FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG

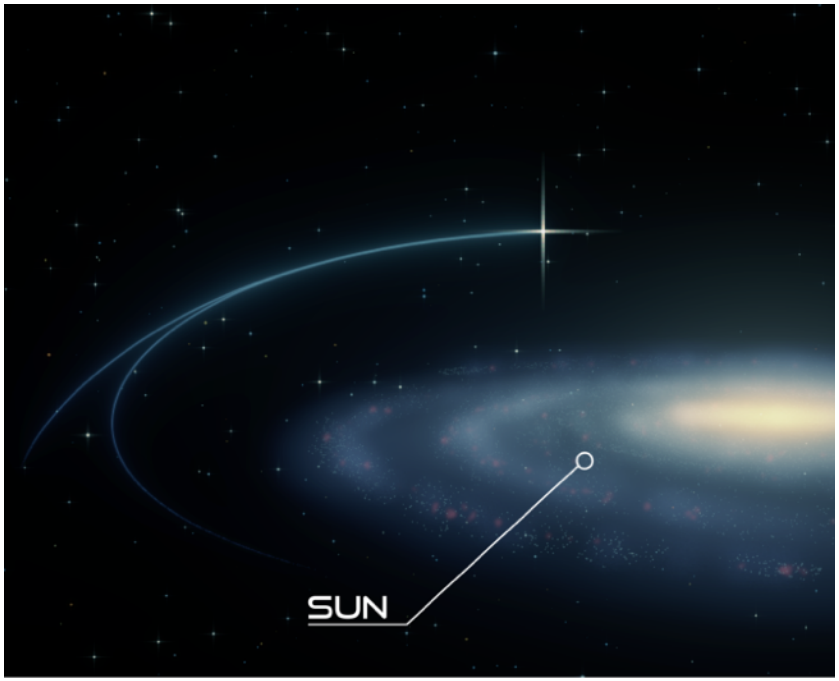
Astronomy and Astrophysics

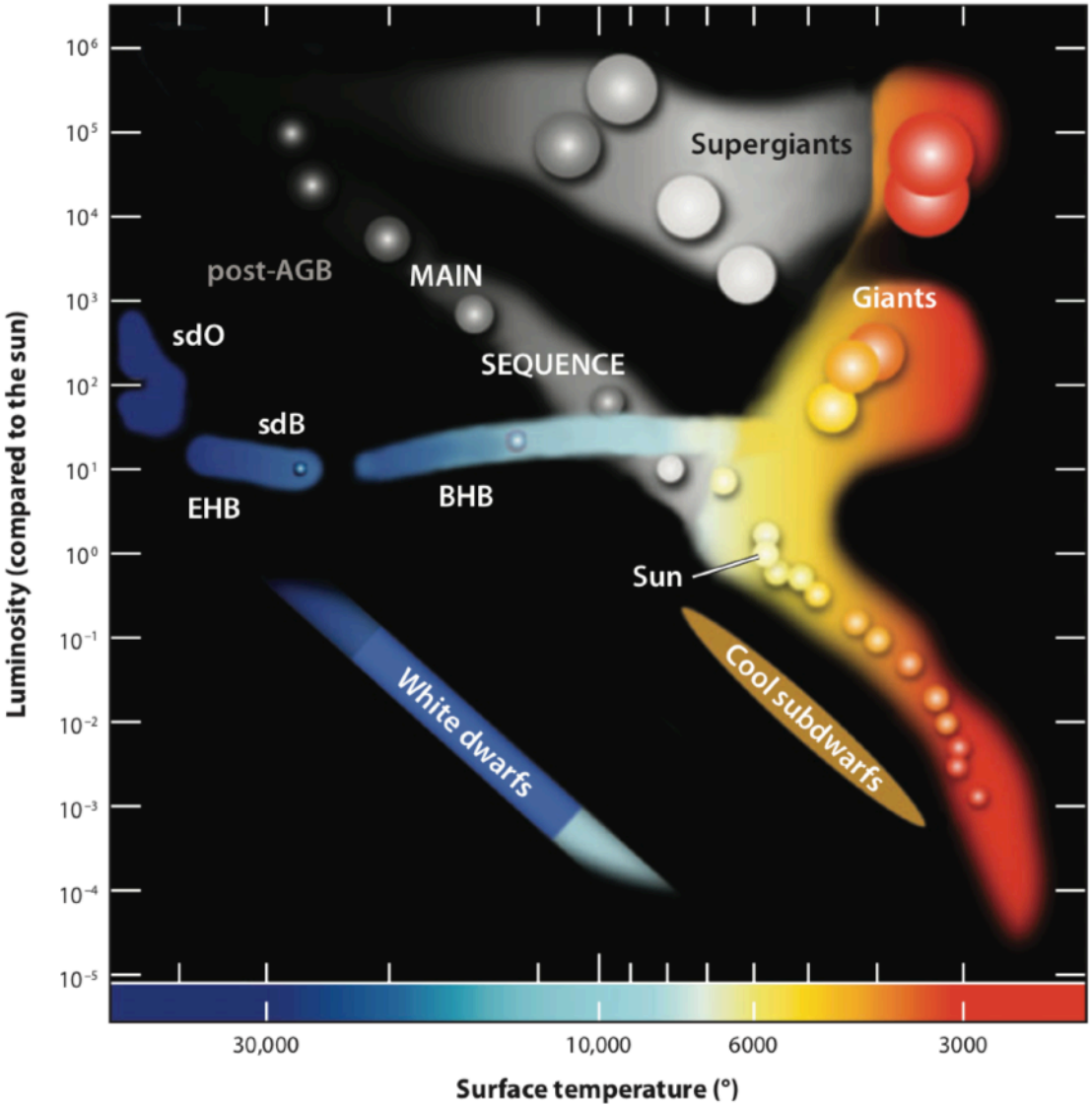
Manami Sasaki

Dr. Karl Remeis Sternwarte, Bamberg

Stellar Astronomy

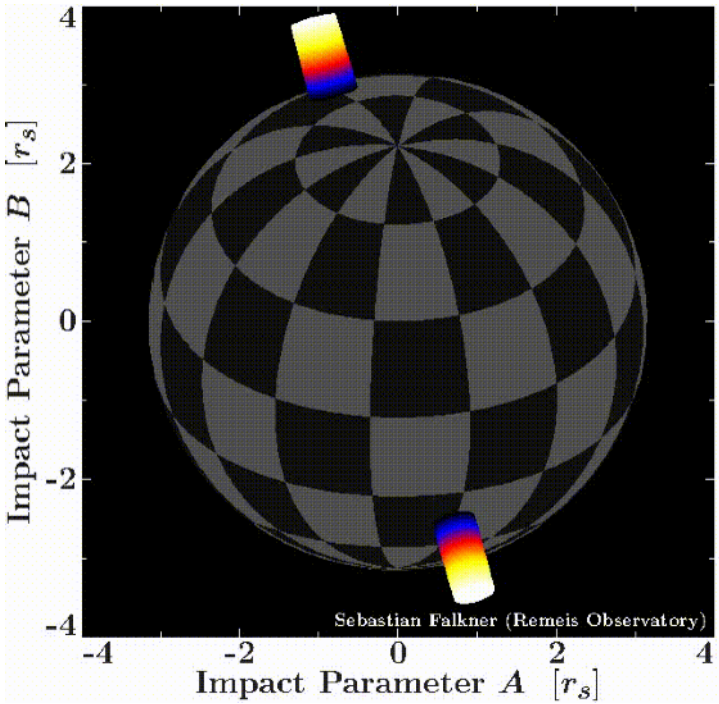
- Hot subdwarfs
- Stellar atmospheres
- Hyper-velocity stars

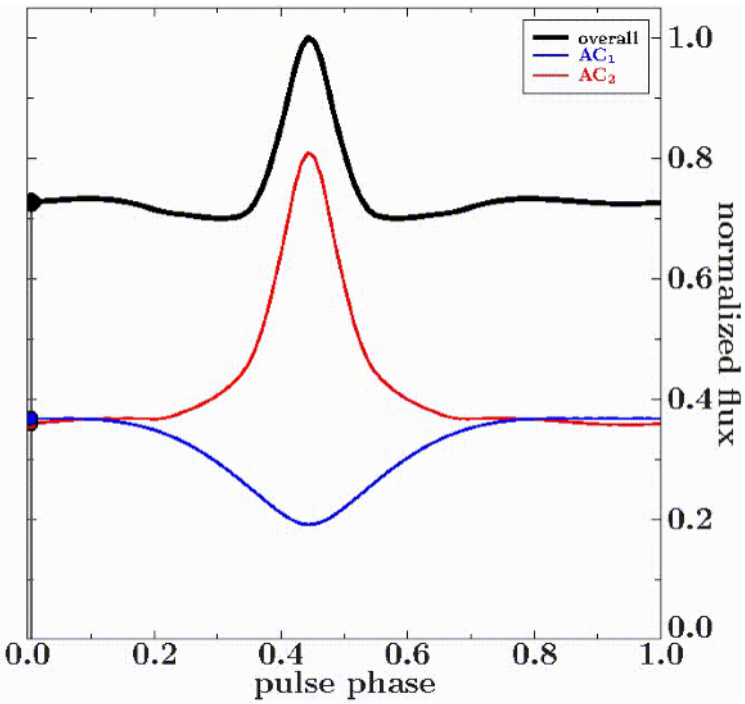




X-ray Astronomy

- Accreting neutron stars and black holes in binaries
- Active galactic nuclei
- Atomic physics
- ISM absorption
- Future X-ray missions





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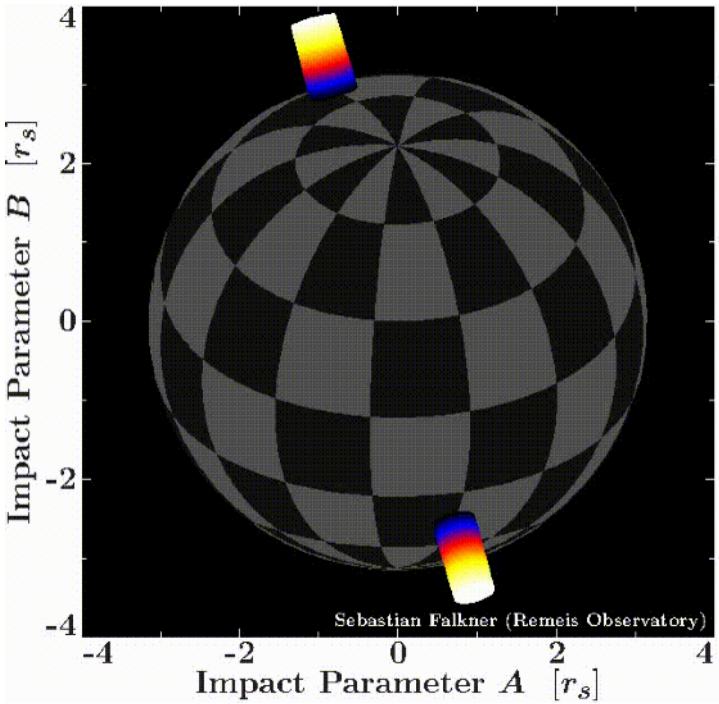
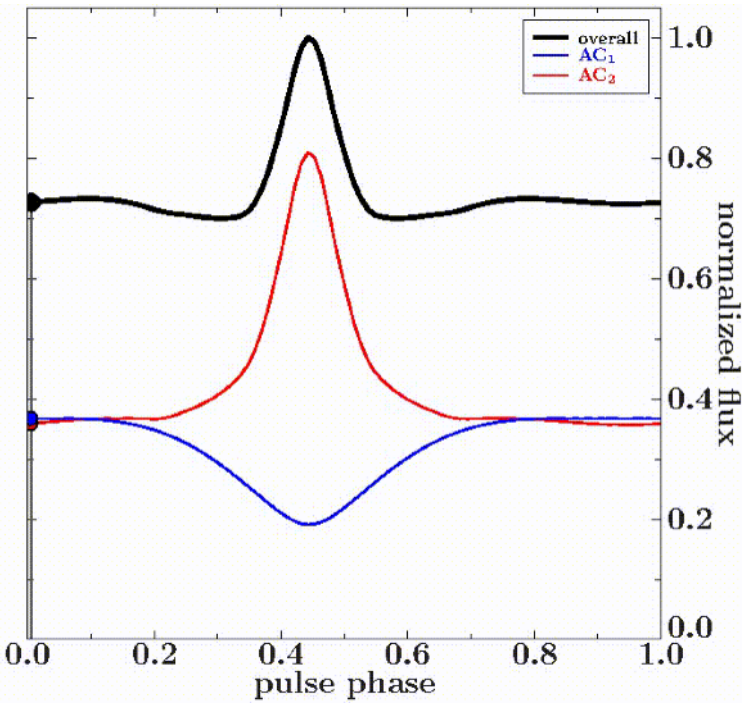
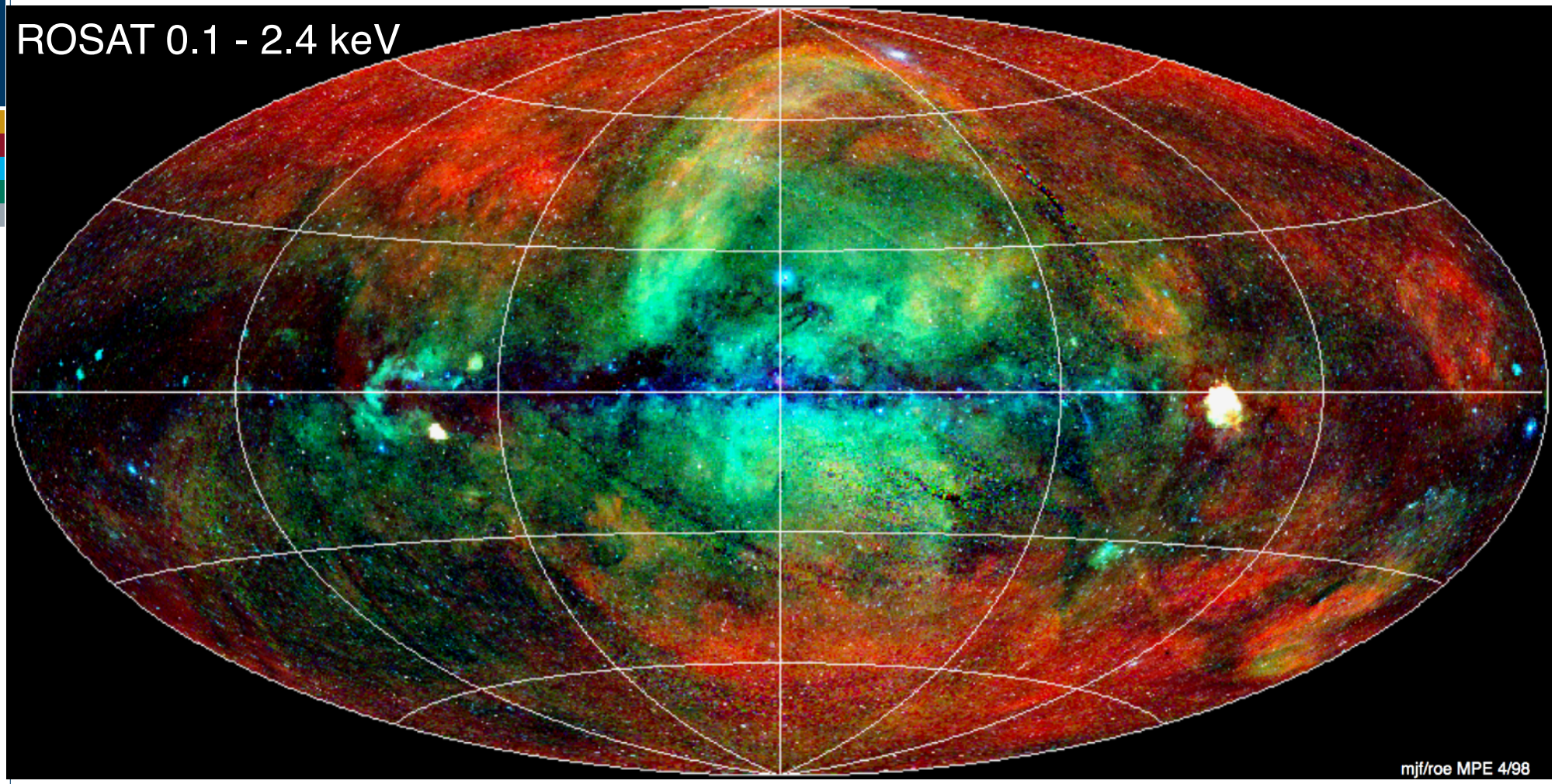
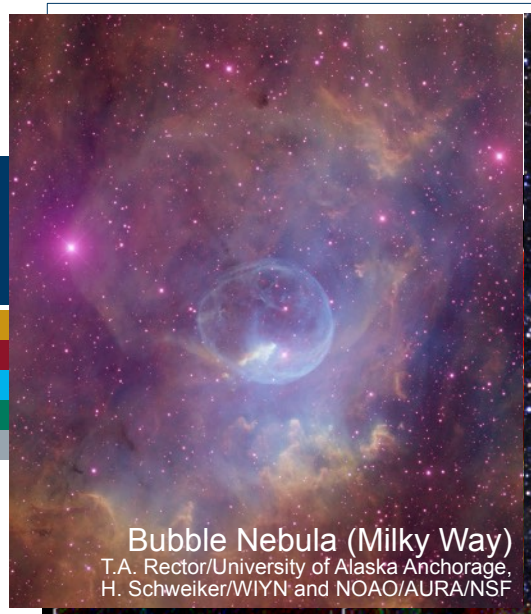




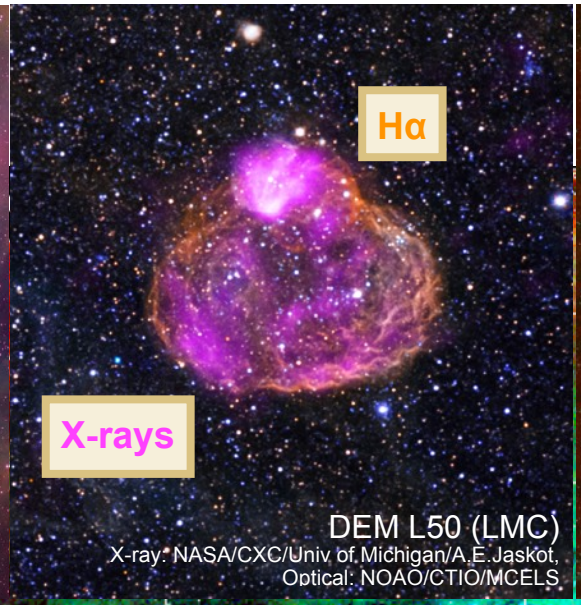
X-ray sky



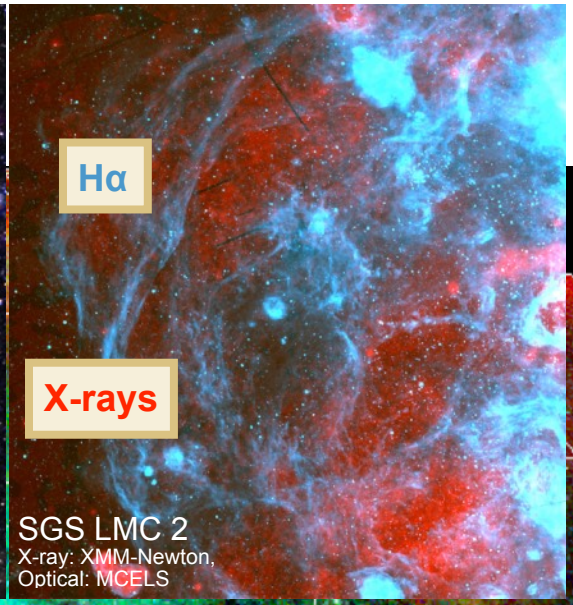
X-ray sky



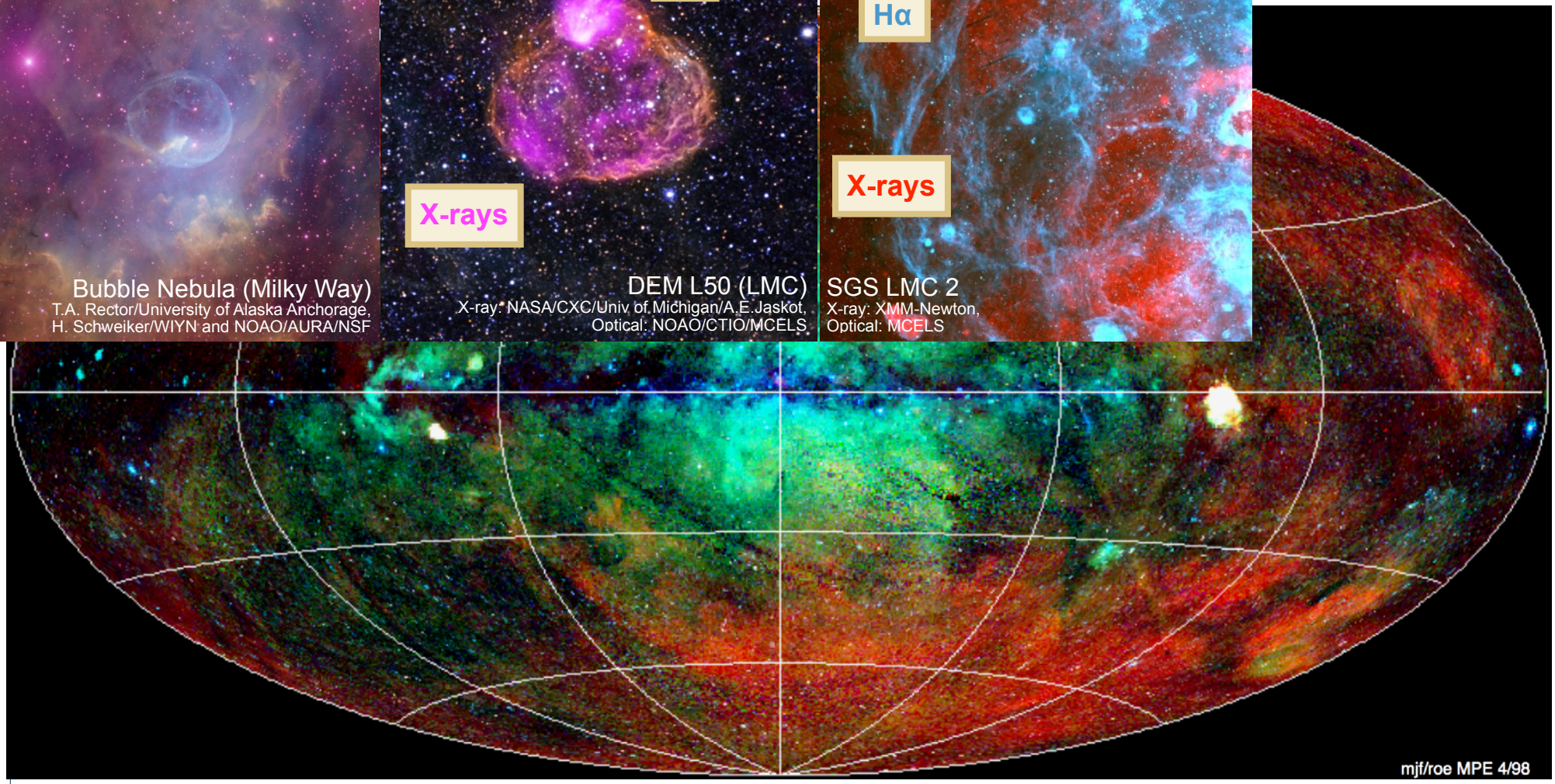
Bubble Nebula (Milky Way)
T.A. Rector/University of Alaska Anchorage,
H. Schweiker/WIYN and NOAO/AURA/NSF



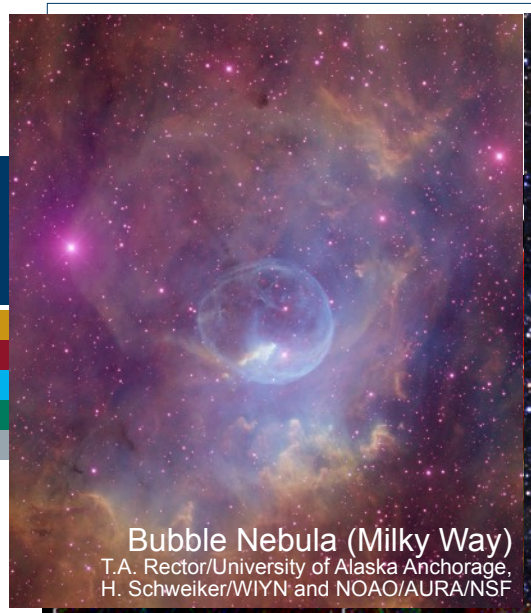
DEM L50 (LMC)
X-ray: NASA/CXC/Univ of Michigan/A.E.Jaskot,
Optical: NOAO/CTIO/MCELS



SGS LMC 2
X-ray: XMM-Newton,
Optical: MCELS



X-ray sky



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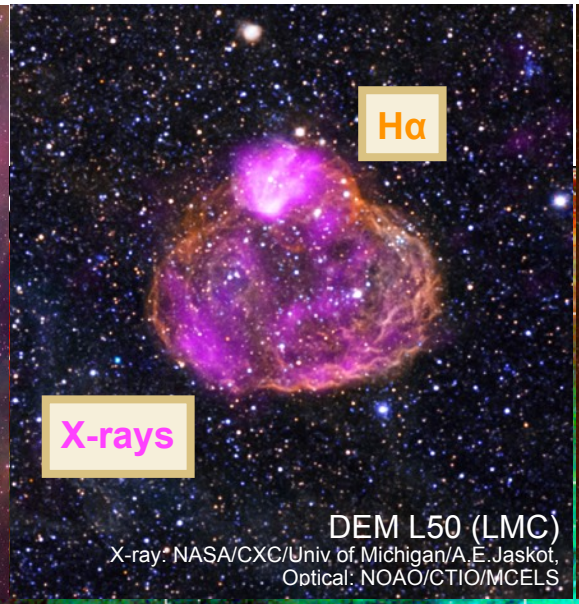

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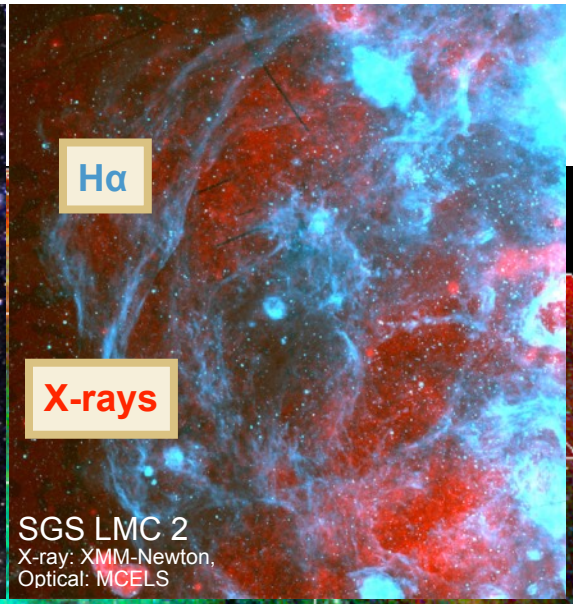
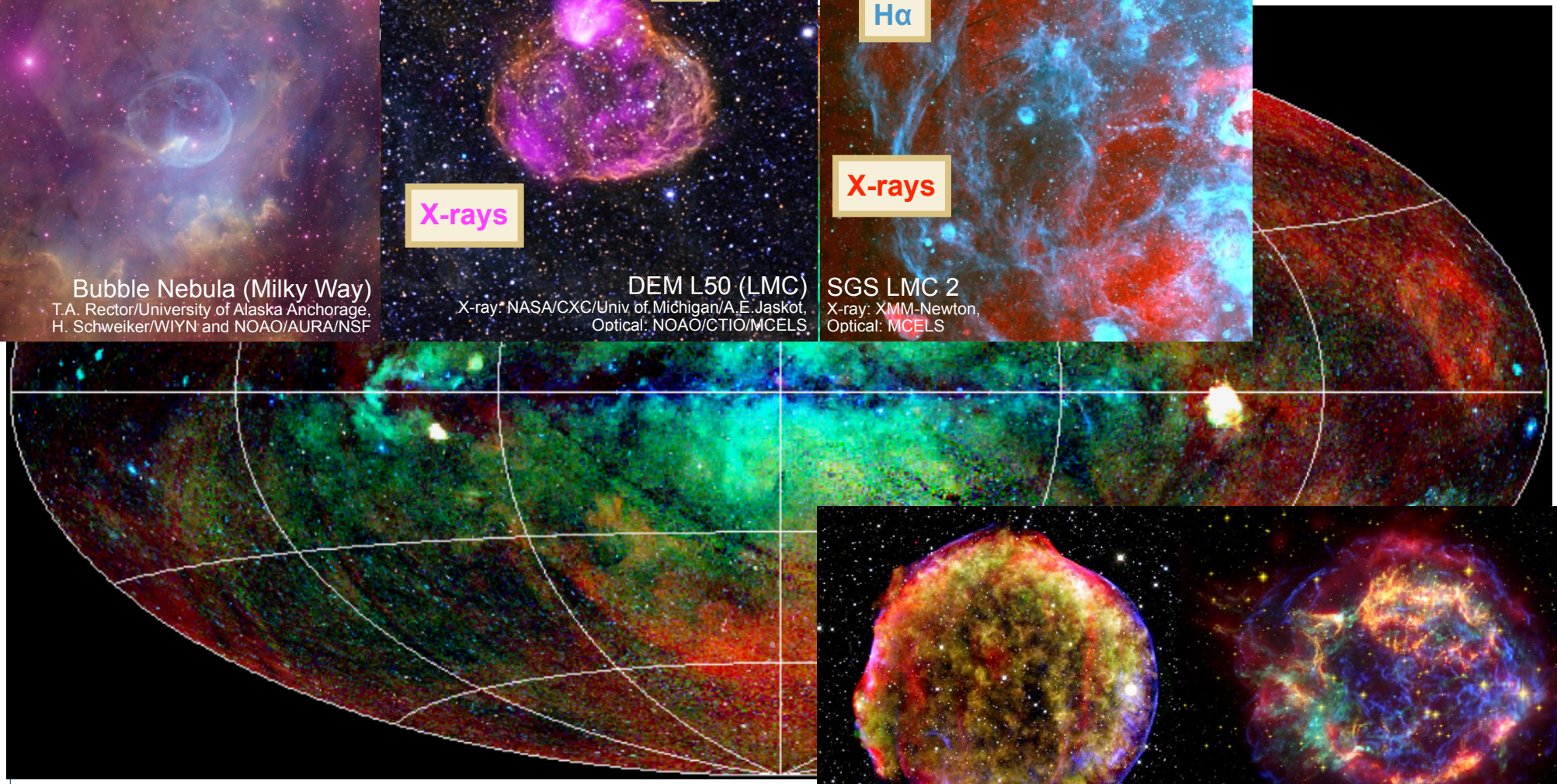
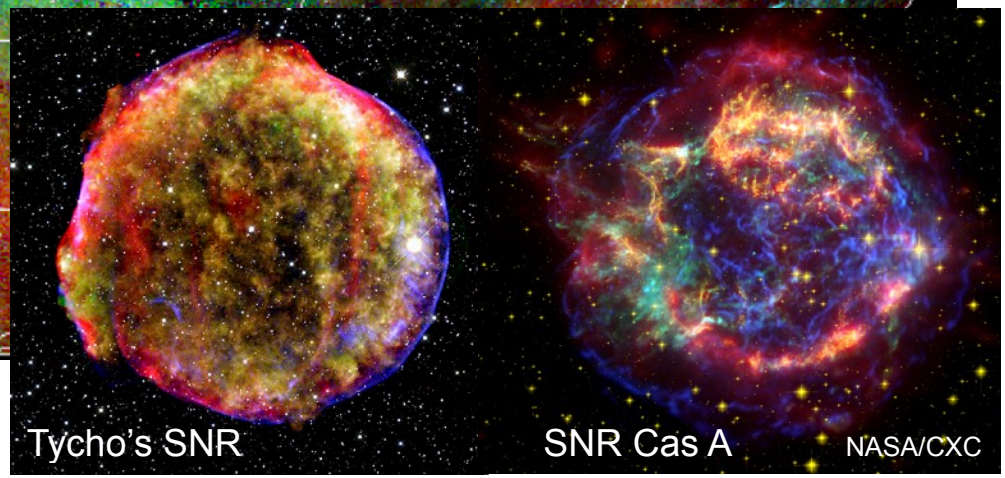


SGS LMC 2
X-ray: XMM-Newton,
Optical: MCELS



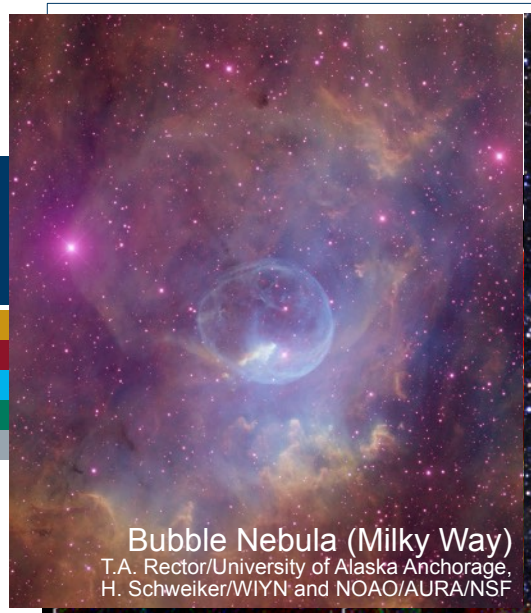


Tycho's SNR

SNR Cas A

NASA/CXC

X-ray sky



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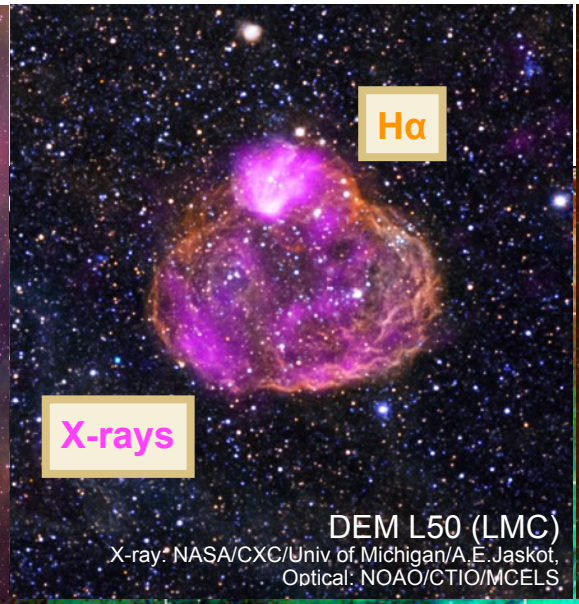
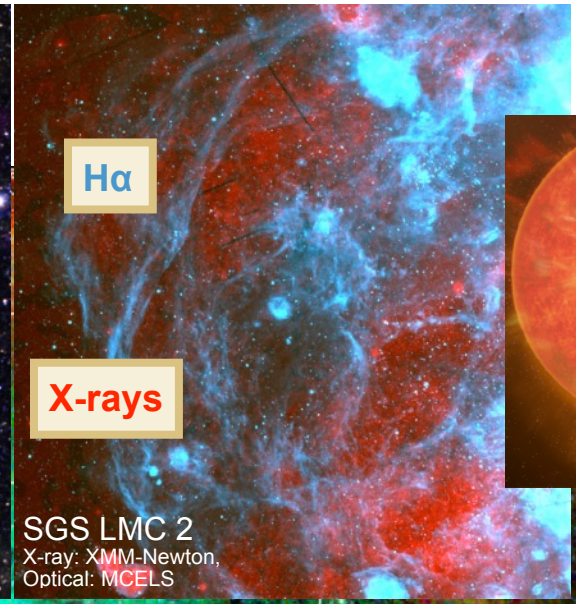
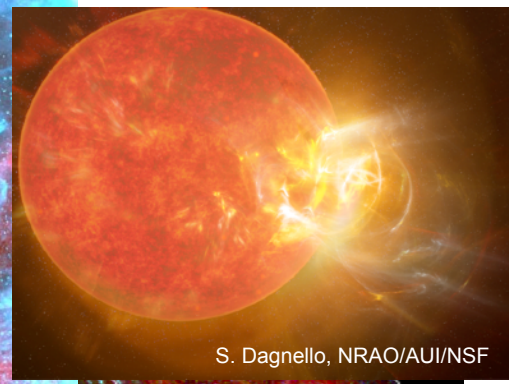


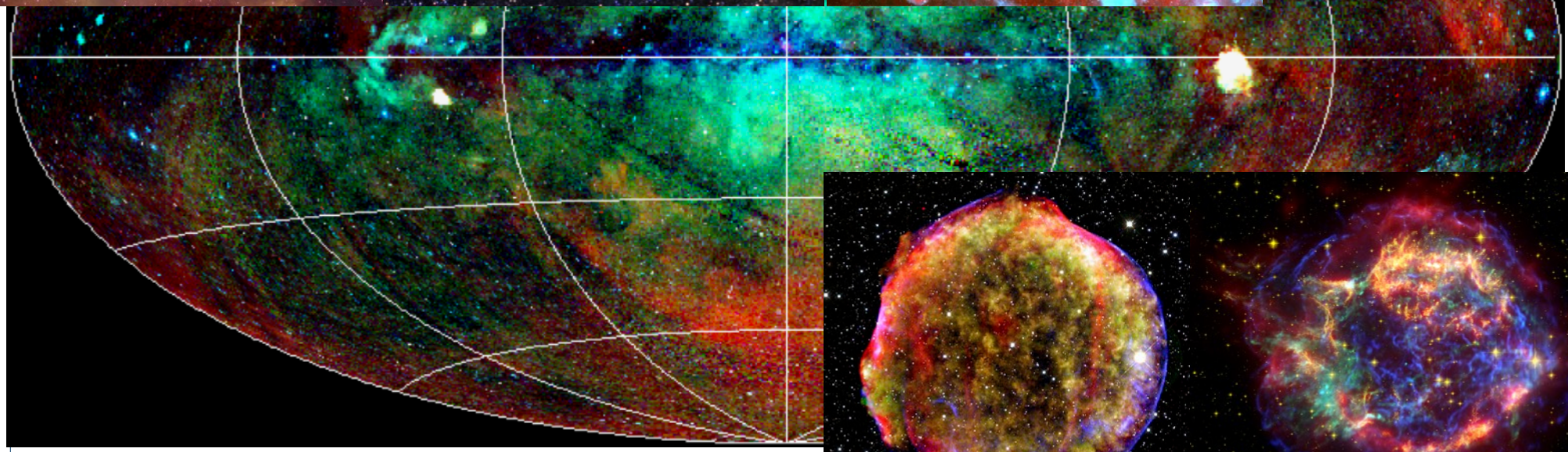
DEM L50 (LMC)
X-ray: NASA/CXC/Univ of Michigan/A.E.Jaskot, Optical: NOAO/CTIO/MCELS

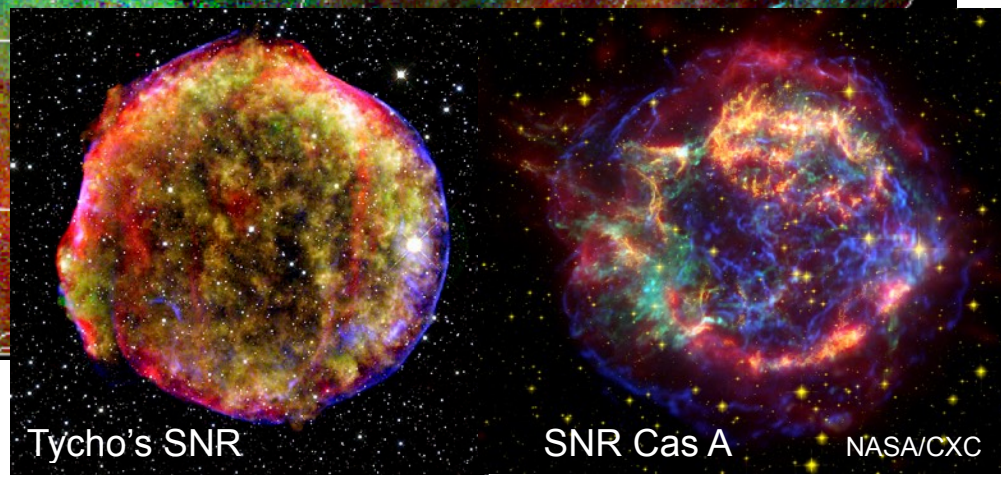


SGS LMC 2
X-ray: XMM-Newton, Optical: MCELS



S. Dagnello, NRAO/AUI/NSF



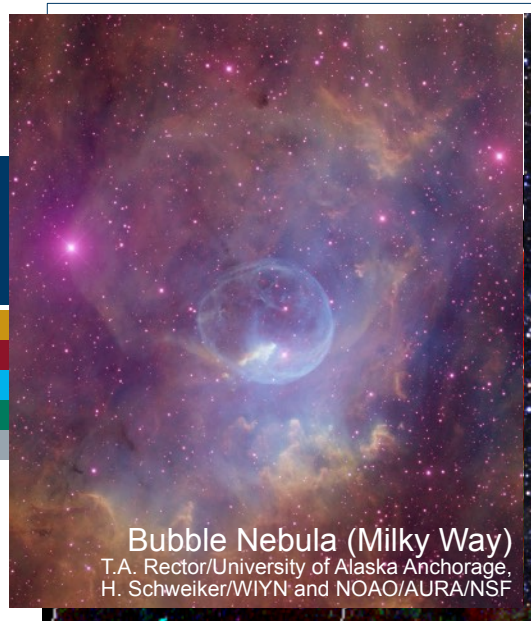


Tycho's SNR

SNR Cas A

NASA/CXC

X-ray sky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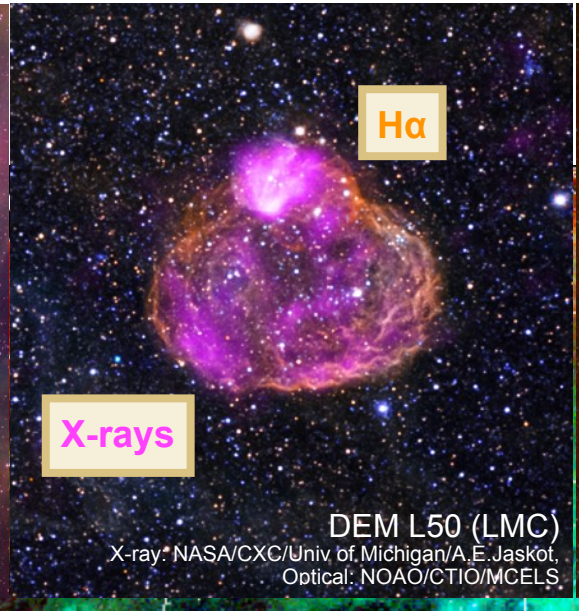

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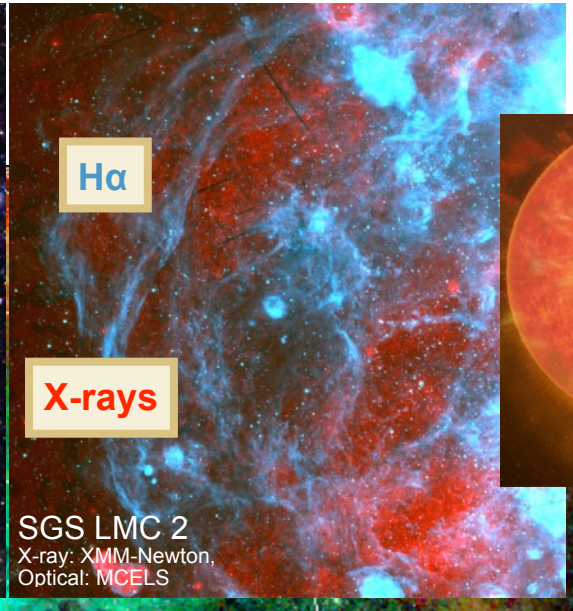
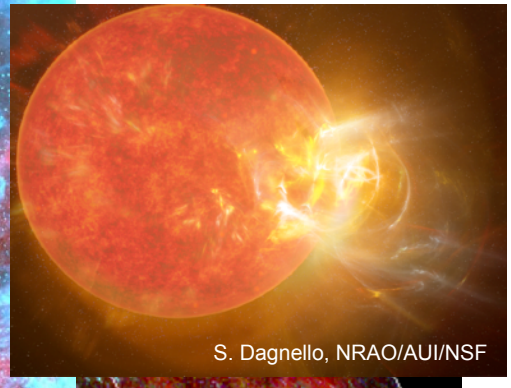
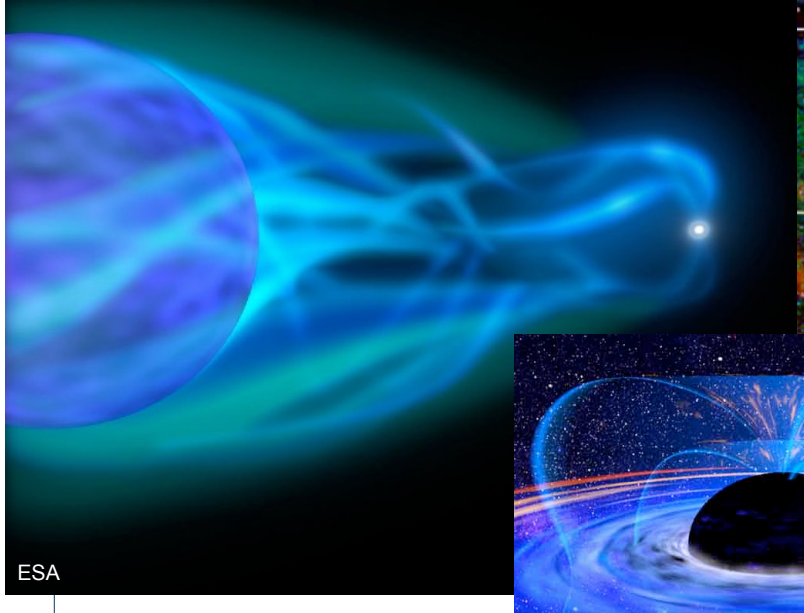
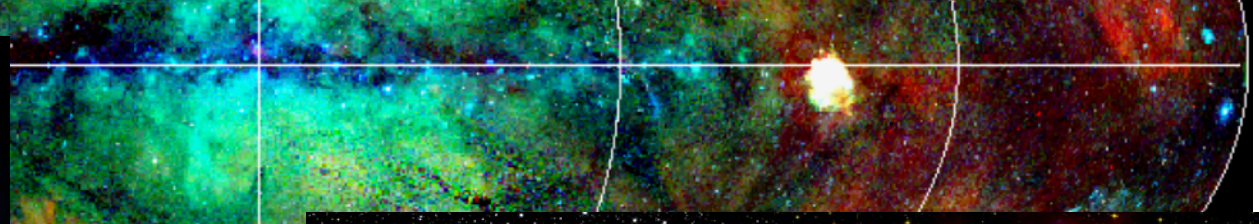


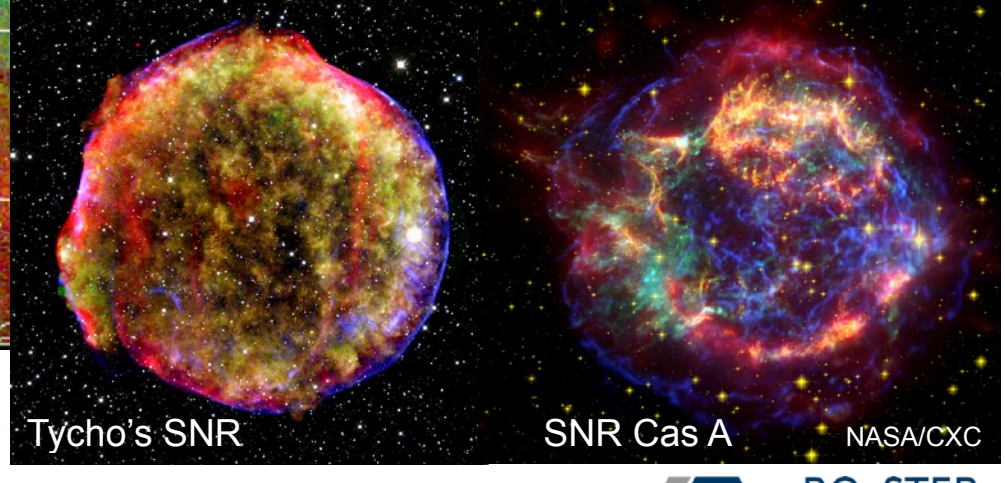
SGS LMC 2
X-ray: XMM-Newton,
Optical: MCELS


S. Dagnello, NRAO/AUI/NSF


ESA




XMM-Newton / ESA / NASA.


Tycho's SNR
SNR Cas A
NASA/CXC

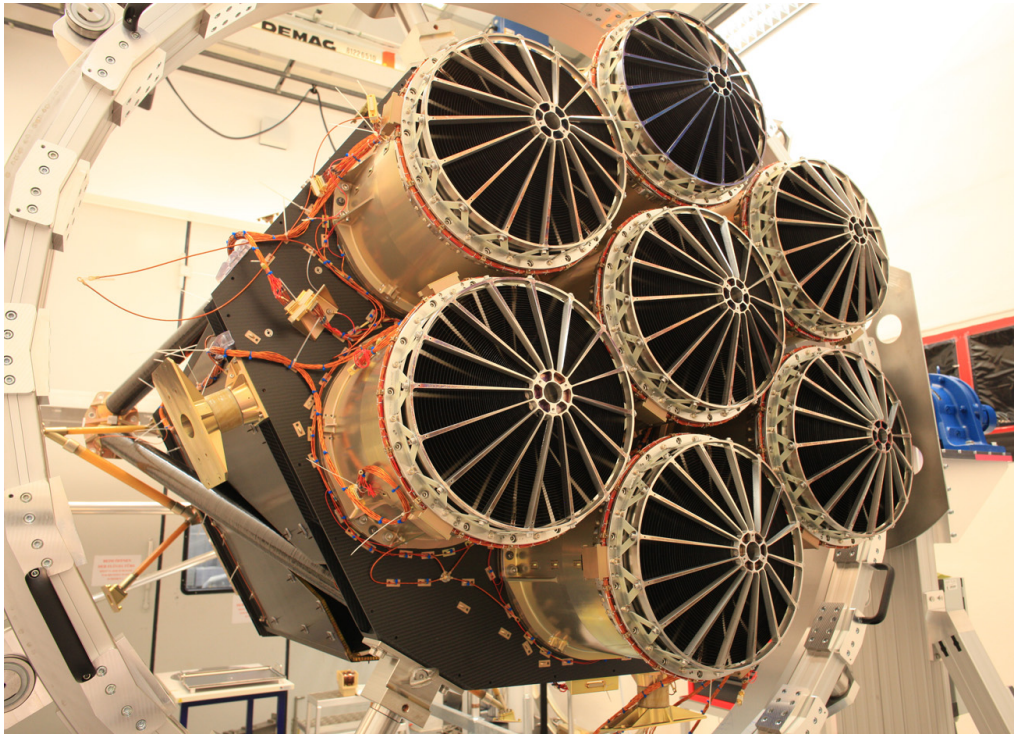
eROSITA

"extended ROentgen Survey with an Imaging Telescope Array"

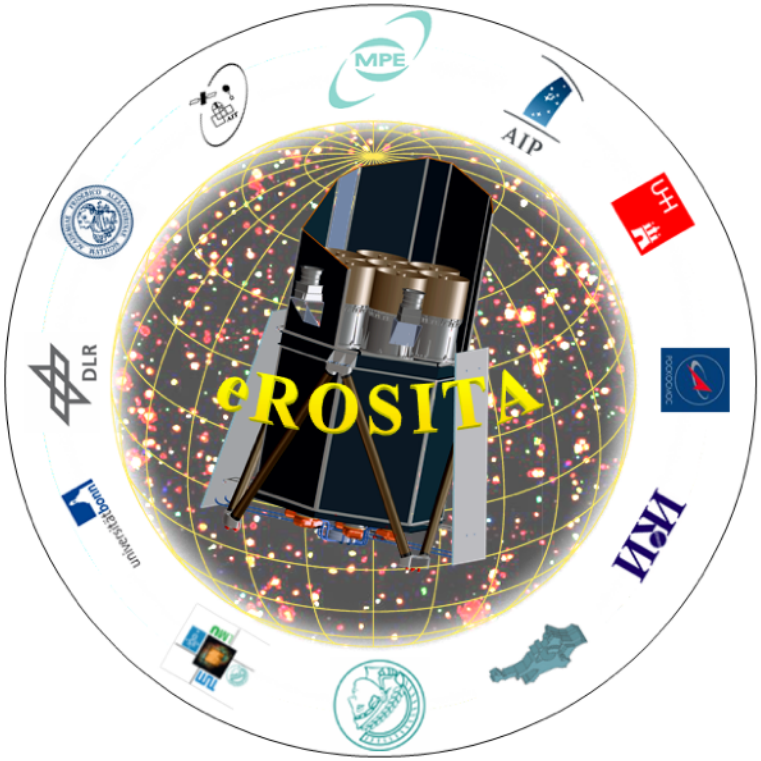
Collaboration between Germany and Russia.

German X-ray telescope on board the Russian "Spectrum-Roentgen-Gamma" (SRG) satellite.

First all-sky survey in the soft to medium X-ray band from 0.2 to 10 keV with a spatial resolution of 26" and spectral resolution of 80 eV at 1.5 keV.



Credit: MPE

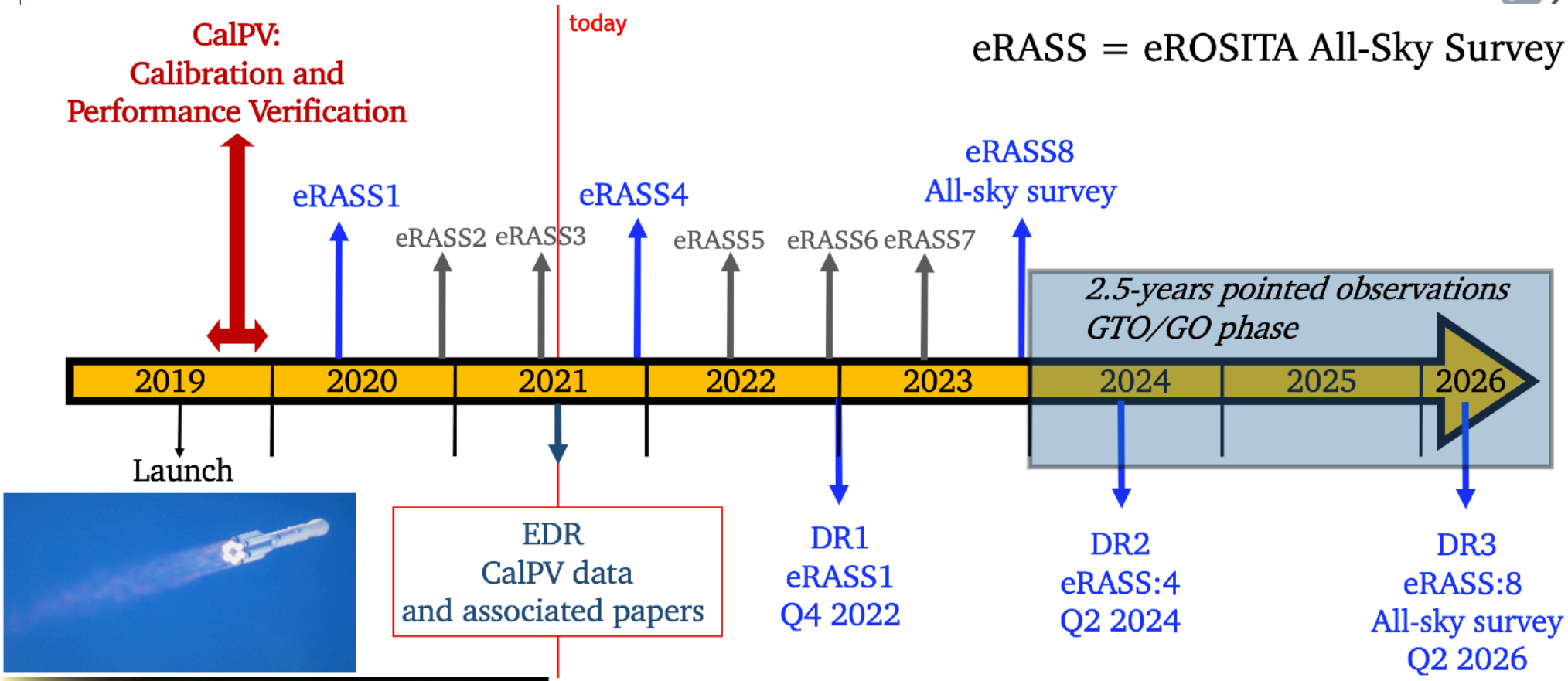


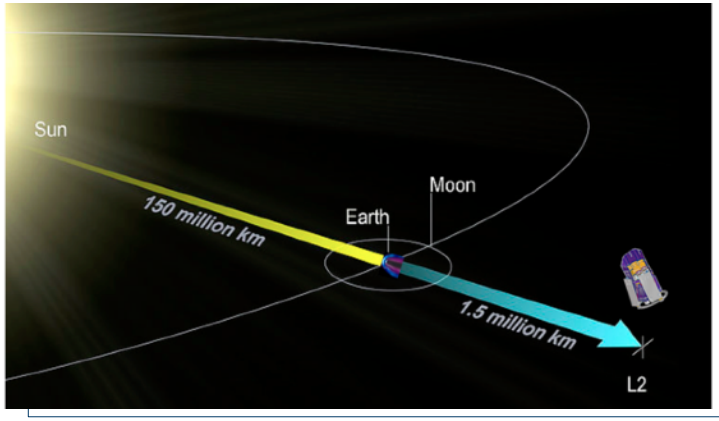
Spektr-Roentgen Gamma

Launch: July 13, 2019, 14:31 CEST


Anatoly Zak, russianspaceweb.com

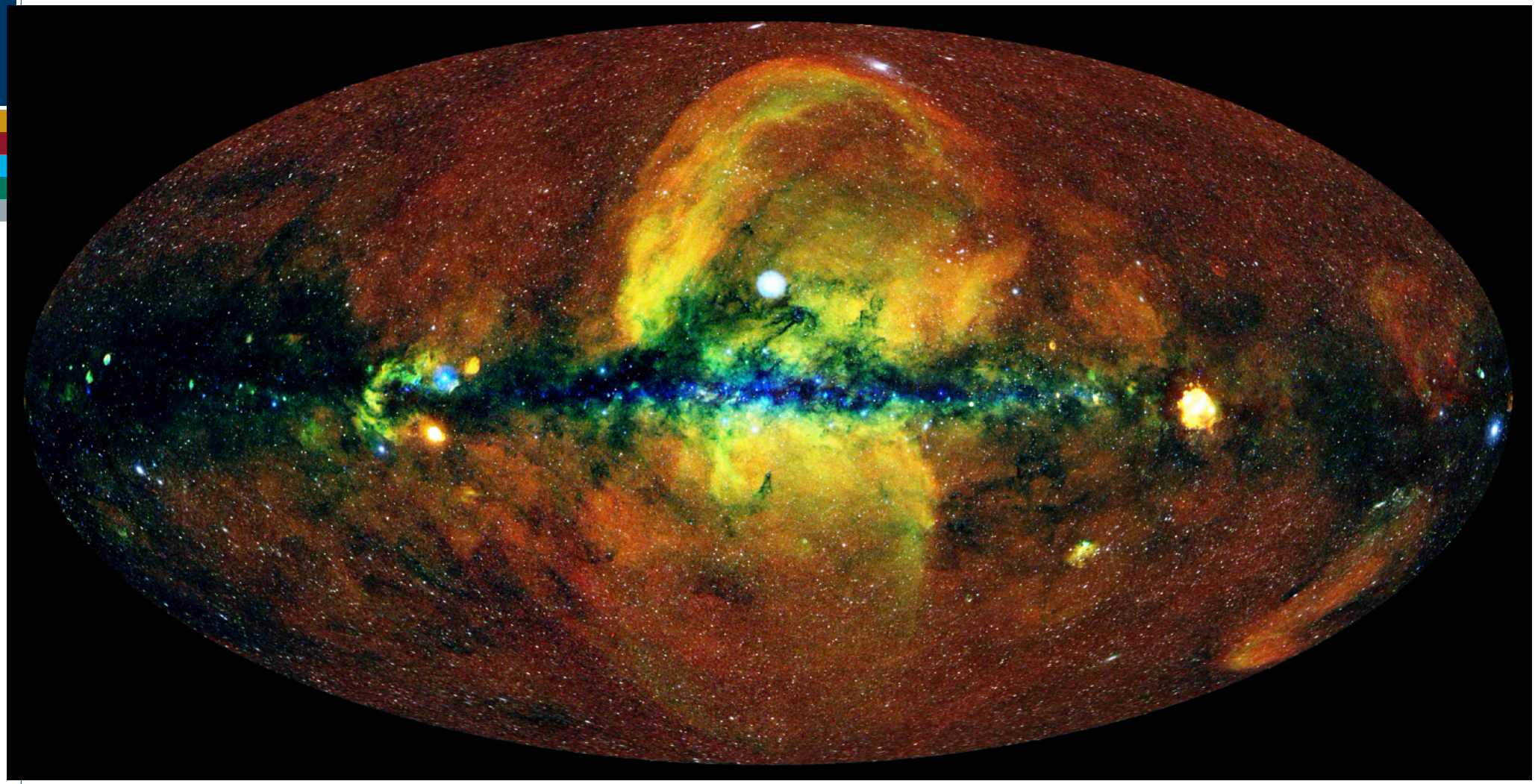
Timeline





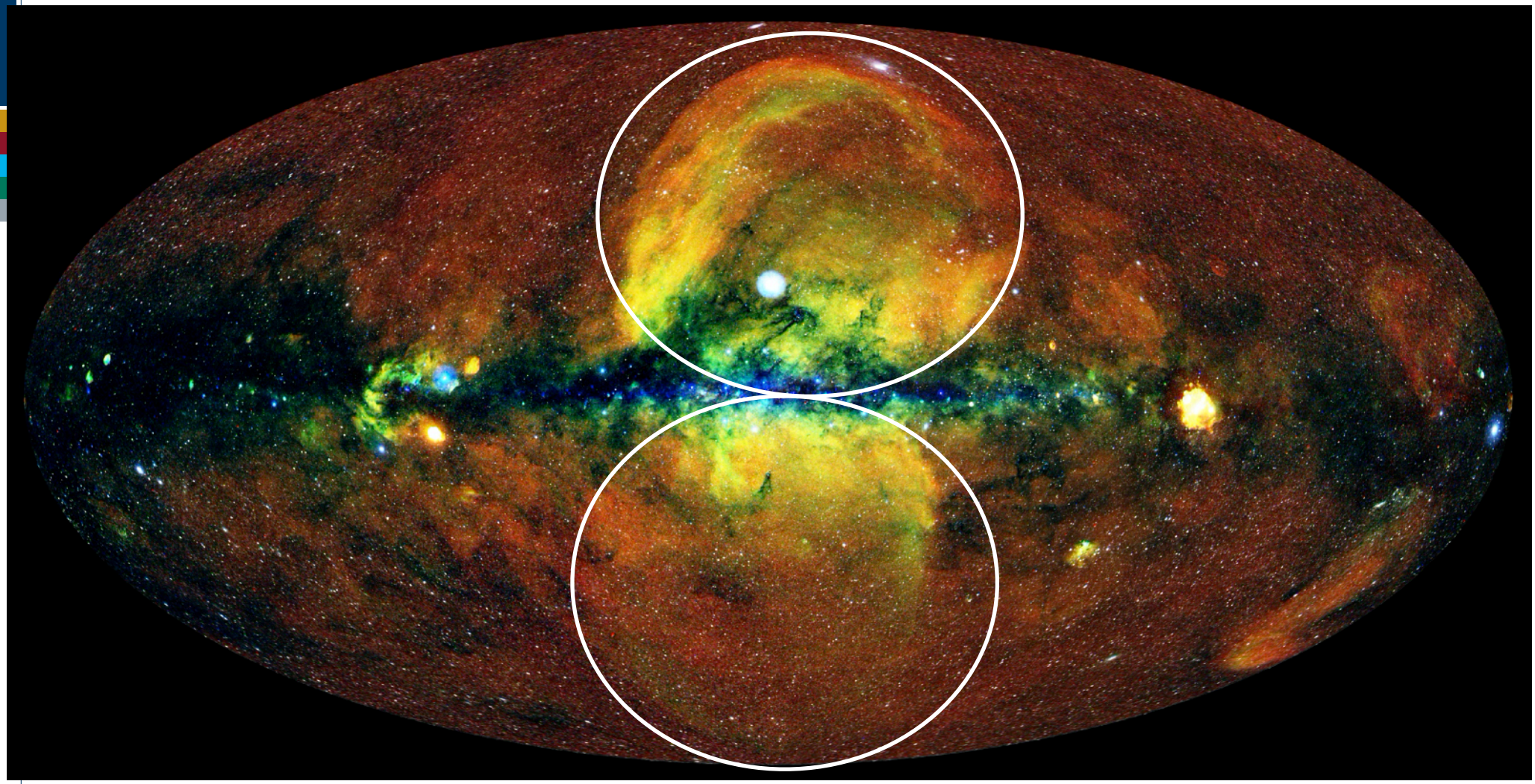
Credit: A. Merloni (MPE)

eROSITA All-Sky Survey



J. Sanders, H. Brunner (MPE), E. Churazov, M. Gilfanov (IKI), and eSASS team

eROSITA bubbles

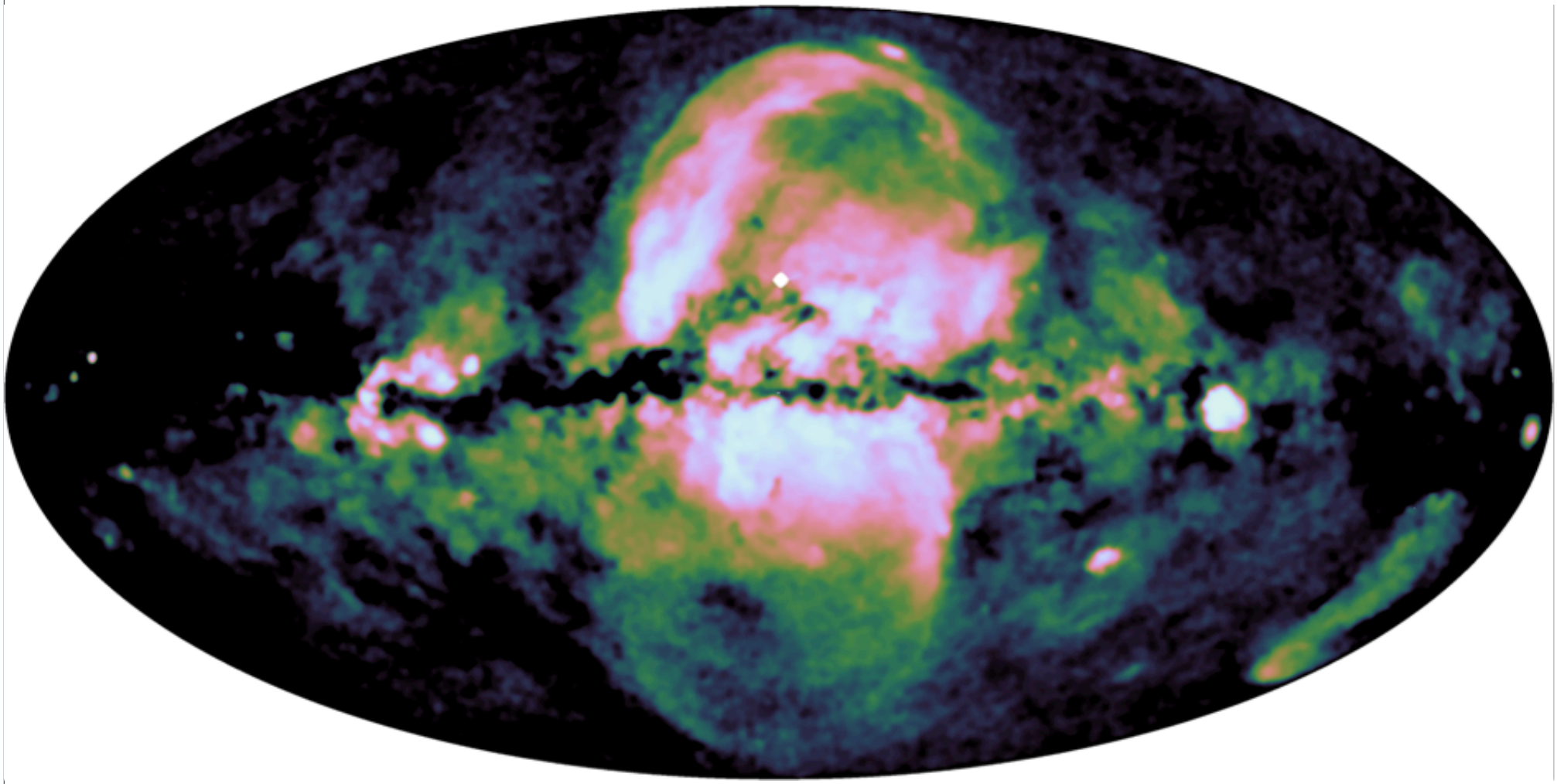


J. Sanders, H. Brunner (MPE), E. Churazov, M. Gilfanov (IKI), and eSASS team

eROSITA bubbles

eROSITA All-Sky Survey 1

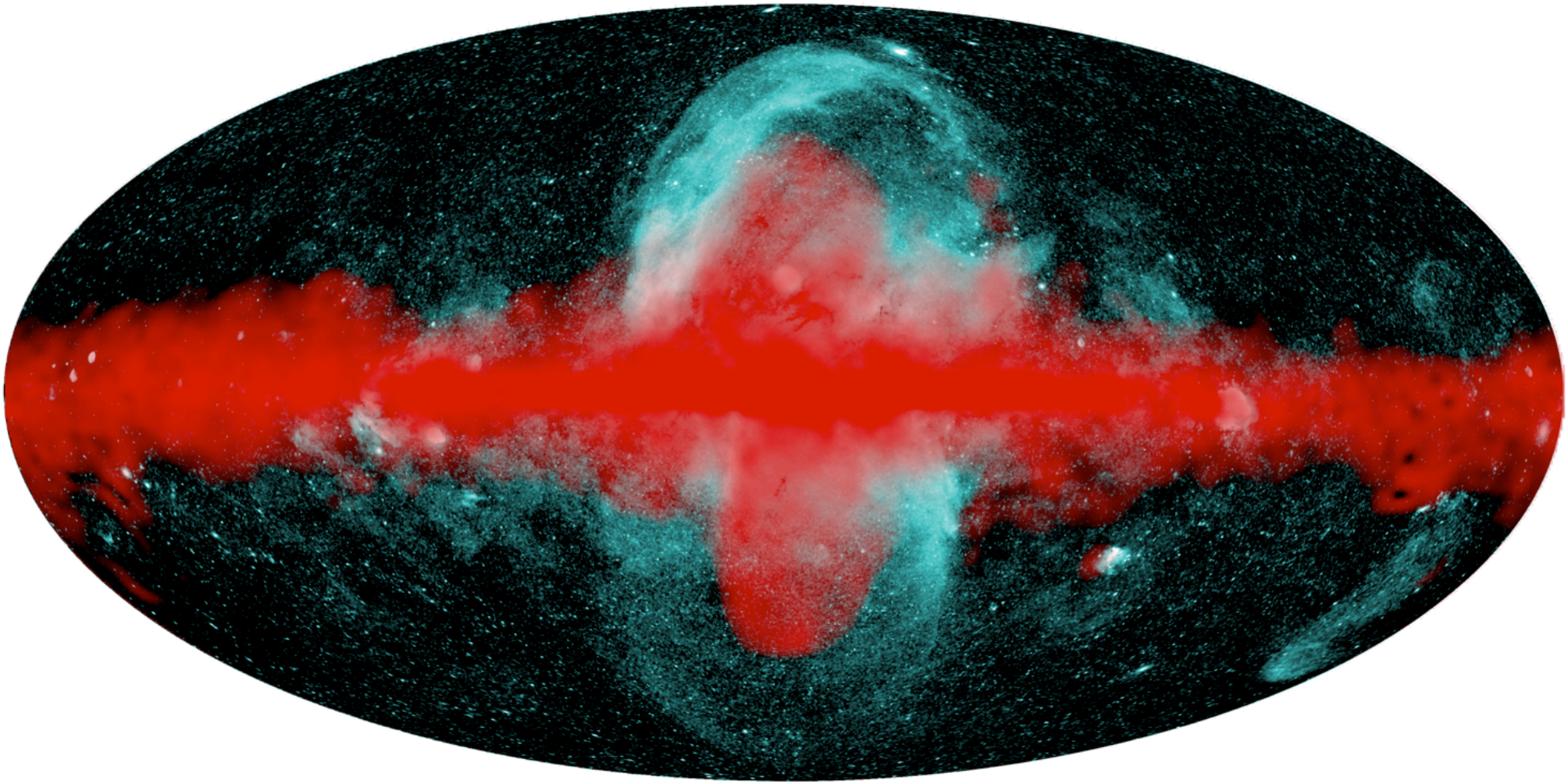
0.6 - 1 keV without point sources



Predehl et al. (2020)

eROSITA bubbles

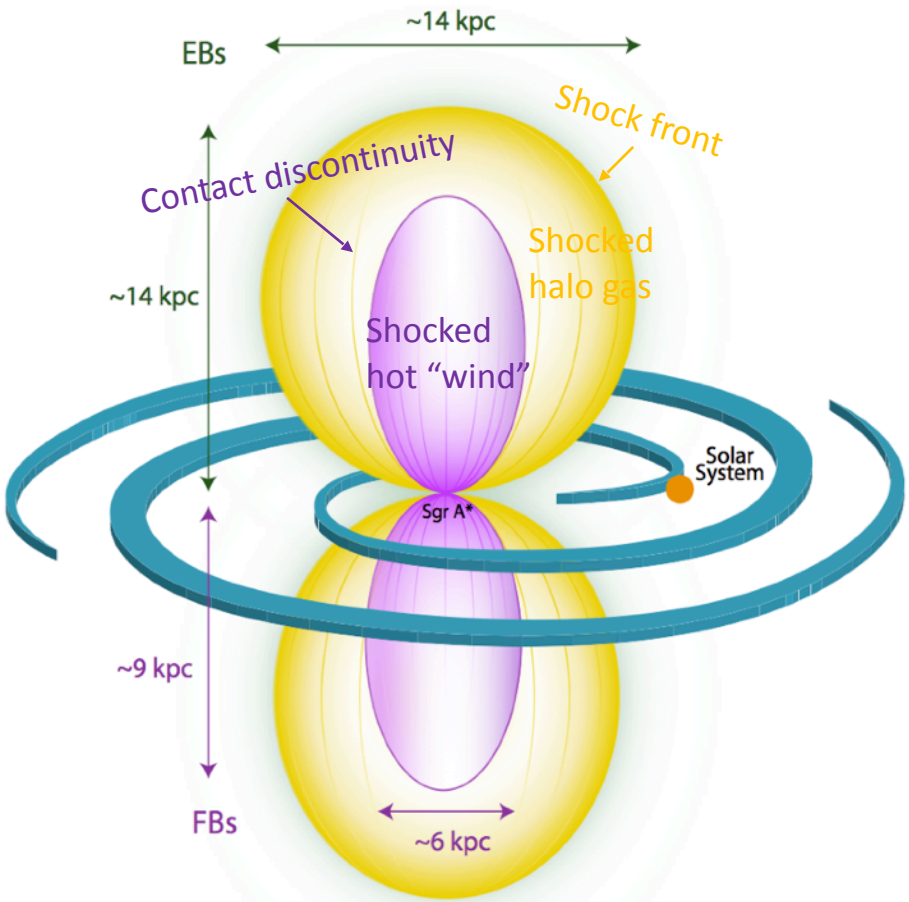
Fermi bubbles vs. eROSITA bubbles



Predehl et al. (2020)

Fermi and eROSITA bubbles

- Mean surface brightness of eROSITA bubbles = (2 - 4) × 10^{-15} erg cm^{-2} s^{-1} $arcmin^{-2}$.
- Thermal plasma with kT = 0.3 keV for 0.2 x solar abundances.
- $L_{X,tot}$ ~ 10^{39} erg/s at a distance of 10.6 kpc.
- Age ~ 20 Myr.
- Shock velocity v_s ~340 km/s.
- Gas cooling time t_{cool} ~ 2 x 10^8 years (>> age of bubbles).



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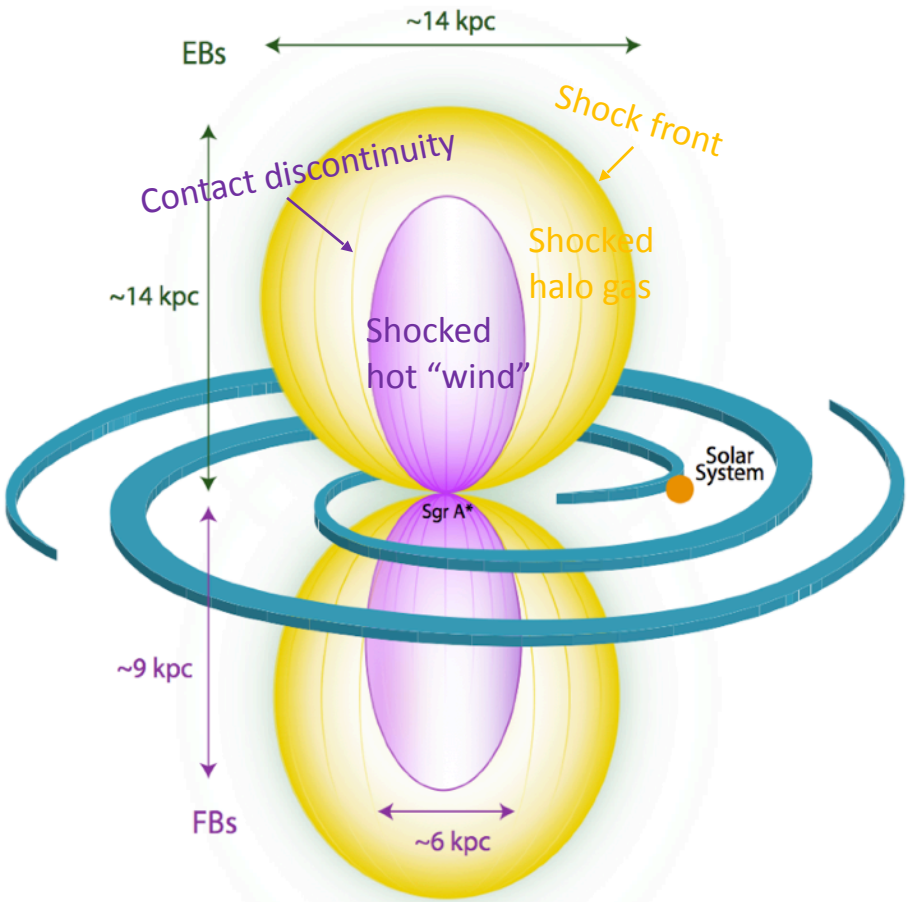
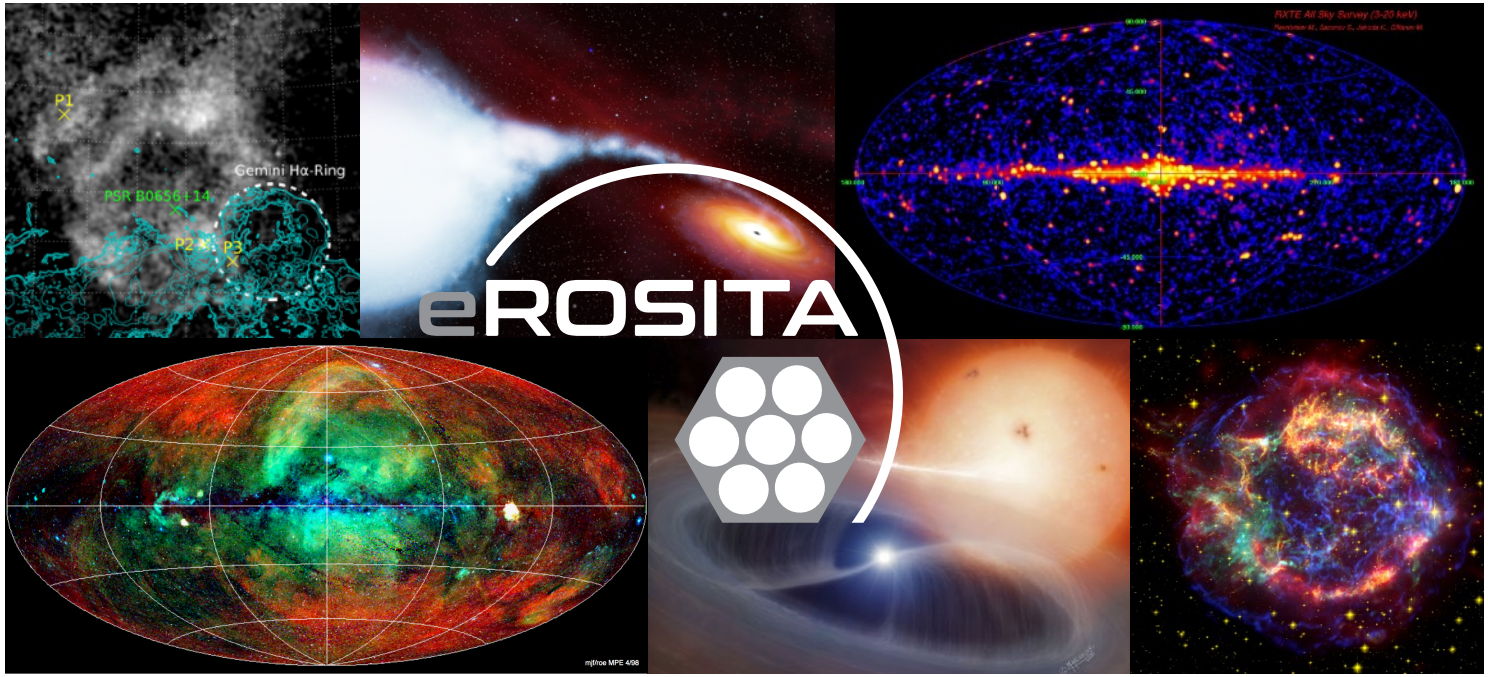
- Gas cooling time t_{cool} ~ 2 x 10^8 years (>> age of bubbles).
- Sofue & Kataoka (2021):
  - At the outer shock front: v_s = 1000 km/s. t_{cool} = 1.5 Gyr.
  - 3 kpc crater in the disk at the base of the bubbles (HI, CO).



Predehl et al. (2020)

eRO-STEP



The eROSITA View of Stellar Endpoints

- **Research unit** funded by the German Research Foundation (DFG).
- Coordinated research at the core institues of the German eROSITA consortium:

MPE | FAU Friedrich-Alexander Universität Erlangen-Nürnberg | Eberhard Karls Universität Tübingen | UHH | AIP Leibniz-Institut für Astrophysik Potsdam

- Study the **graveyard of stellar evolution** in our Milky Way and the Magellanic System using eROSITA: **local ISM, supernova remnants, accreting compact objects**.

DFG Deutsche Forschungsgemeinschaft | eRO-STEP FOR2990