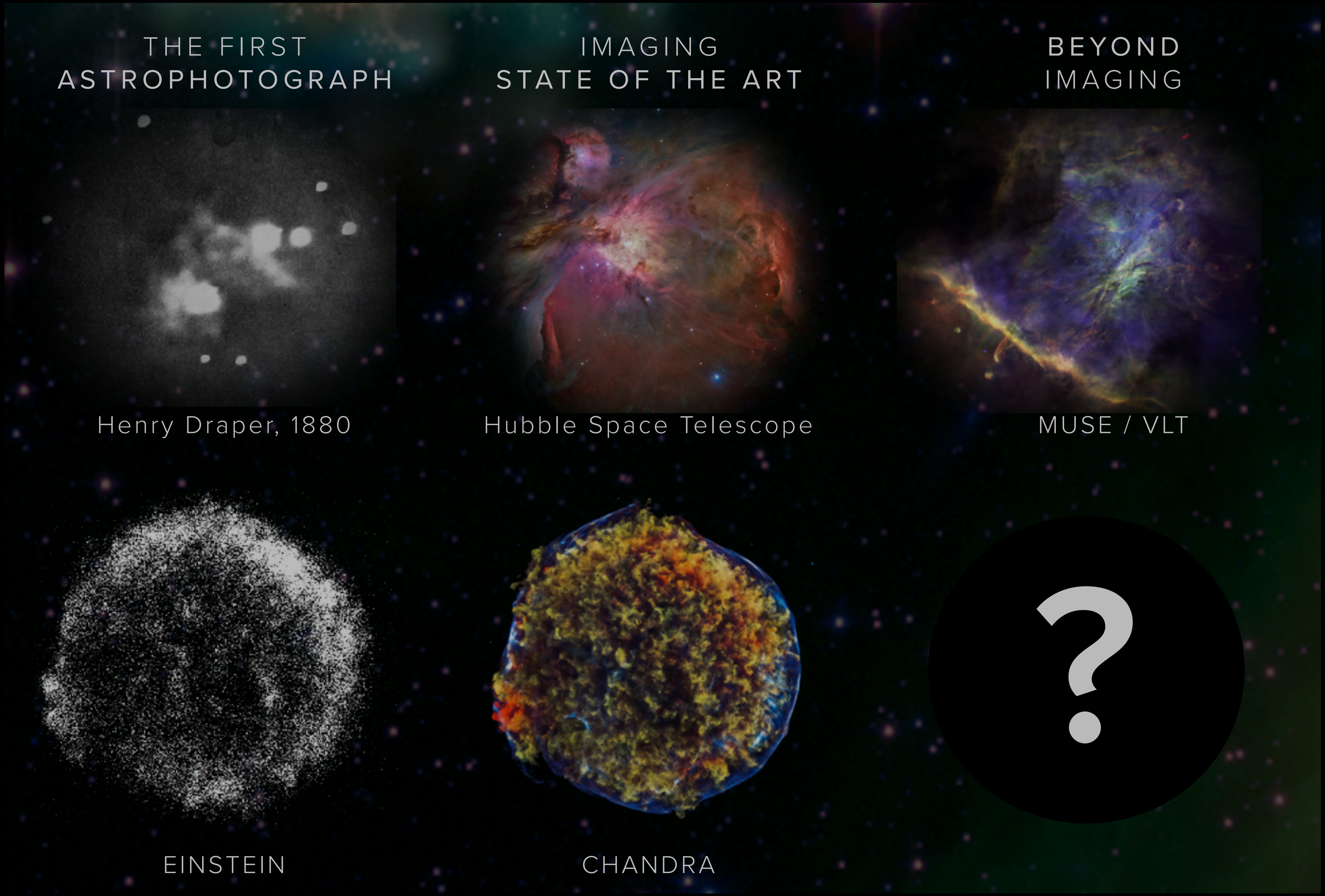
the FUTURE *of* HIGH-RESOLUTION X-RAY IMAGING



the FUTURE

of HIGH-RESOLUTION

X-RAY IMAGING

is

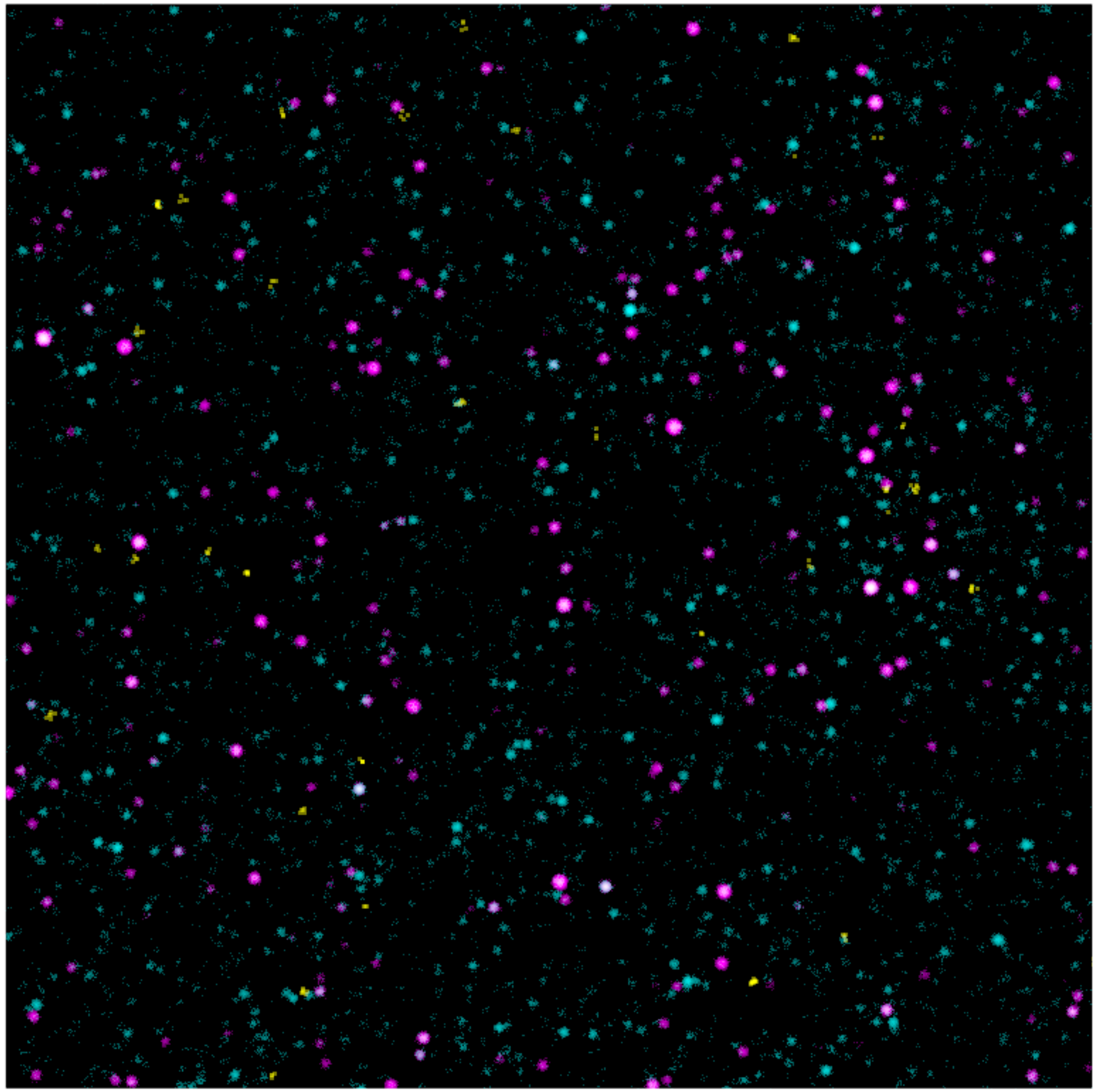
LYNX

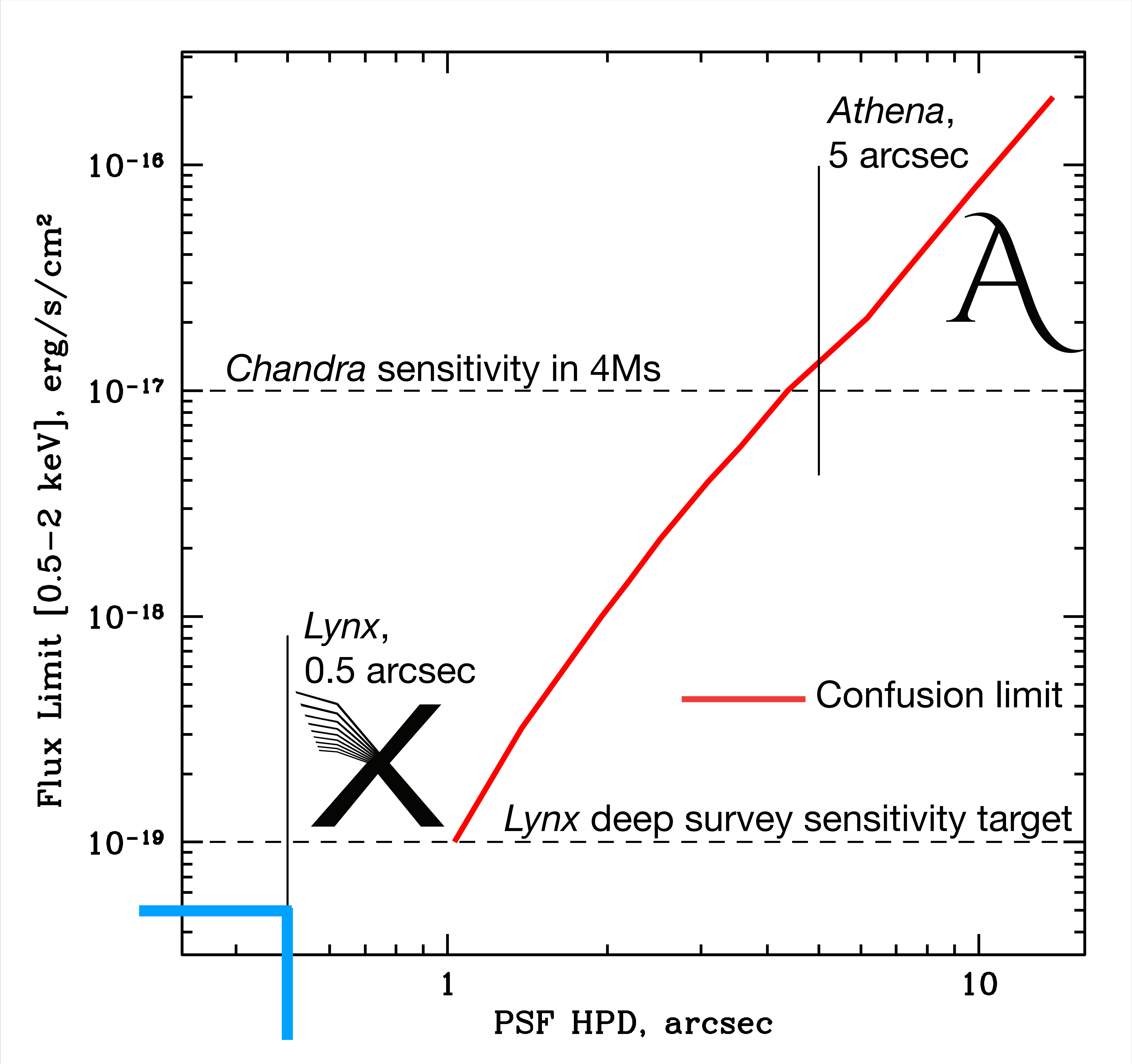
“In astronomy, discovery eclipses physics”

R. Giacconi

R E S O L U T I O N = S E N S I T I V I T Y

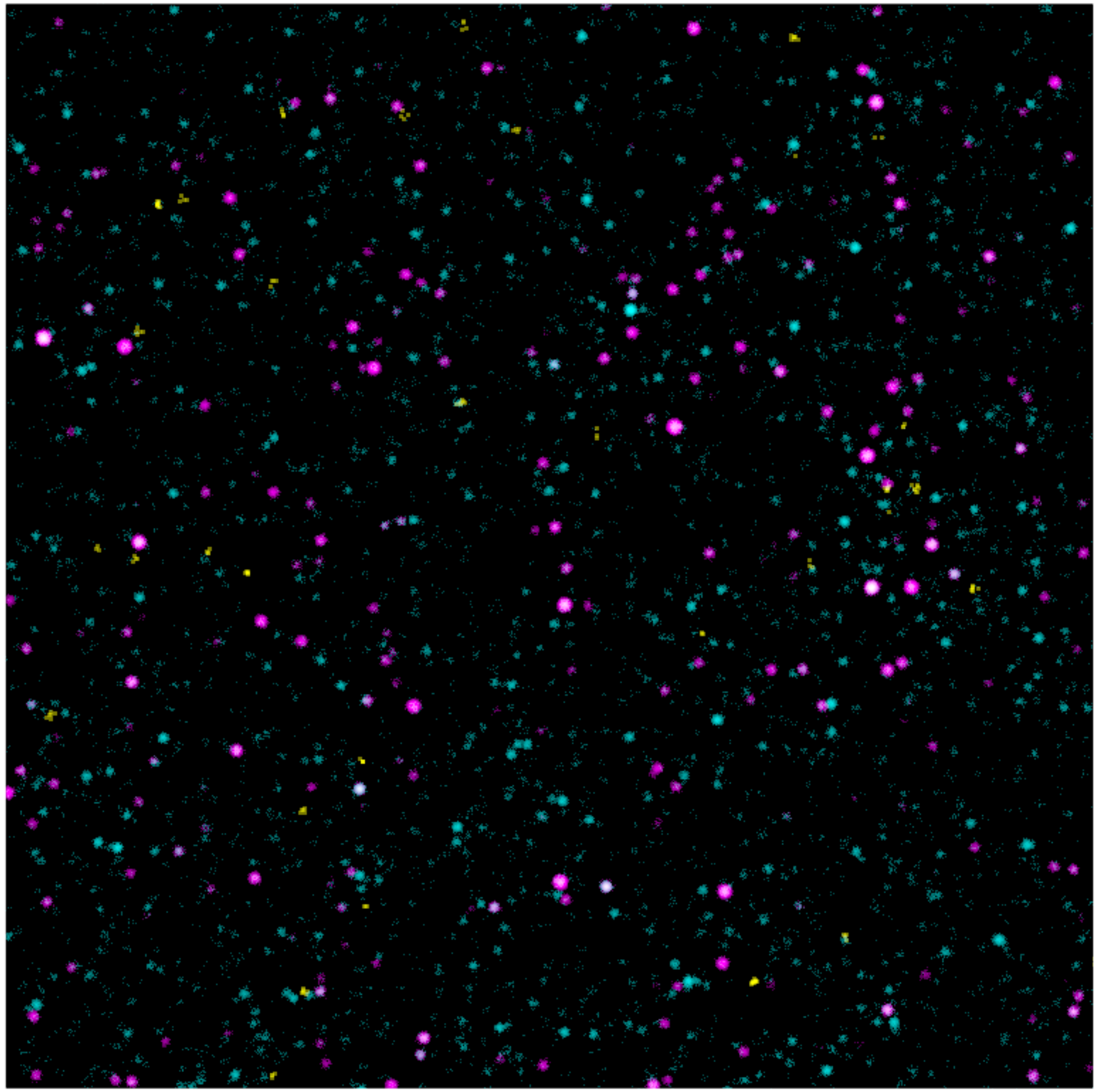
0.5’’ PSF

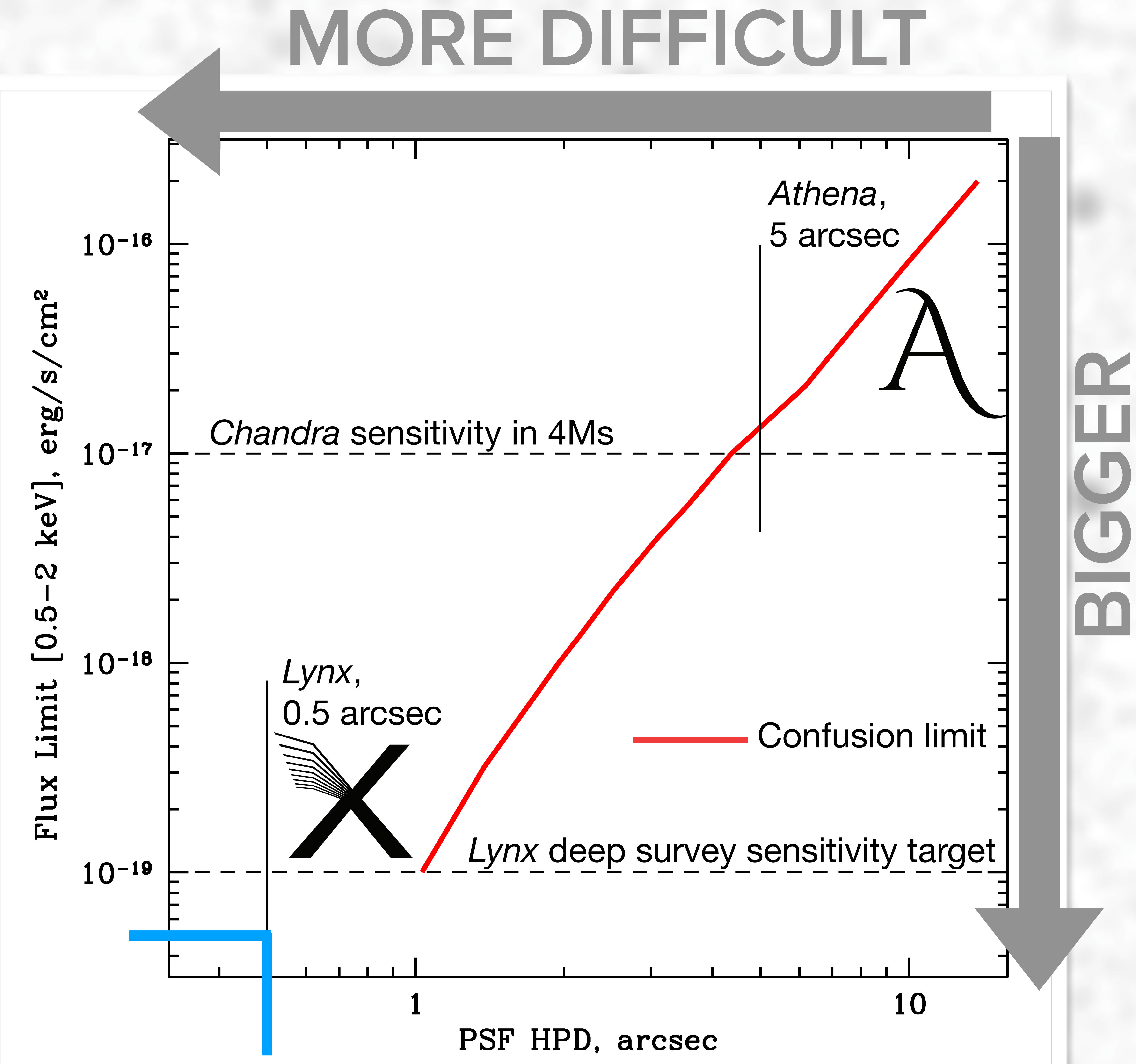


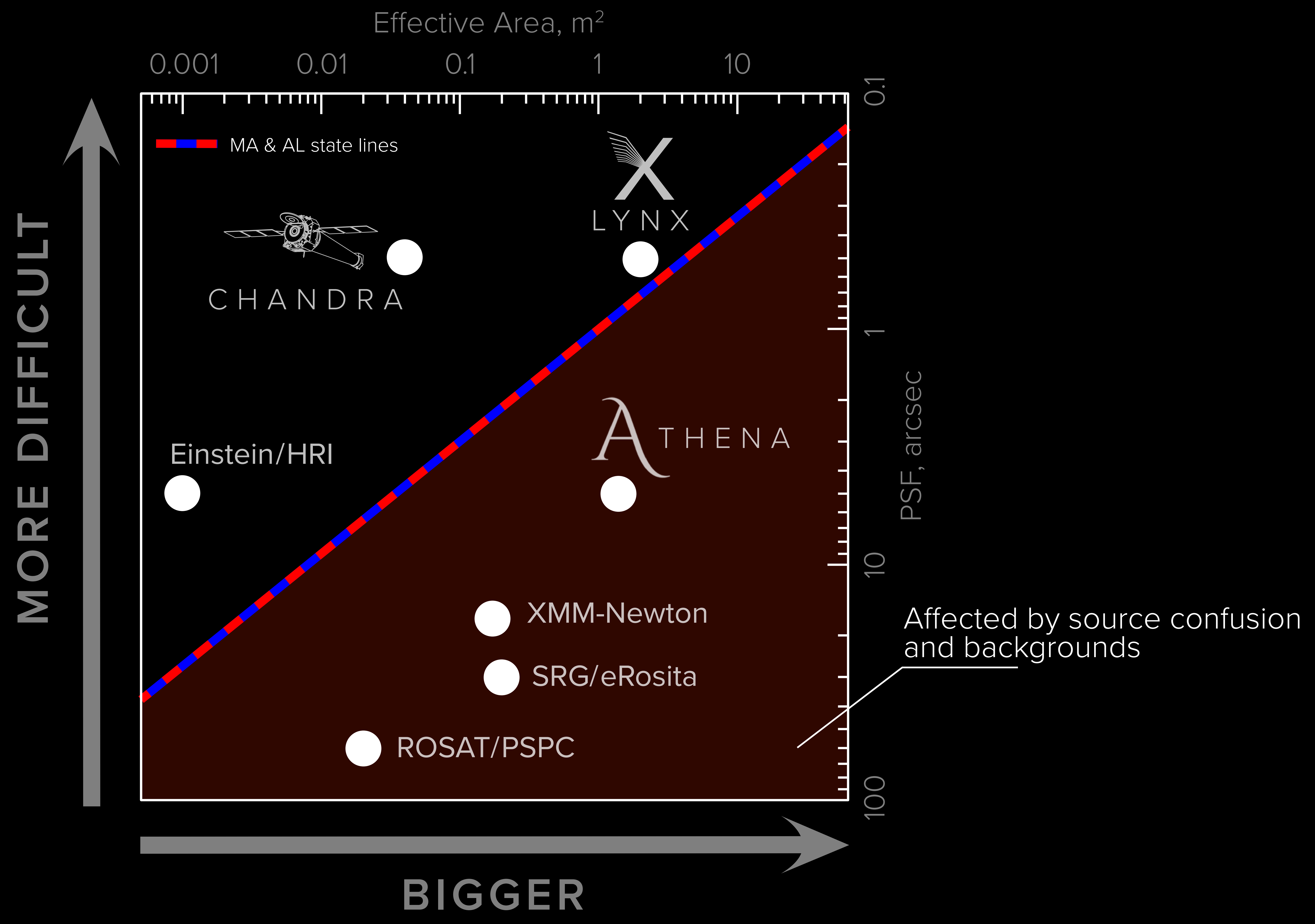


RESOLUTION = SENSITIVITY

0.5'' PSF







Effective Area, m²
0.001
0.01
0.1
1
10
MA & AL state lines
CHANDRA
LYNX
Einstein/HRI
ATHENA
XMM-Newton
SRG/eRosita
ROSAT/PSPC
0.1
1
10
100
PSF, arcsec
Affected by source confusion and backgrounds
MORE DIFFICULT
BIGGER

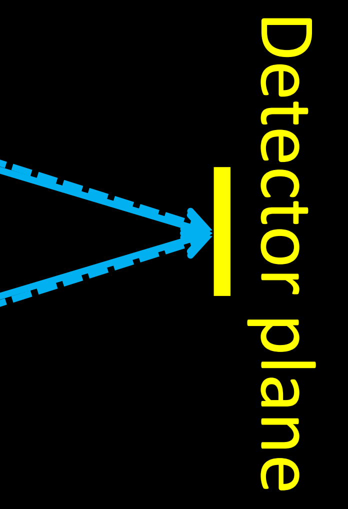
ept for ESA's Voyage 2050 program

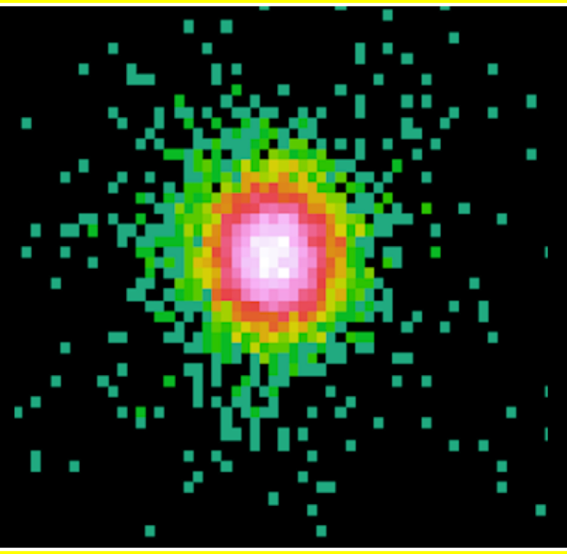
ard Willingale[3]
e 2050 call
1 University of Amsterdam 2 SRON Netherlands Institute for Space Research 3 University of Leicester

gths

cs (Wolter-I)

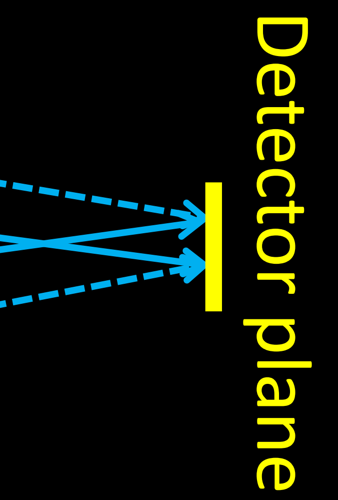
Chandra point-spread function: 0.5 arcsec HEW

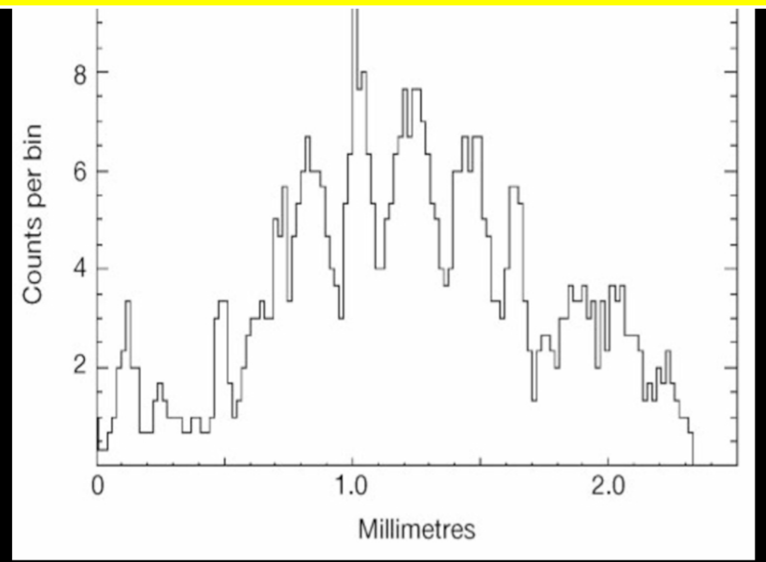




terferometer

Lab measurement of X-ray fringes for 1 mm baseline: 0.1 arcsec resolution

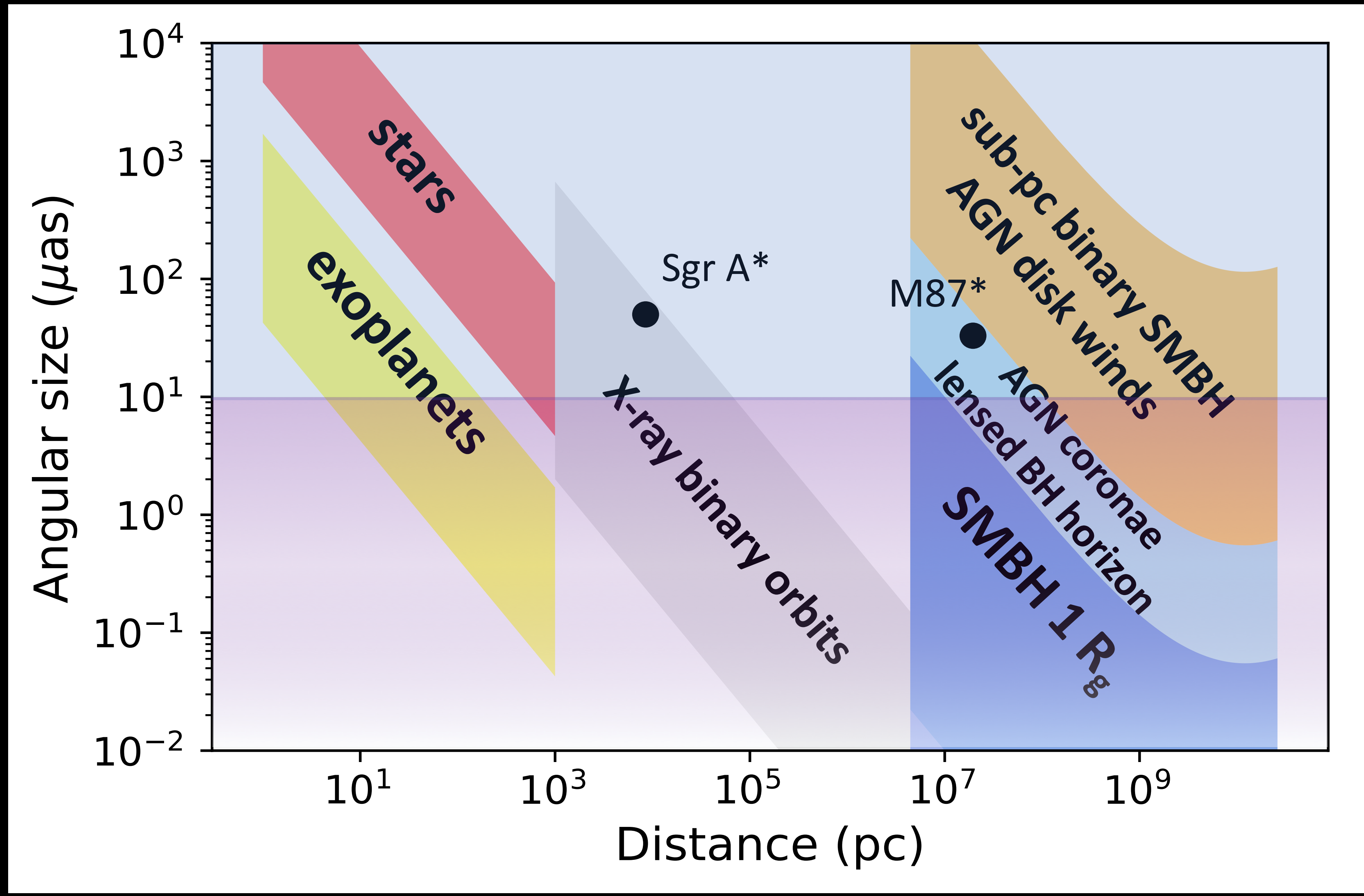




Cash et al. 2000

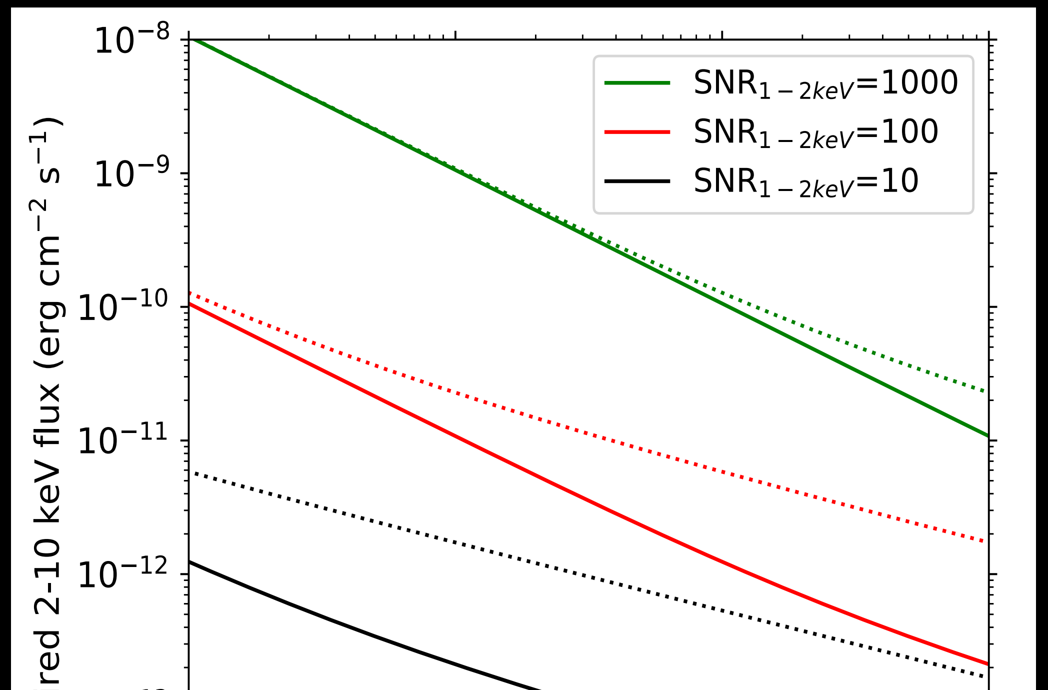
and longer wavelengths, but remain 4 or
n shaping and maintenance of curved grazing
imitation by using flat mirrors – fringes have
se in space with longer baselines.

The X-ray universe at μas resolution



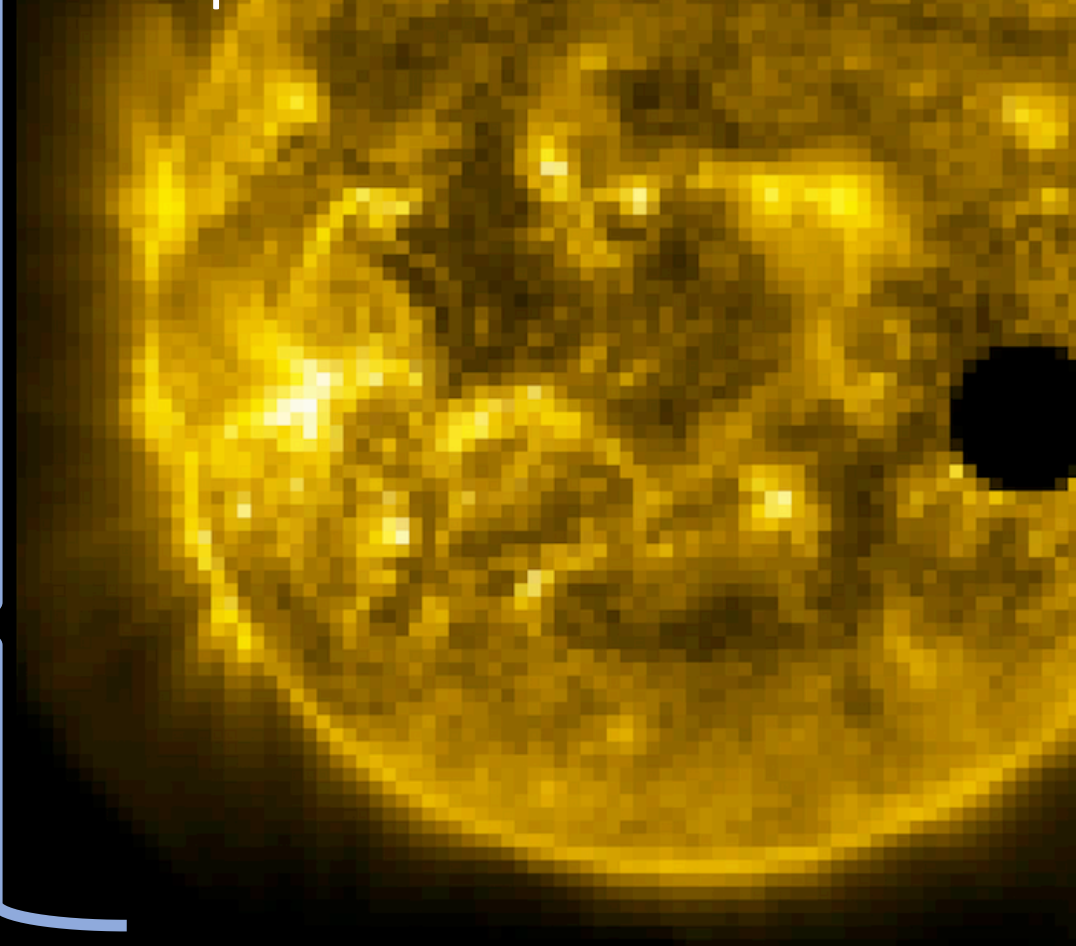
Single spacecraft (1-10 keV)

Formation flying (1-10 keV)

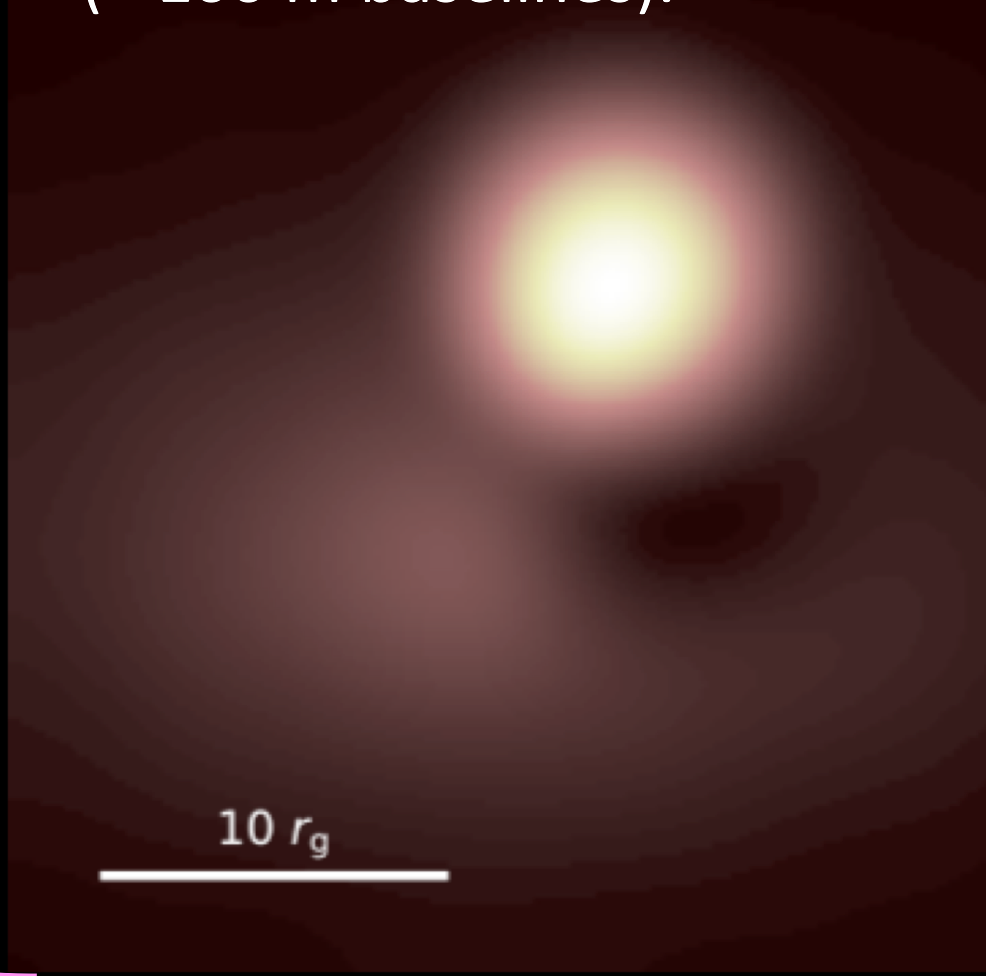


Left: *1-2 keV point-source sensitivity curves for 1000 cm^2 collecting area, assuming AGN-like spectra. With arcmin-scale collimation, background should be dominated by cosmic rays. The dotted curves show the required Athena-WFI background at L2 and solar minimum. The solid*

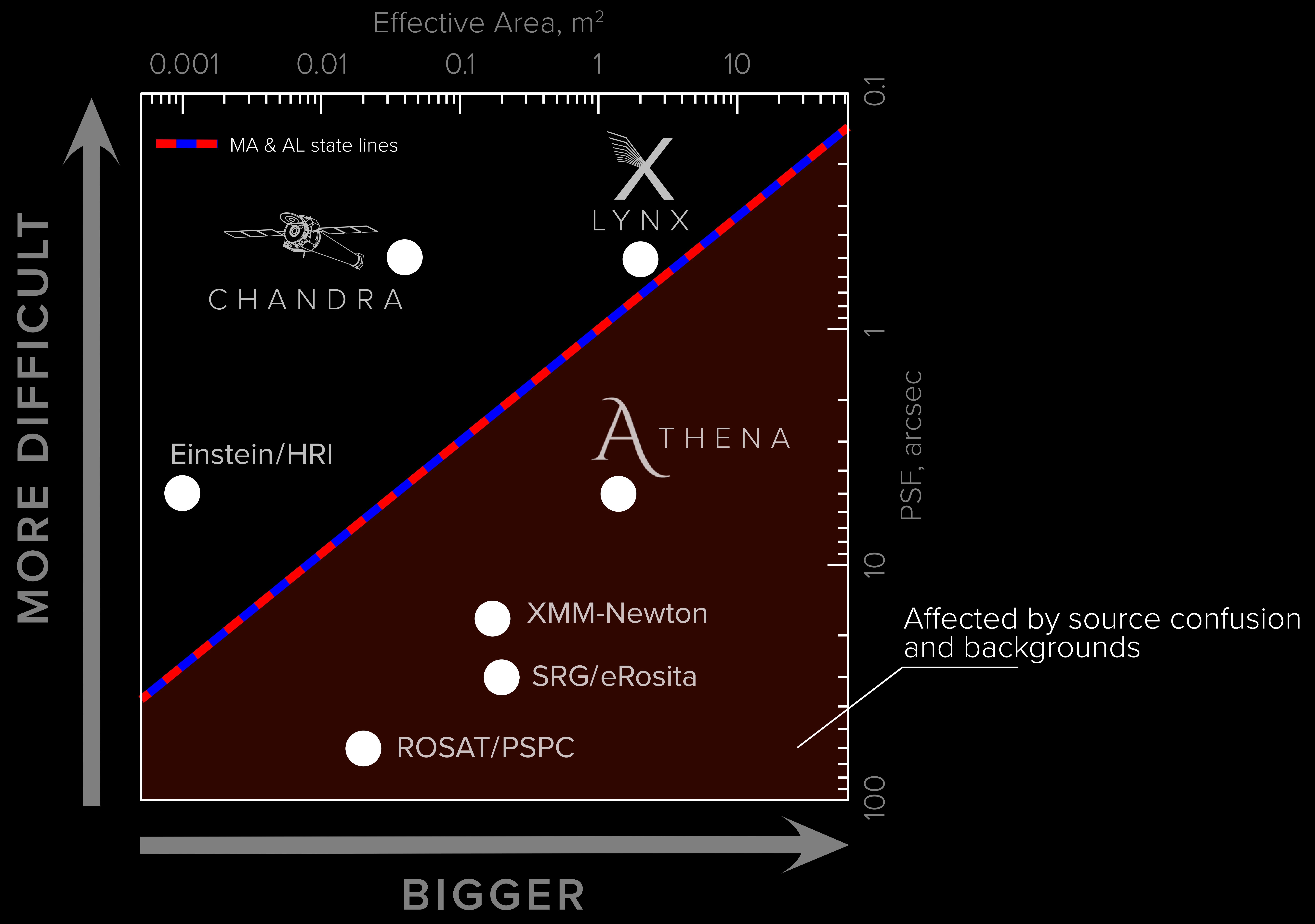
Low mass star AU Mic (and tra
exoplanet) at 10 pc. Pixel size i
which is just attainable on a sin
spacecraft.



Accreting 10^9 M_{sol} black hole a
with corona above the accretio
The image is blurred to 1 μas r
(< 100 m baselines).



Above: *an X-ray interferometer w*



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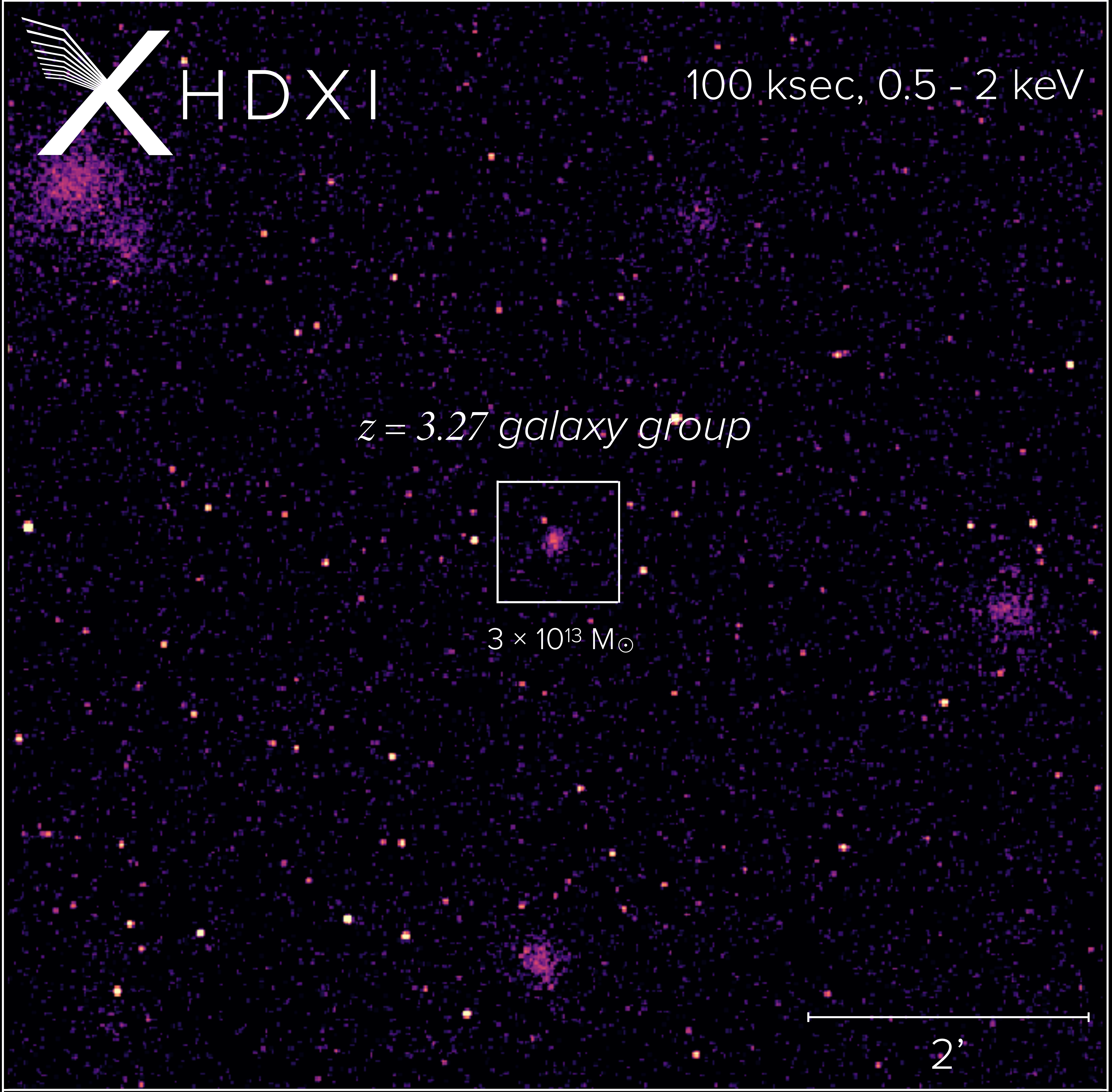

HDXI
100 ksec, 0.5 - 2 keV
z = 3.27 galaxy group
3 × 10^13 M☉
2’


HDXI
100 ksec, 0.5 - 2 keV
Lower z clusters & groups
High z active galactic nuclei
5’


HDXI
100 ksec, 0.5 - 2 keV
Lower z clusters & groups
HST
XMM
HDXI
100 ksec
z=2 cluster, 100 ksec
High z active galactic nuclei
5'

EVERY 100 KSEC HDXI EXPOSURE *is*

DEEPER *than the* **7 MSEC CHANDRA DEEP FIELD SOUTH**


5’


HDXI FOOTPRINT
7,000 SOURCES
from a “BLANK”
part of the sky
22’


100 ksec
HDXI FOOTPRINTS
10 MEGAPARSECS
1.255°

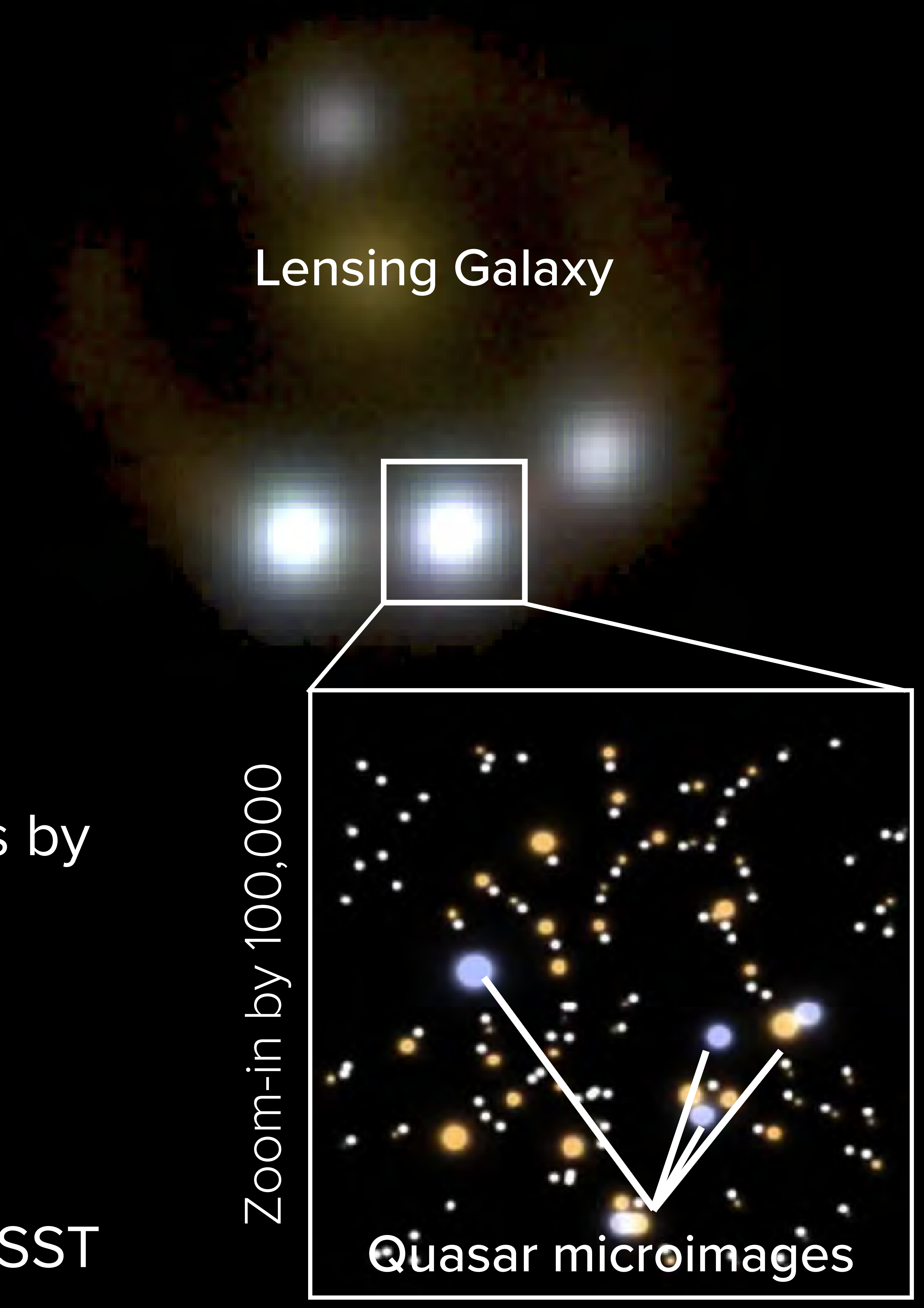

the
LEGACY FIELD
10 MEGASECONDS
10 SQUARE DEGREES
10 MEGAPARSECS
1.255°


RCW 49 & Westerlund 2
4.2 kpc away
Spitzer
15 arcmin (60 ly)
Westerlund 2
HST + Chandra
15 ly
Westerlund 2
412 pc away
1 ly
Orion
412 pc away
1 ly
the MILKY WAY
X HORIZON
5 kiloparsecs
CHANDRA HORIZON
400 parsecs

the STELLAR IMF *via* QUASAR MICROLENSING

Nobody ever measures the stellar mass. That is not a measurable thing; it's an inferred quantity. You measure light, OK? You can measure light in many bands, but you infer stellar mass. Everybody seems to agree on certain assumptions that are completely unproven.

Carlos Frenk, 2017 May 15 (44:48)



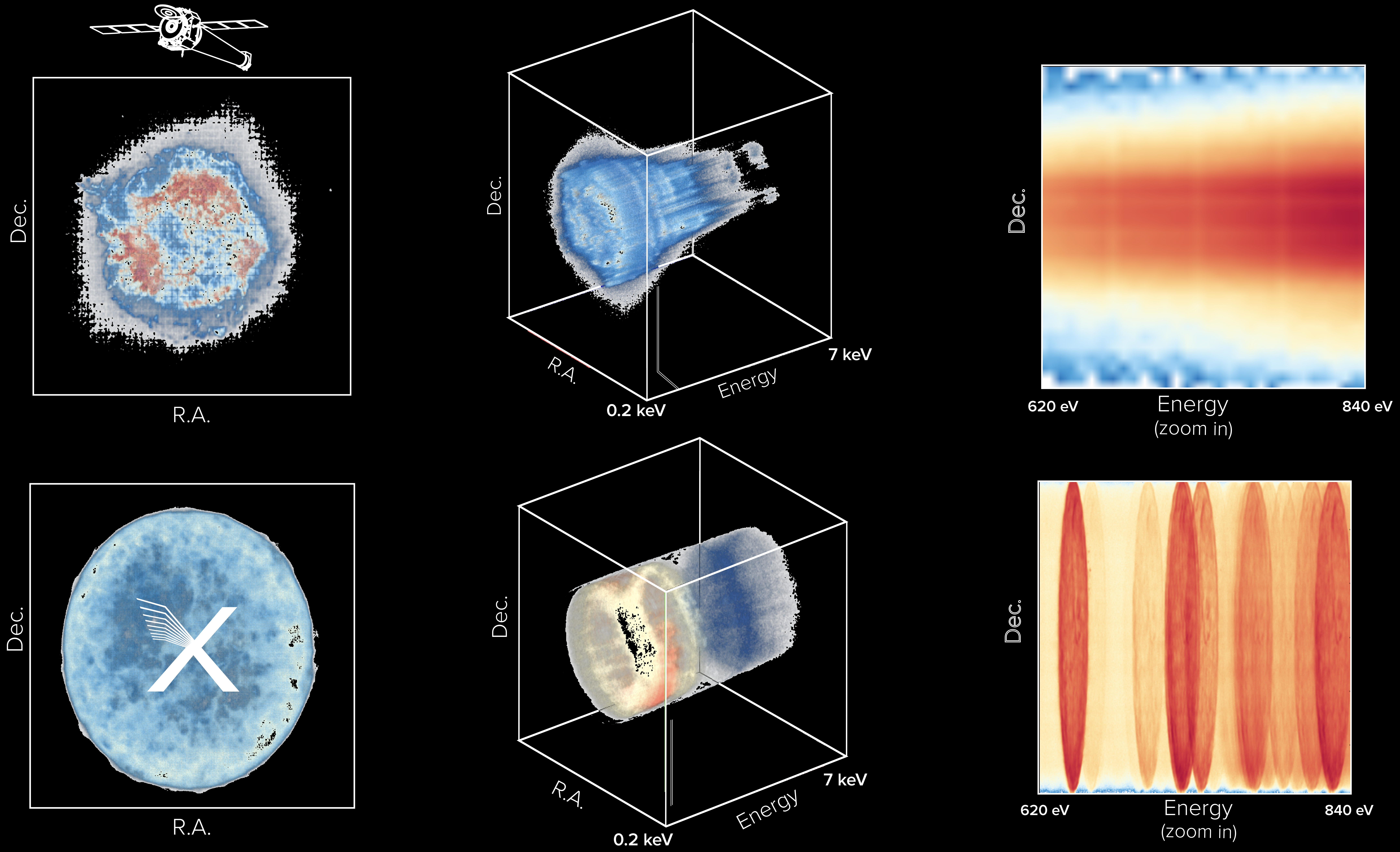
Order-of-magnitude variations in brighness when stellar field shifts by 10s of µas.

Macrolensing gives full mass

Microlensing gives mass in stars

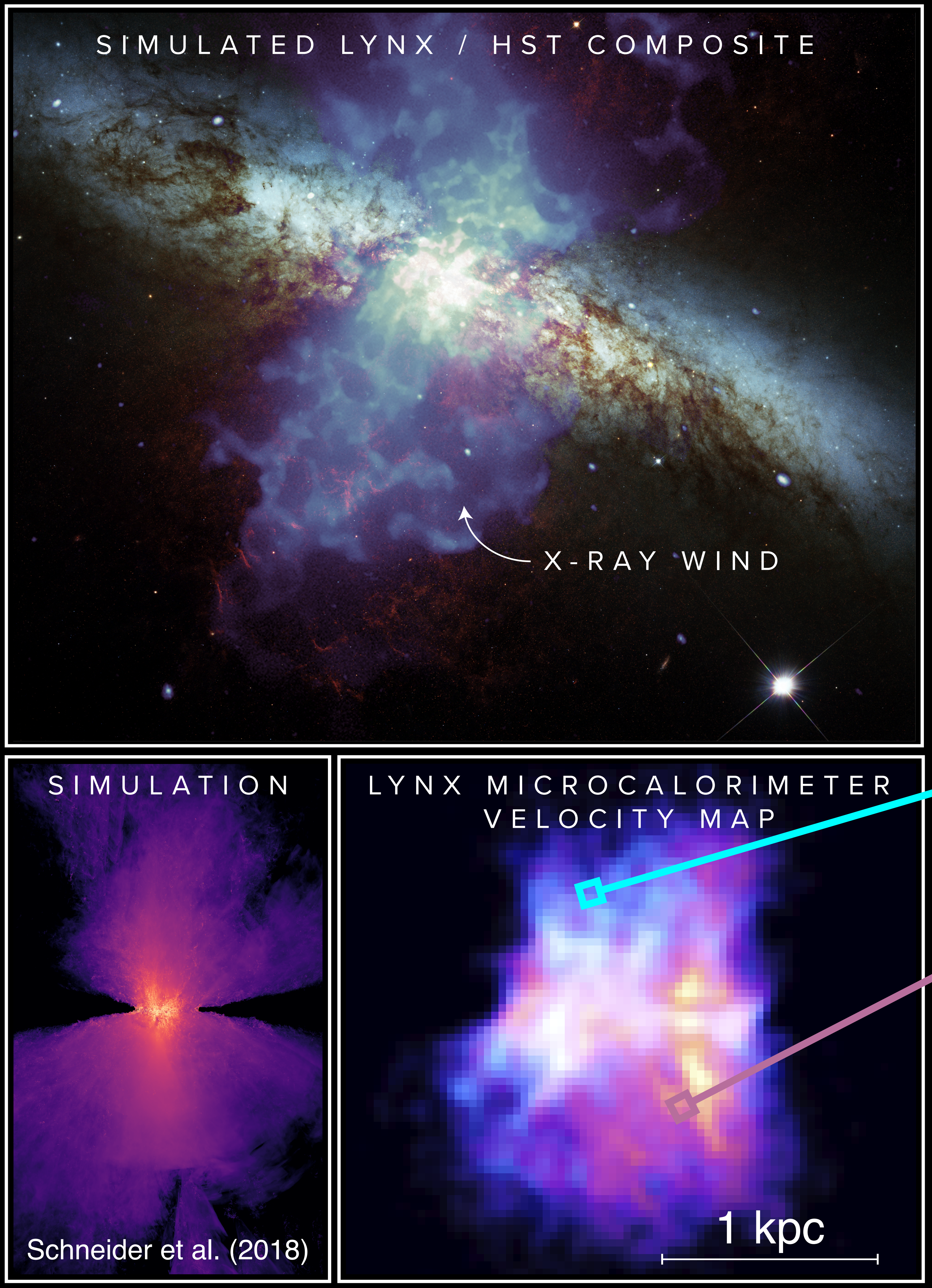
Chandra results: M*/L = 1.2 ± 0.6 Salpeter ⟶ exquisite post-LSST

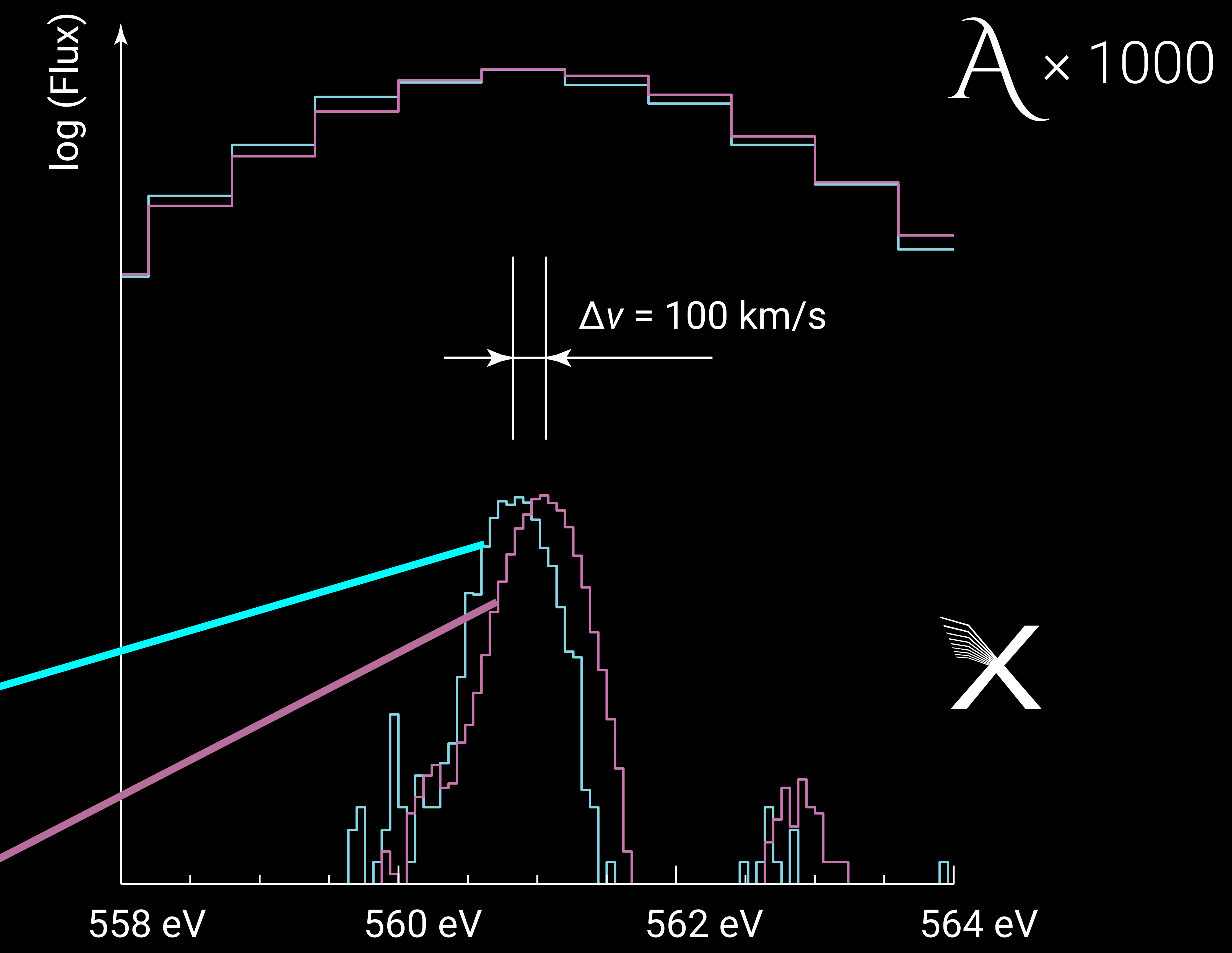
IMAGING *meets* SPECTROSCOPY



the DRIVERS *of* GALAXY EVOLUTION

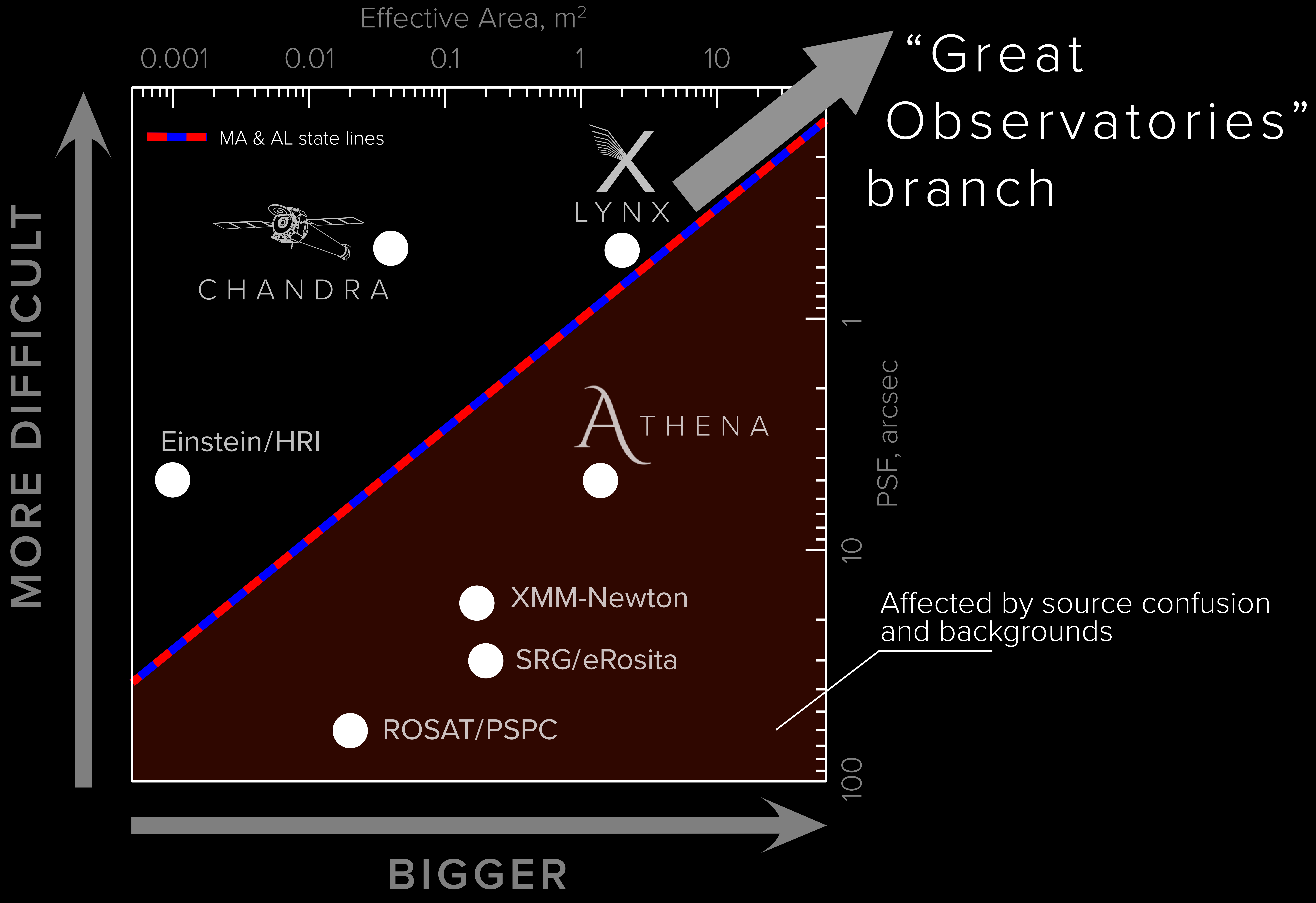
FEEDBACK *in* ALL MODES, *on* ALL SCALES





Structure of the galactic wind with 1 arcsec spatial and 30 km/s kinematic resolution

the COLD ISM *via* X-RAY REFLECTION



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100
MORE DIFFICULT
BIGGER
“Great Observatories” branch
Affected by source confusion and backgrounds

a NEW GREAT OBSERVATORY *recipe*: $A = 2\,\mathrm{m}^2 \times (\mathrm{PSF}/0.5'')^{-2}$

the most economical way to high sensitivity

X-ray discovery engine with profound
impact across all of astrophysics

strong and easily understandable
model constraints

If an object does not appear in Lynx images,
it does not exist!!