S. Rosswog

# Tidal disruption of a WD by an IMBH

## WD-BH encounter

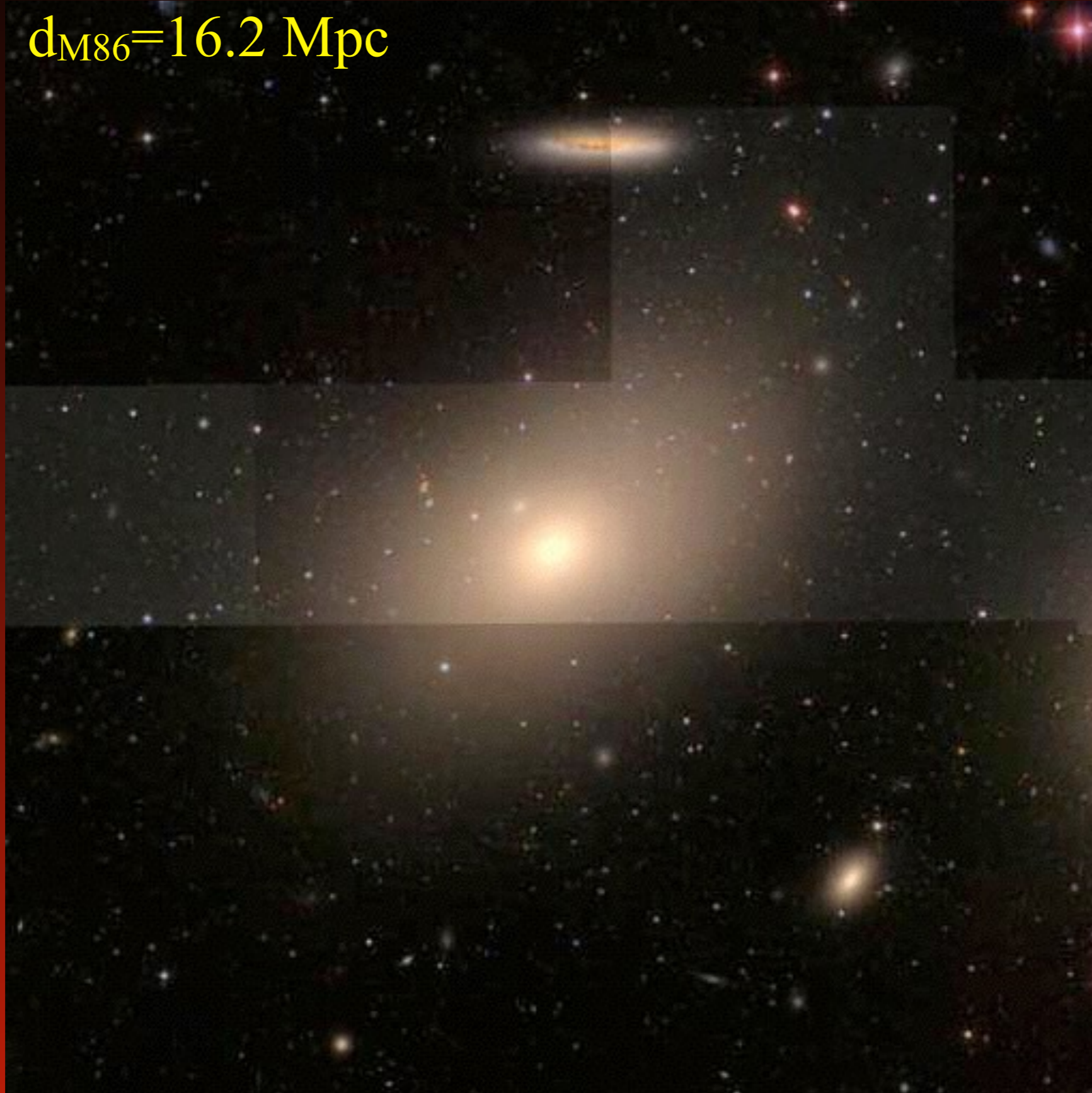
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# M86

$d_{M86} = 16.2 \text{ Mpc}$

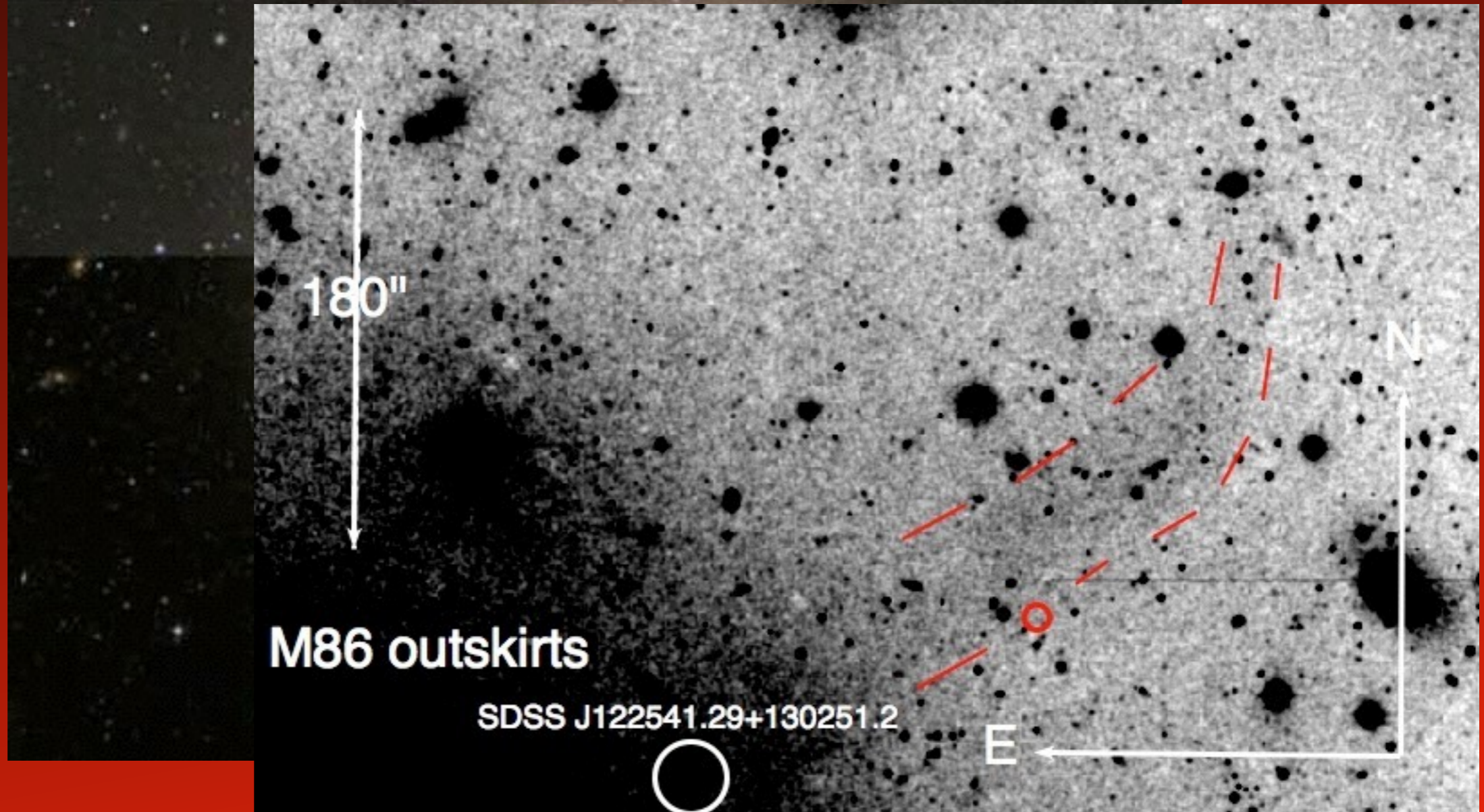


SDSS

# M86



SDSS



180"

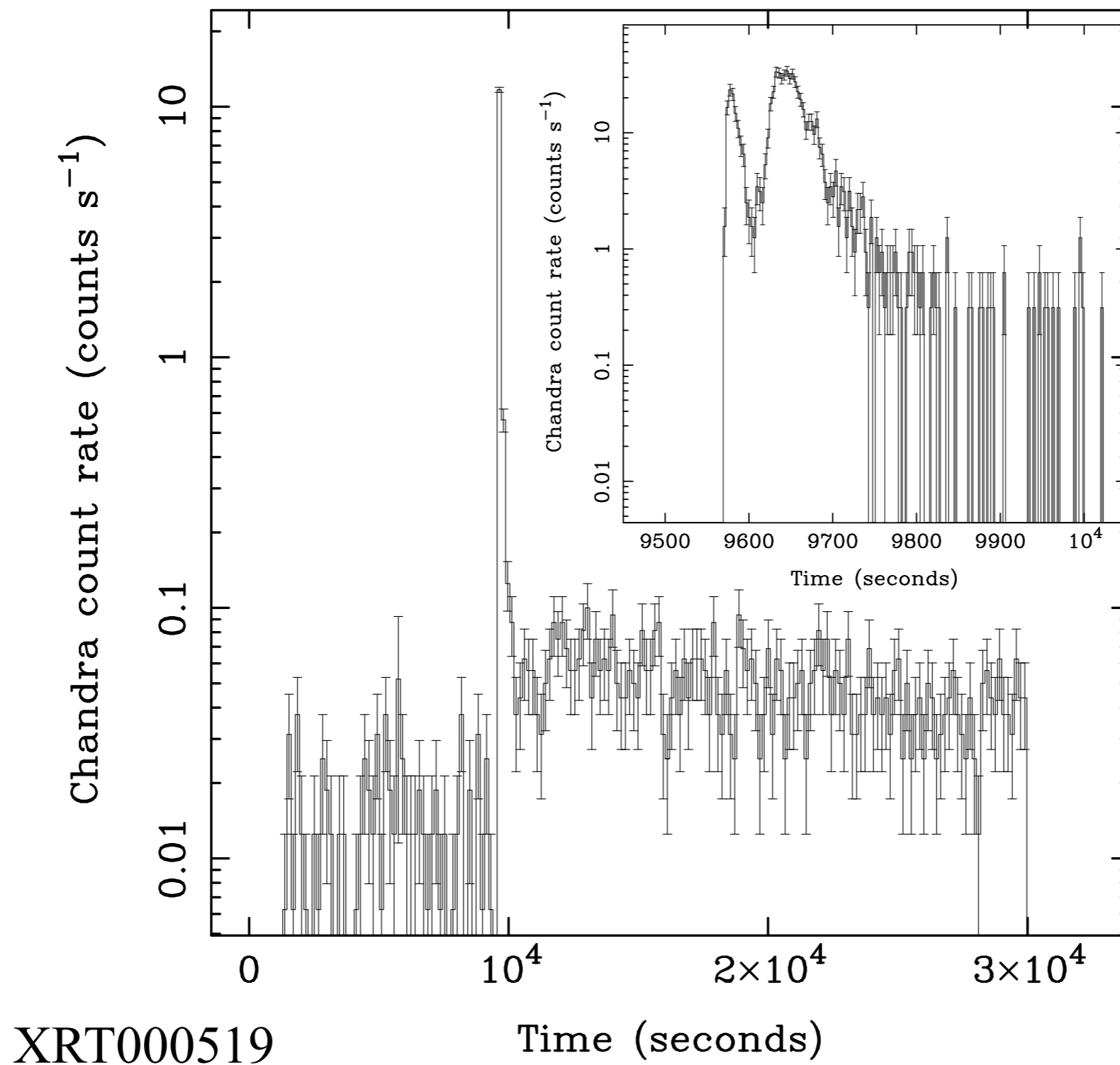
M86 outskirts

SDSS J122541.29+130251.2

E

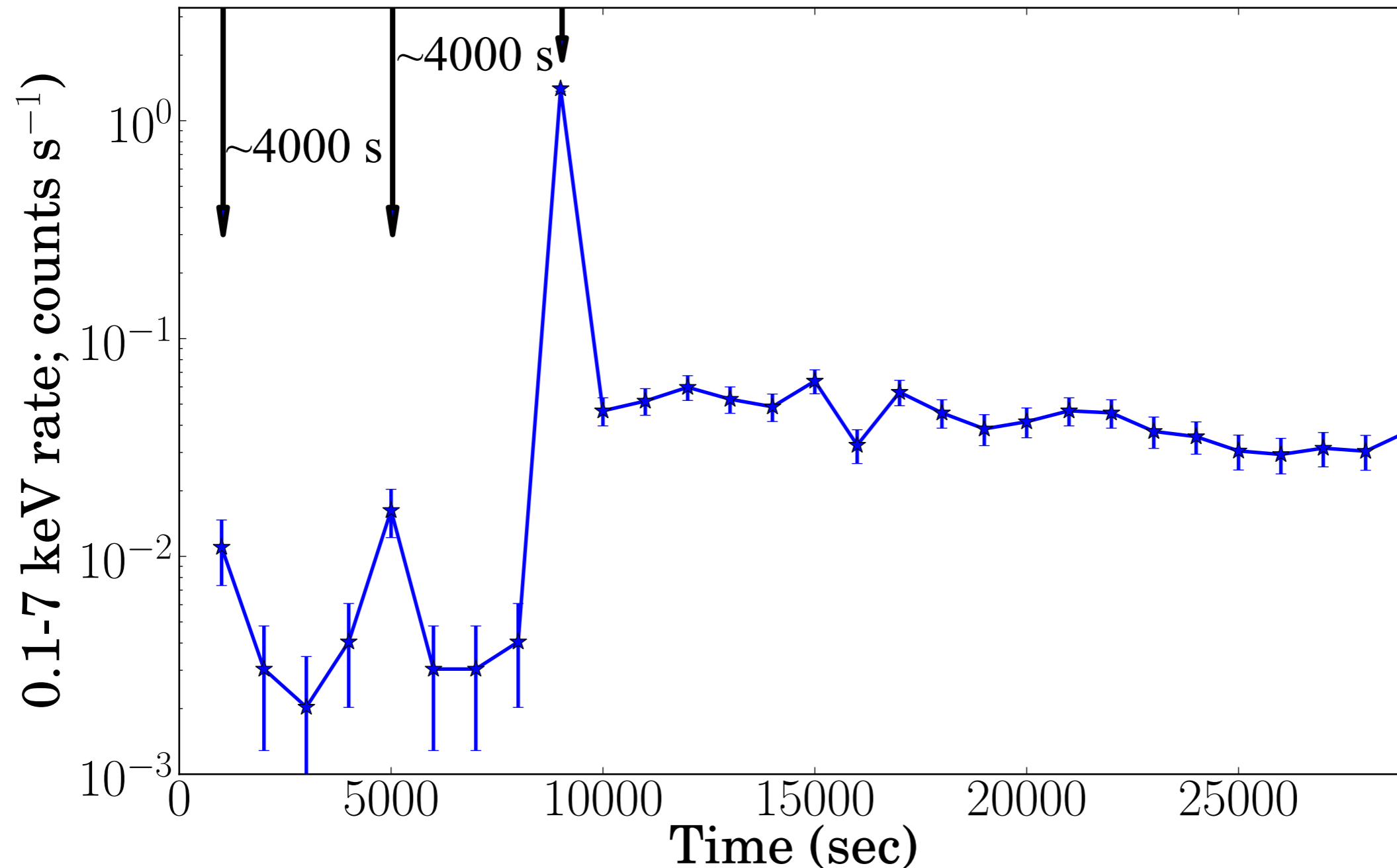
N

# Detection of a fast X-ray transient

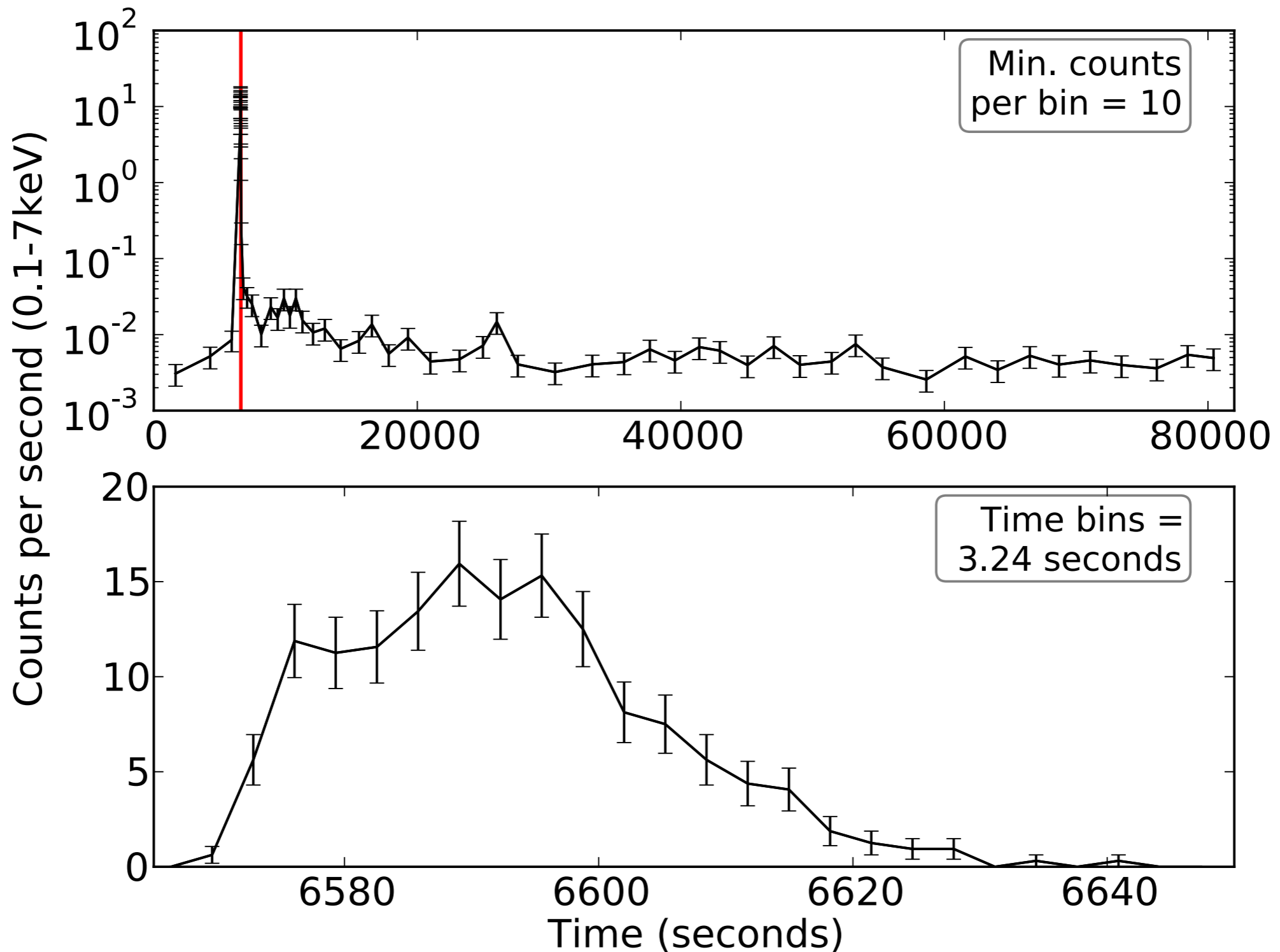




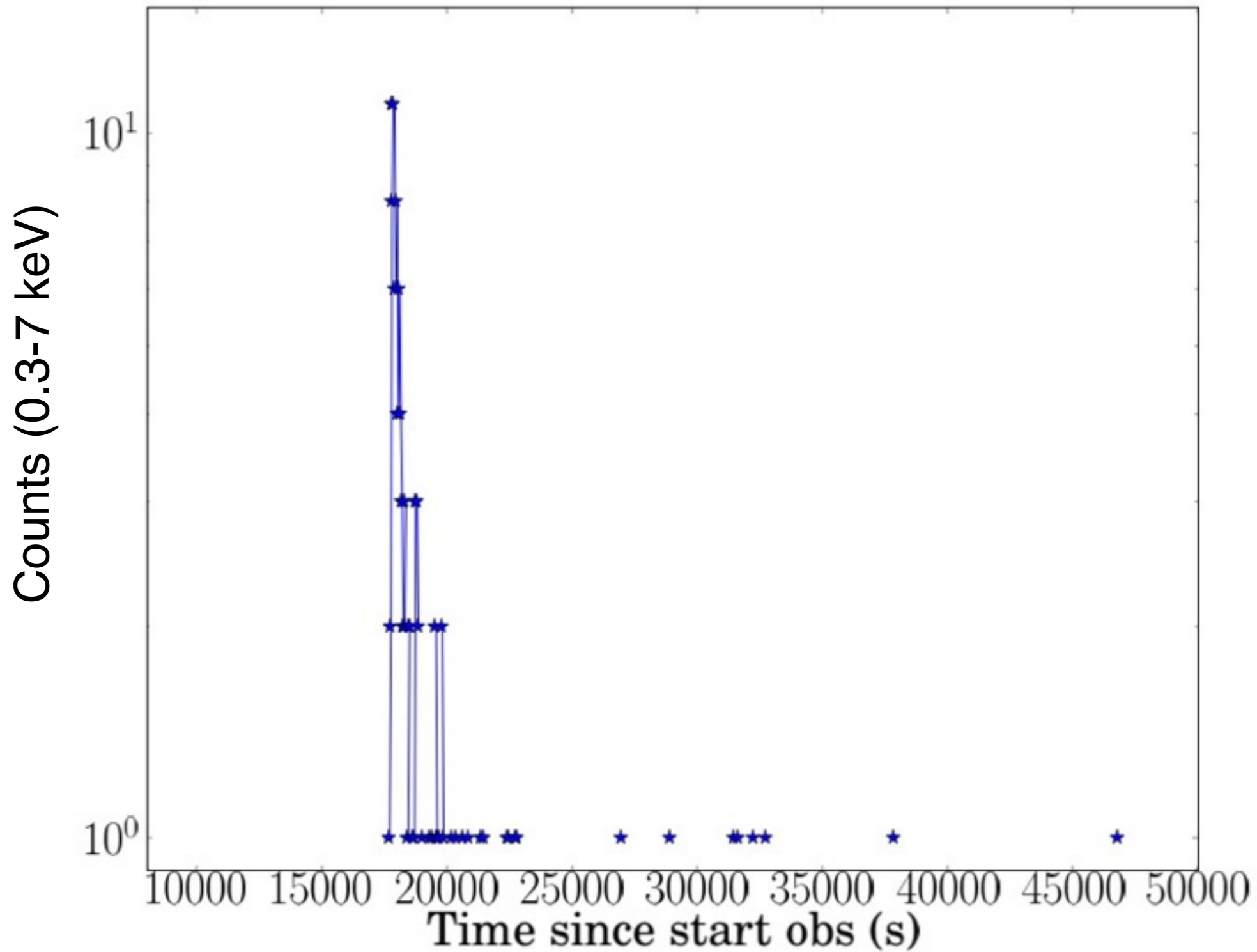
# Precursors to the transient



# More fast X-ray flashes:



# More fast X-ray flashes:

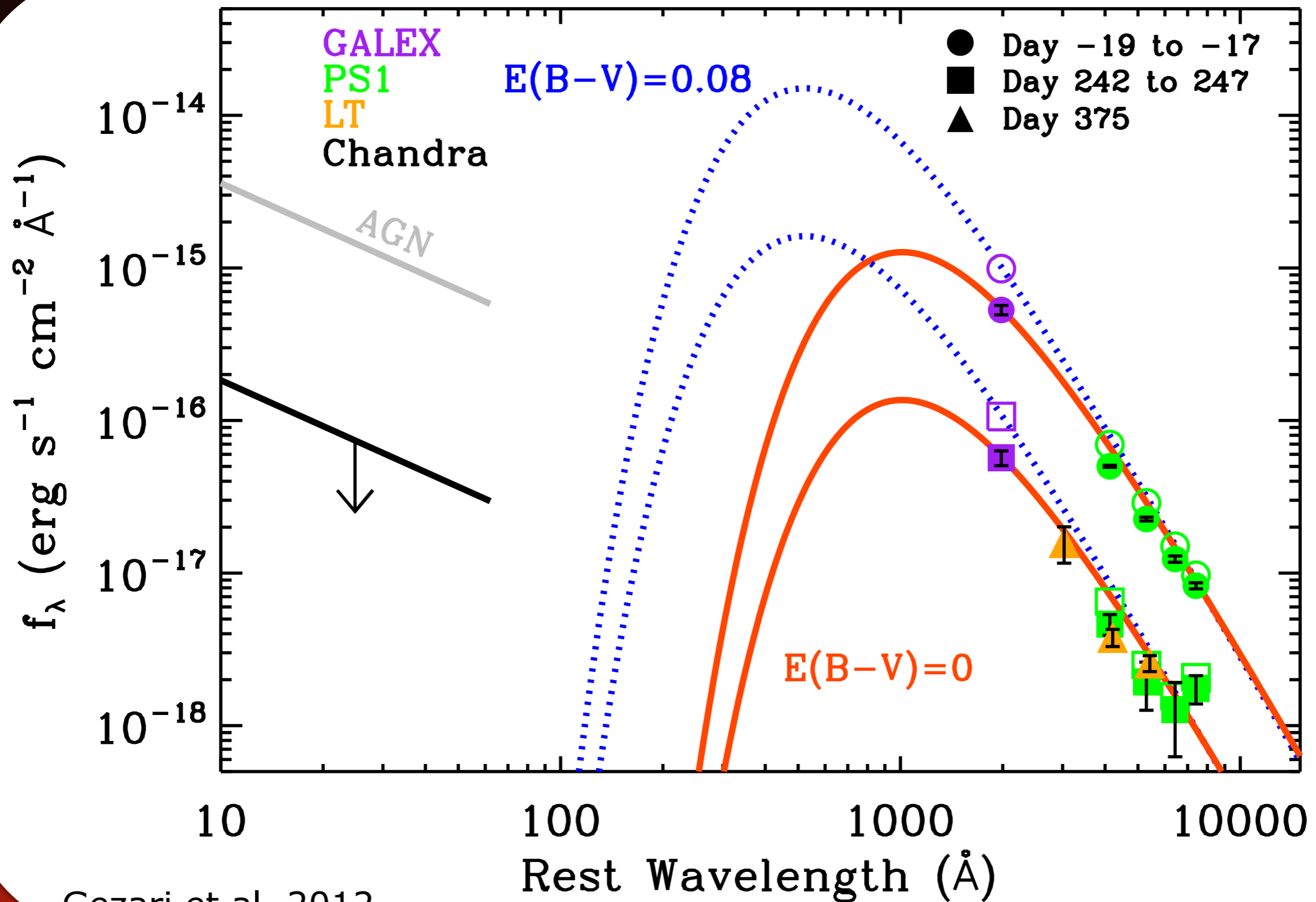


# Conclusion:

Athena-discovered tidal disruption events will be a great tool to search for intermediate-mass black holes

Prerequisite: some onboard event processing & fast transmission of data (coordinates & fluxes)  
US or Japanese contributions?

# Tidal disruption events; optical



Gezari et al. 2012