Neil Gehrels Memorial Meeting

NAS, Washington, DC

May 21-22, 2018

I spent a lot of time with Neil in 1991 when I was a Lindsay Lecturer of NASA Goddard Space Flight Center. Neil was responsible for my visit.

We met many times before and after on different ocasions.

He was really great in his position of a person responsible for SWIFT spacecraft and representing NASA in INTEGRAL.

Neil was one of the most visible scientists in the field of High Energy Astrophysics.

He was strong as a professional, very reliable and always friendly and positive to his colleagues, friends and young scientists. This Meeting demonstrates how many friends he had.

Rashid Sunyaev
Max-Planck Institute for Astrophysics, Garching
Space Research Institute, Moscow
Institute for Advanced Study, Princeton

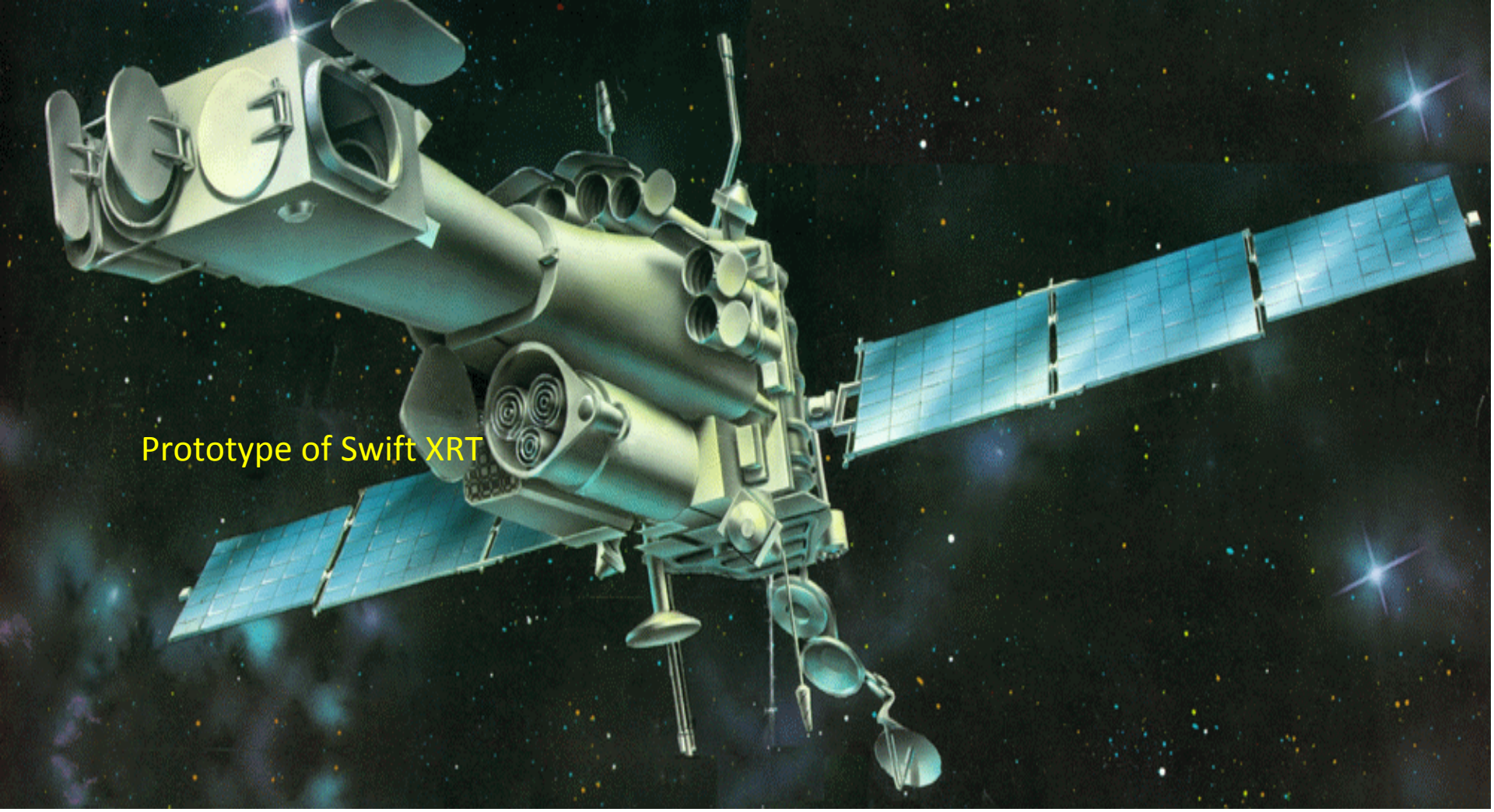
I met several times prof. Tom Gehrels, father of Neil.

It was a surprize for me when I was informed by IAU that one asteroid has now name „11759 Sunyaev“. This was absolutely unexpected.

Later I recognized that this asteroid was discovered by Tom Gehrels.
Tom discovered more than 4000 asteroids and small planets. It is interesting to see the list of names of these celestial bodies in Wikipedia paper “Discoveries by Tom Gehrels”.

Among them are:
1777 Gehrels
18241 Genzel
12146 Ostriker
11755 Paczynski
18242 Peebles
5451 Plato
4587 Rees
5450 Sokrates
11759 Sunyaev
2413 van de Hulst

And second paper of Neil was written together with his father.
Minor planets and related objects. XXVI - Magnitudes for the numbered asteroids
Gehrels T., Gehrels, N.
Astronomical Journal, vol. 83, Dec. 1978, p. 1660-1674



SPECTRUM-X: old concept (1987 – 2003)

Broad cooperation with UK, Denmark, Italy, USA, Israel, Germany, Turkey

PROTON launch was planned

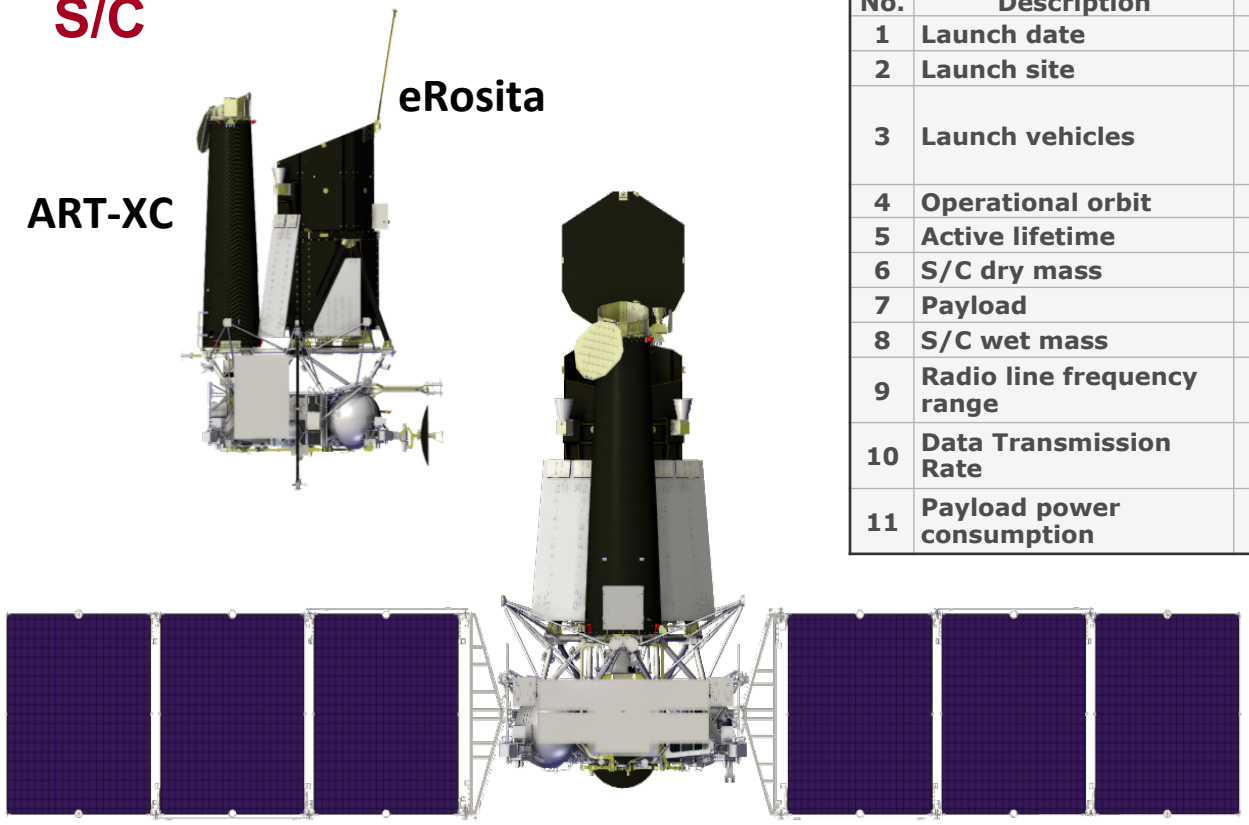
Our drama: great changes in the Soviet Union. Mission was delayed and canceled, when many devices were ready to fly.

New concept

S/C

eRosita

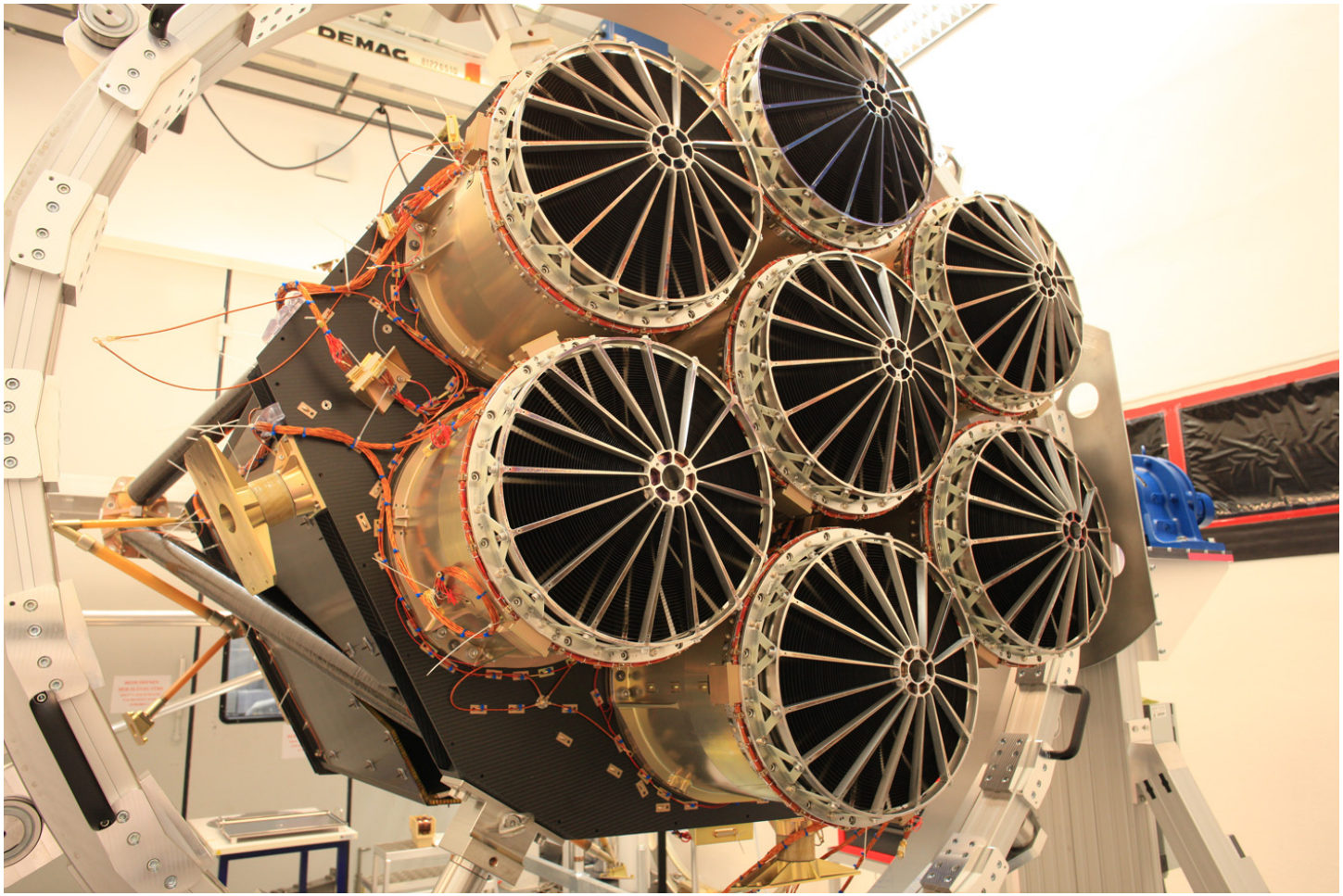
ART-XC



No.	Description	Value
1	Launch date	March 2019
2	Launch site	Baikonur
3	Launch vehicles	"PROTON" - "Booster DM"
4	Operational orbit	L2 point
5	Active lifetime	7,0 years
6	S/C dry mass	2267 kg
7	Payload	1228 kg
8	S/C wet mass	2647 kg
9	Radio line frequency range	X
10	Data Transmission Rate	512 Kbit/ sec
11	Payload power consumption	680 W

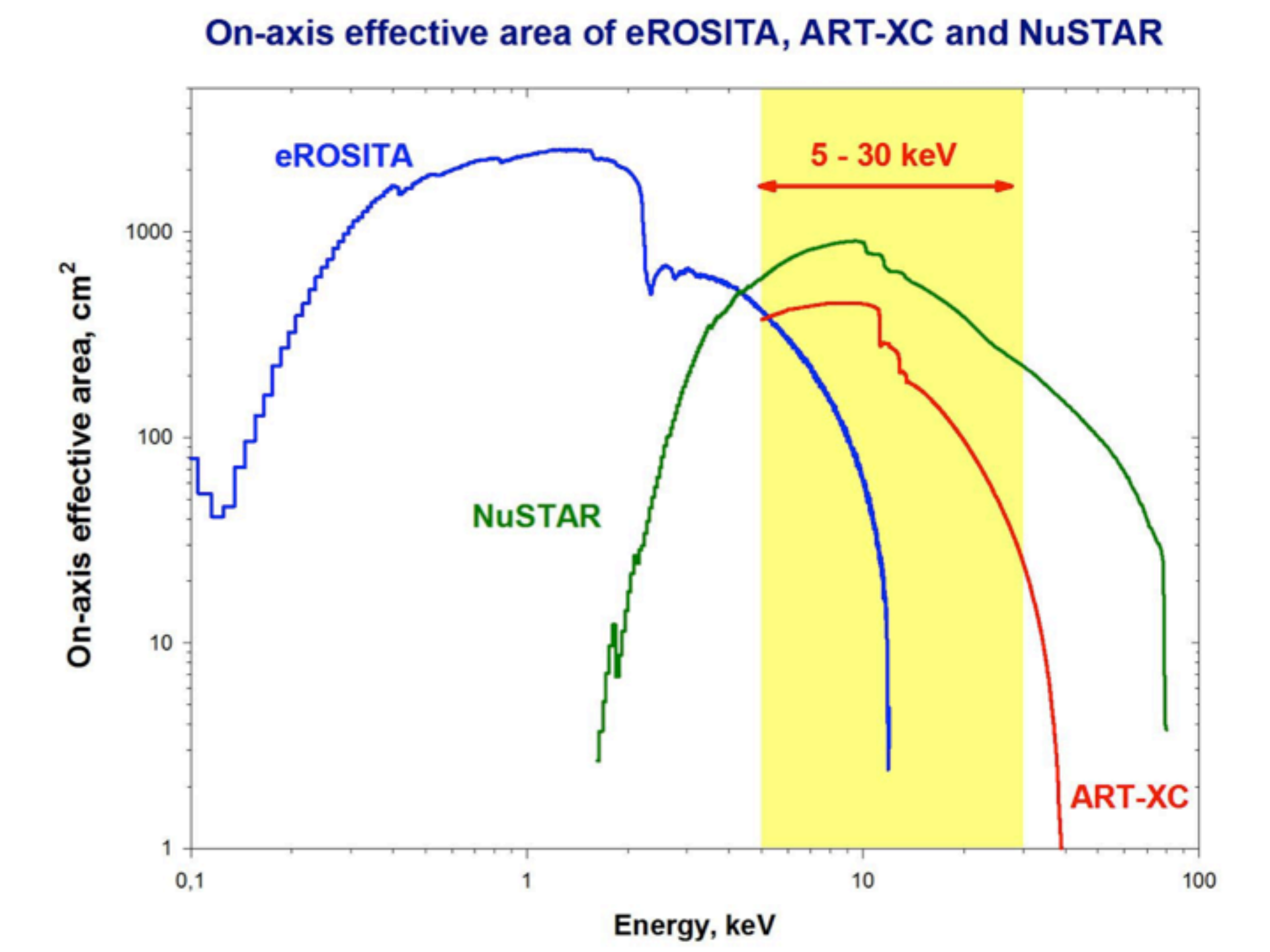
Main scientific goal: 4 years of all sky survey (8 times) with 25" angular resolution (detectors - X-Ray CCDs, grazing incidence optics)

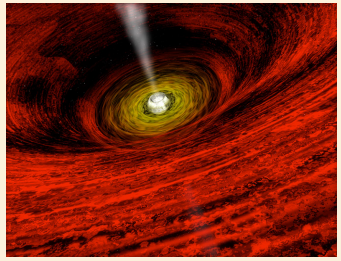
eRosita Flight Mirror System



MPE, Garching

Flight unit of eRosita under assembling


On-axis effective area of eROSITA, ART-XC and NuSTAR
eROSITA
5 - 30 keV
NuSTAR
ART-XC
On-axis effective area, cm2
1000
100
10
1
0,1
1
10
100
Energy, keV



AGN

10 thousand star forming galaxies

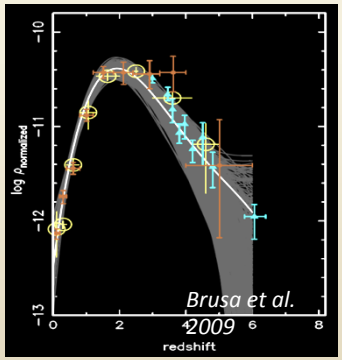
~10 thousand elliptical galaxies (Low mass X-Ray binaries)

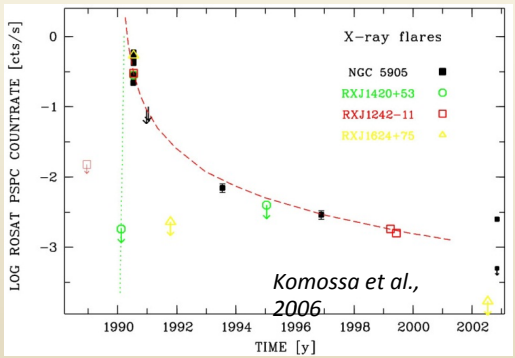
3 Mio. AGN

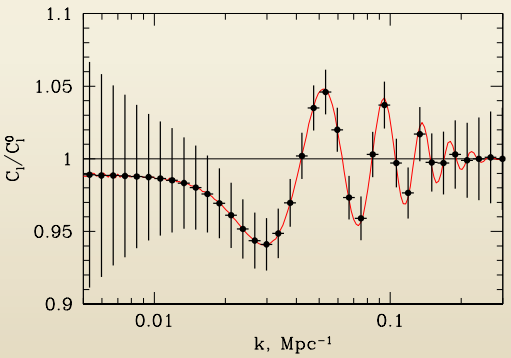
- Accretion History: XLF, obscured vs. unobscured
- LSS: AGN ACF, AGN/Galaxy CCF, AGN/Cluster CCF
- AGN host Galaxies: Morphology, SFR, Obscuration
- Sub-Populations:
  - High Redshift (z>6)
  - Extreme Luminosity
  - Compton thick AGN

Baryonic Acoustic Oscillations

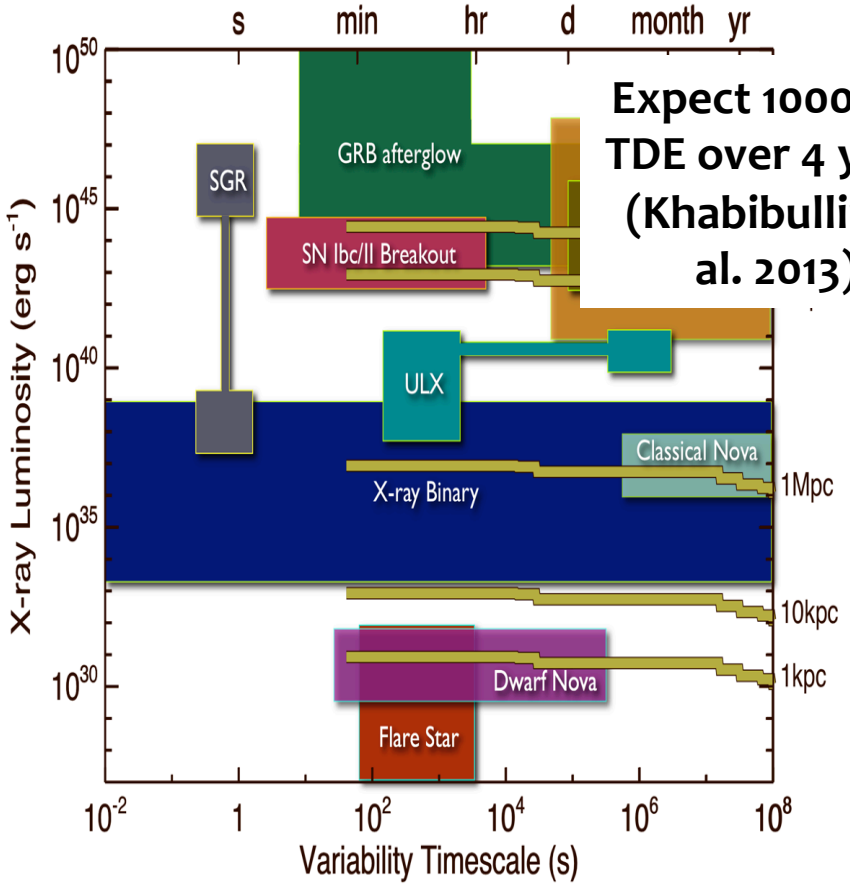
- Spectra: Obscuration, Continuum, Soft Excess, Iron Lines
- Variability: Var. vs. L, L/L_{edd}, z, Tidal Disruptions
- BAOs: 10σ detection, but precise redshifts needed.



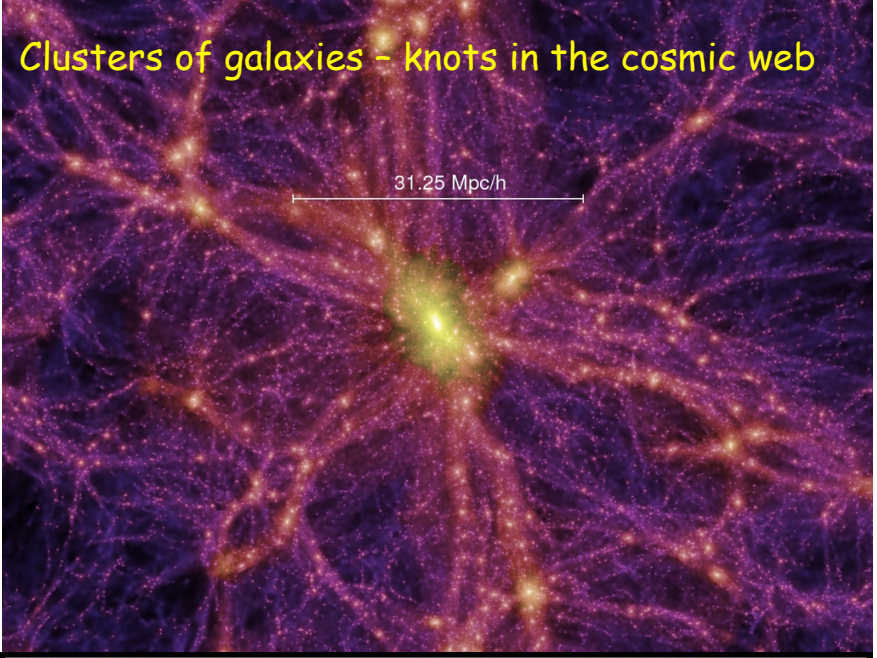


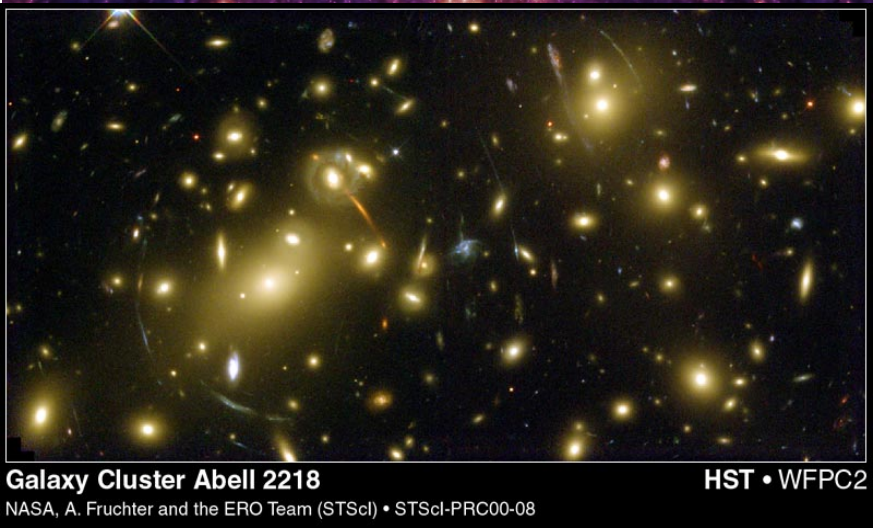


eROSITA sensitivity to variables



Expect 1000's of TDE over 4 years (Khabibullin et al. 2013)

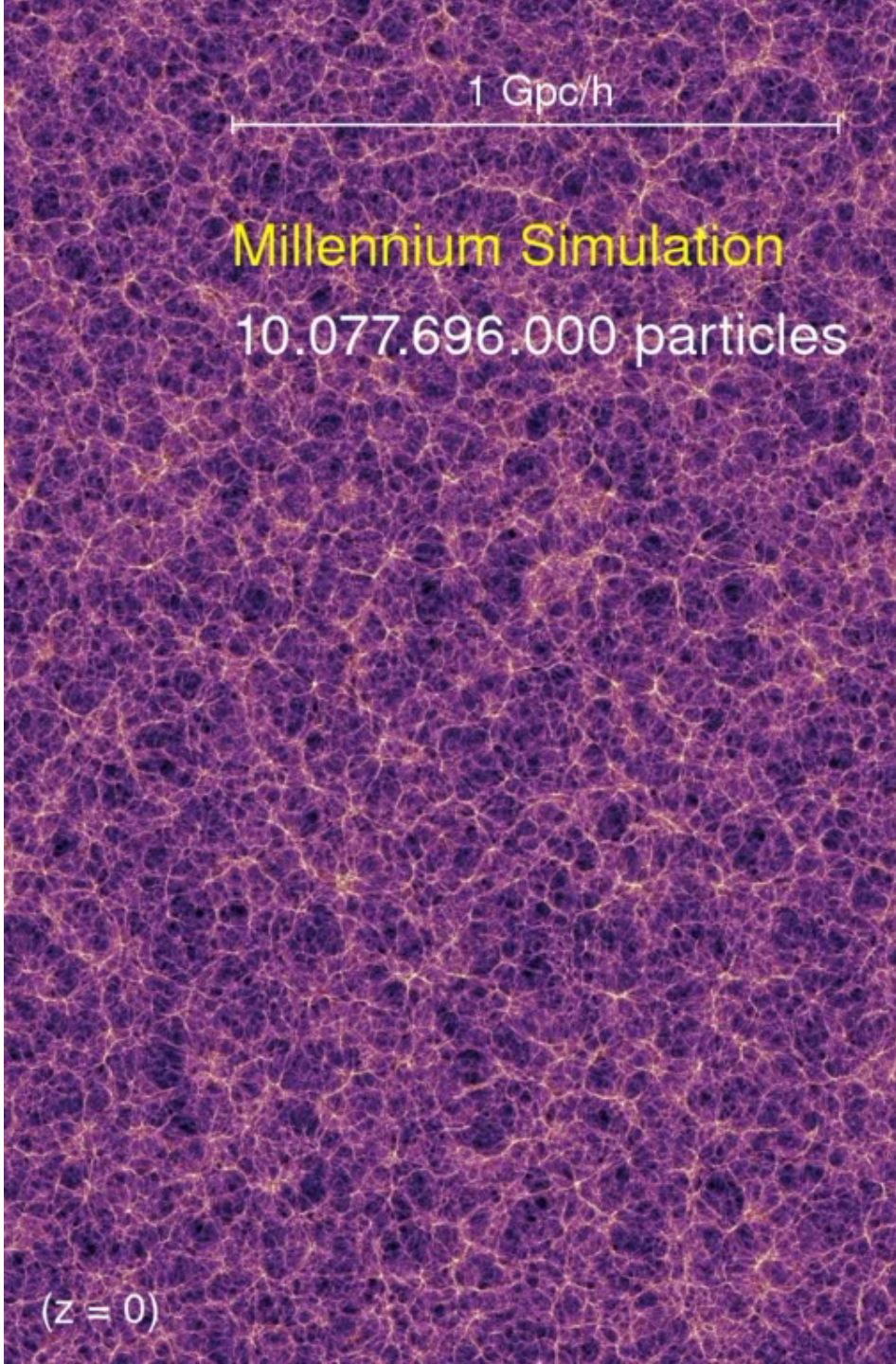




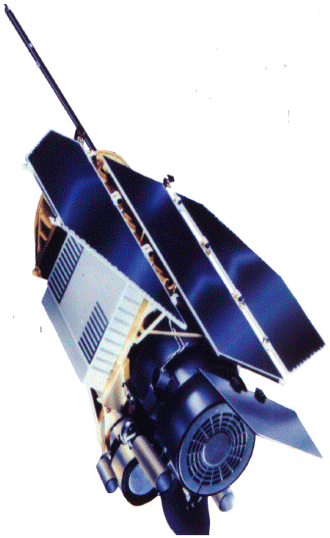
Thousands of galaxies with v ~ 1000 km/s

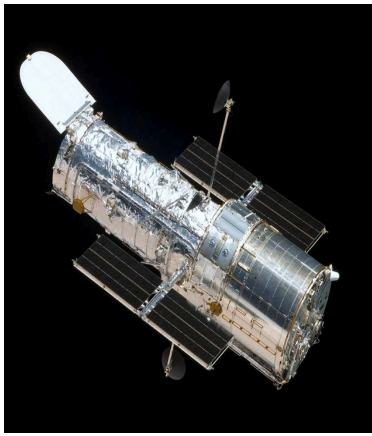
Hot **intergalactic gas** with Te ~ 3 – 10 KeV

Distant galaxies are gravitationally ***lensed***



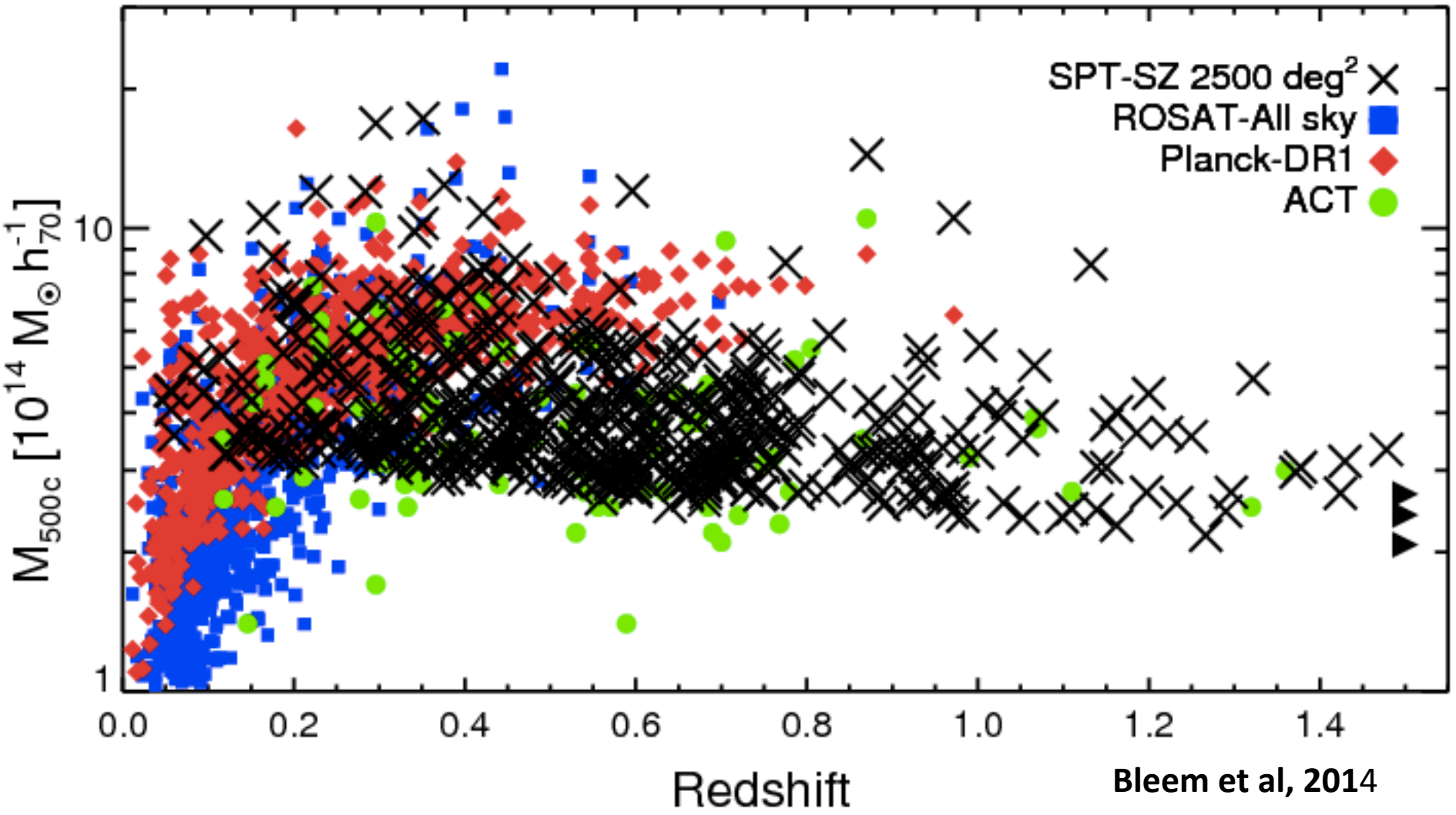
Cluster of galaxies
RX J1347.5–1145, discovered by ROSAT in X-Rays
Images obtained by ALMA (microwave) and HST (optics)





SZ effect

Competion with ground based instruments: SPT and ACT (20 000 sq degrees and hundred of thousands of clusters and groups of galaxies). SRG – whole sky in X-Rays



Bleem et al, 2014

In 2017 SPT started 3G phase with 16 000 bolometers in the focal plane: goal: 4000 new discovered clusters on 2500 sq degrees.

Clusters of galaxies – knots in the cosmic web