

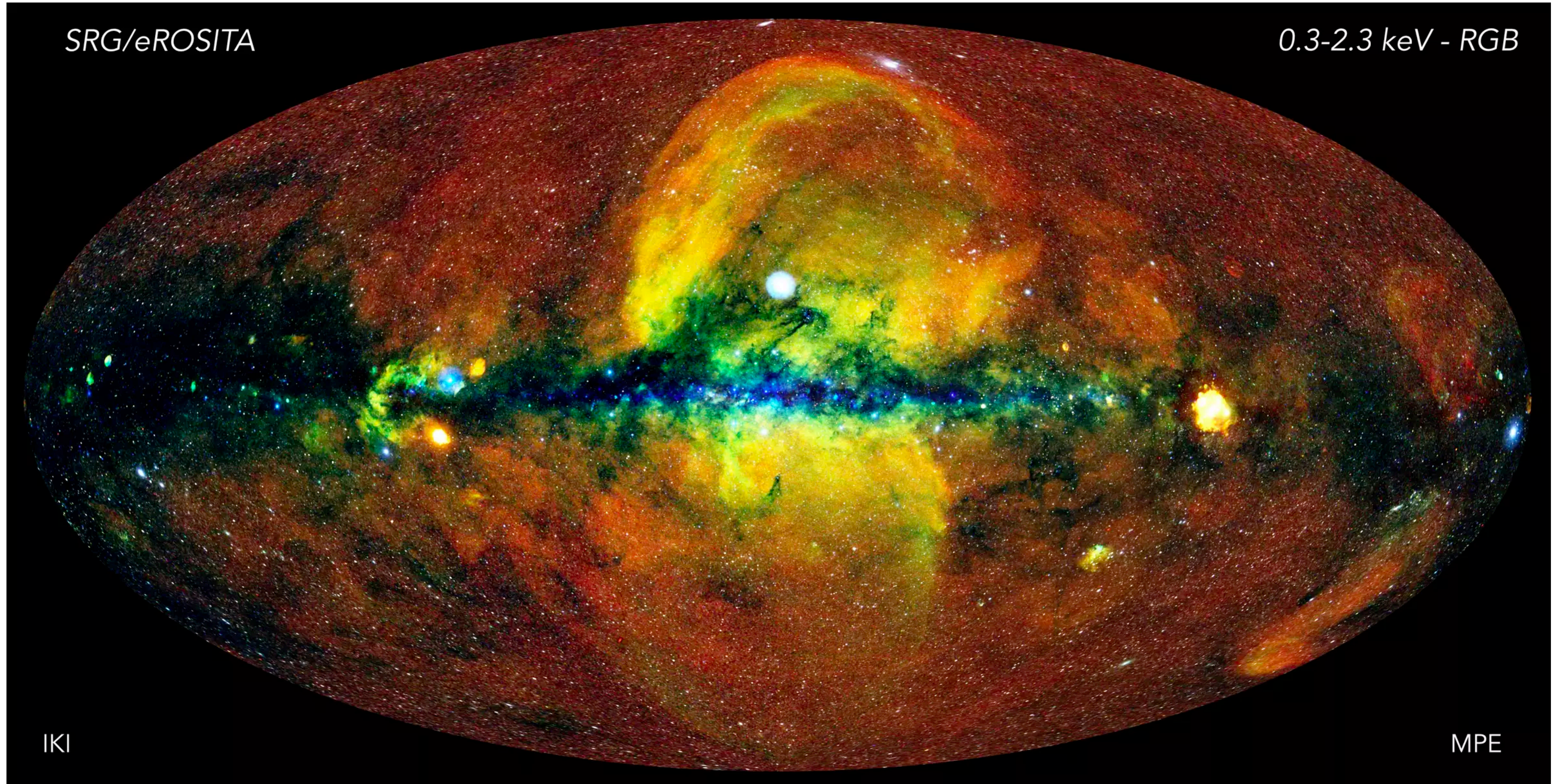


eROSITA's view of the local interstellar medium

Michael Yeung
MPE

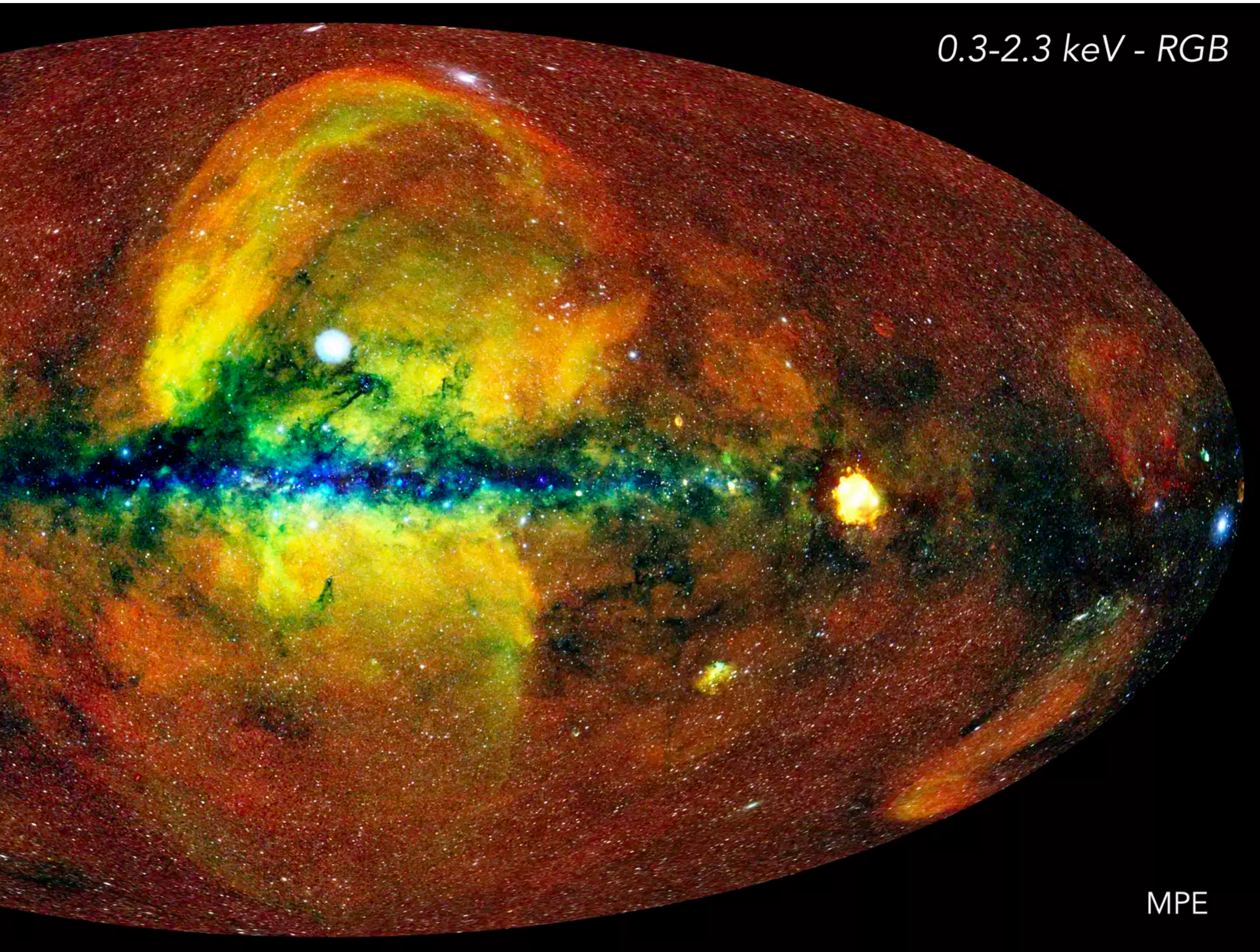
Michael Freyberg, Gabriele Ponti, Konrad Dennerl, Teng Liu, Nicola Locatelli, Martin Mayer,
Jeremy Sanders, Manami Sasaki, Andy Strong, Yi Zhang, Xueying Zheng, Efrain Gatzuz

What do you see?



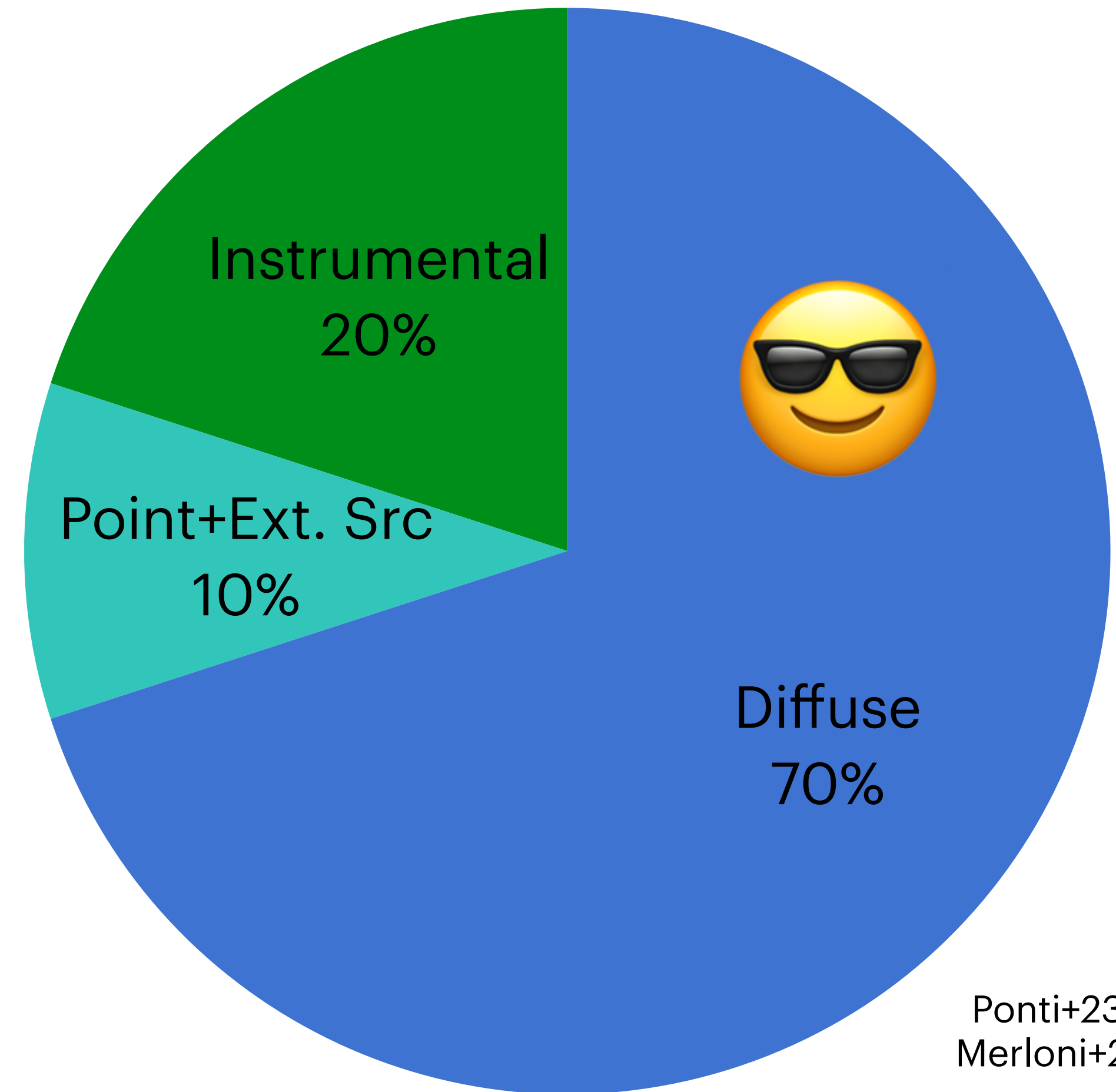
Predehl+20

What do you see?



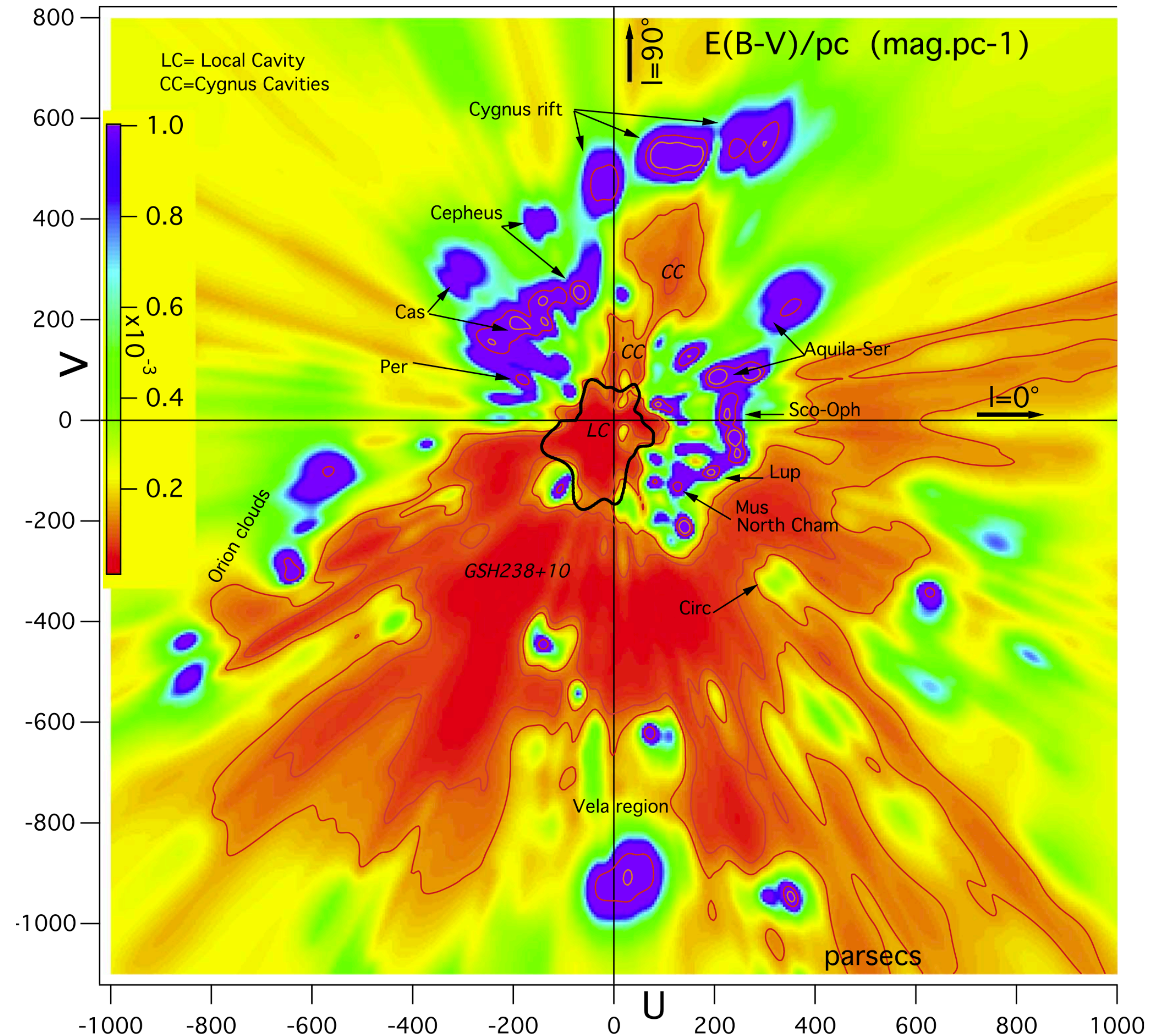
Predehl+20

Photon Fractions



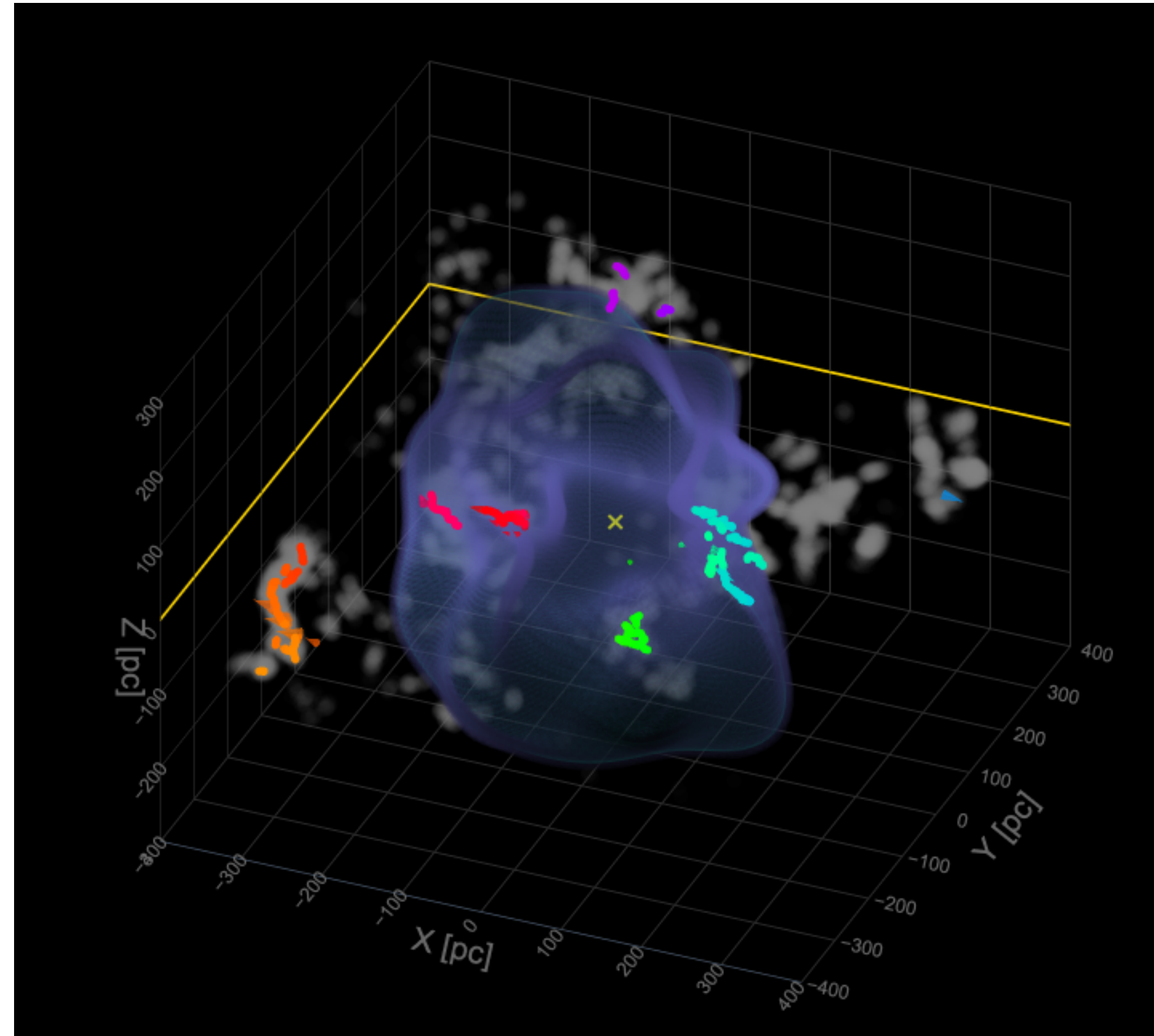
Local Hot Bubble (LHB)

- Local ISM = Local Cavity = Local Bubble
 - Very low density of neutral material
- **Local Hot Bubble (LHB)**
 - cavity filled with hot plasma at $kT \sim 0.1 \text{ keV}$ or 1 MK
- Radius on Galactic disc $\sim 100 \text{ pc}$



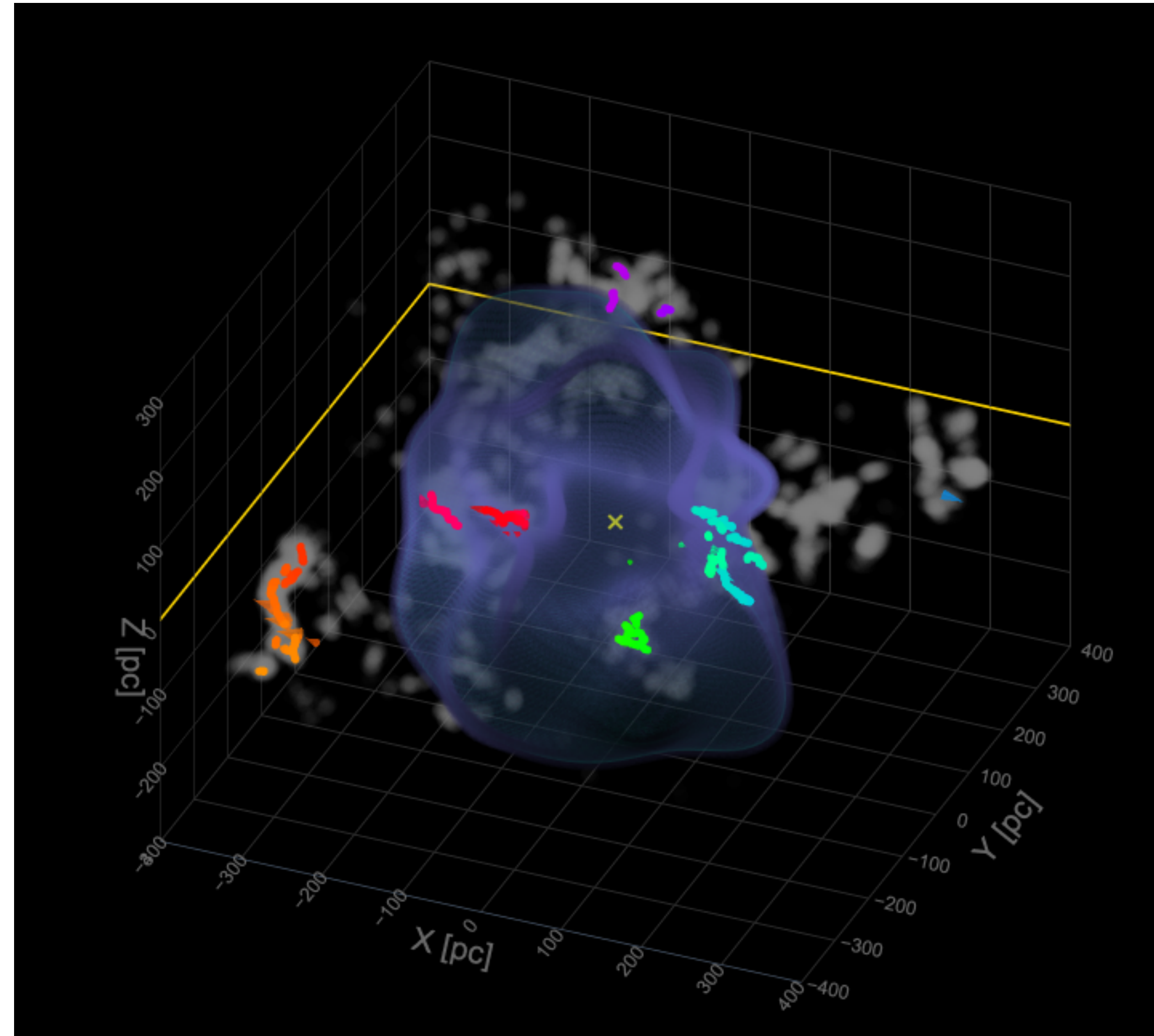
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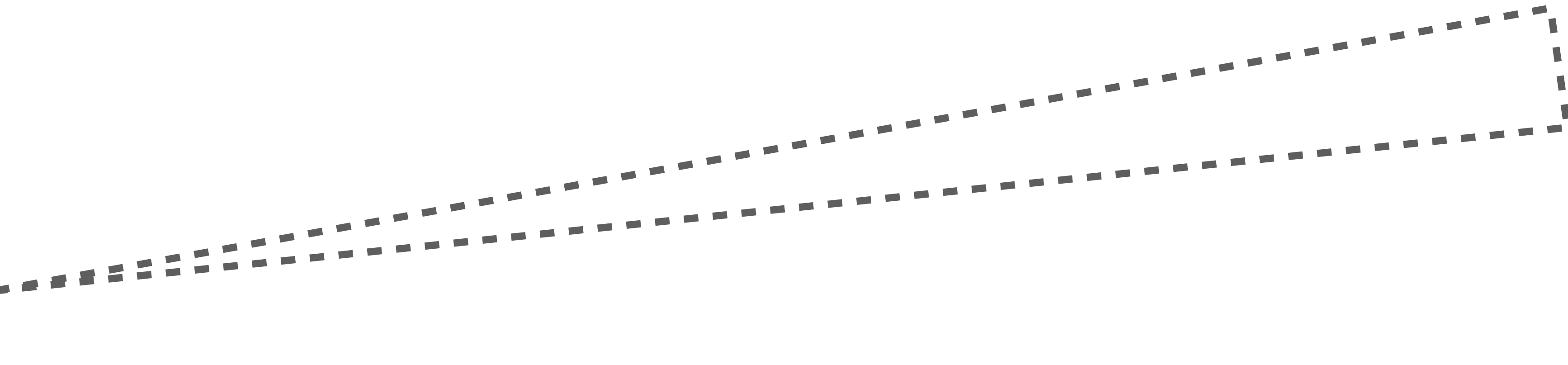
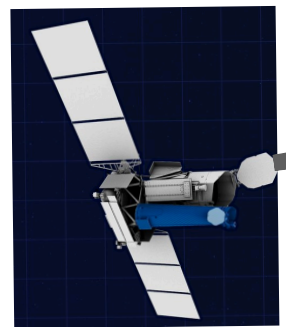
Local Hot Bubble (LHB)

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 - Very low density of neutral material
- **Local Hot Bubble (LHB)**
 - cavity filled with hot plasma at $kT \sim 0.1$ keV or 1 MK
- Radius on Galactic disc ~ 100 pc
- **Study the properties (kT, P, n_e and structure) of the LHB with eROSITA**



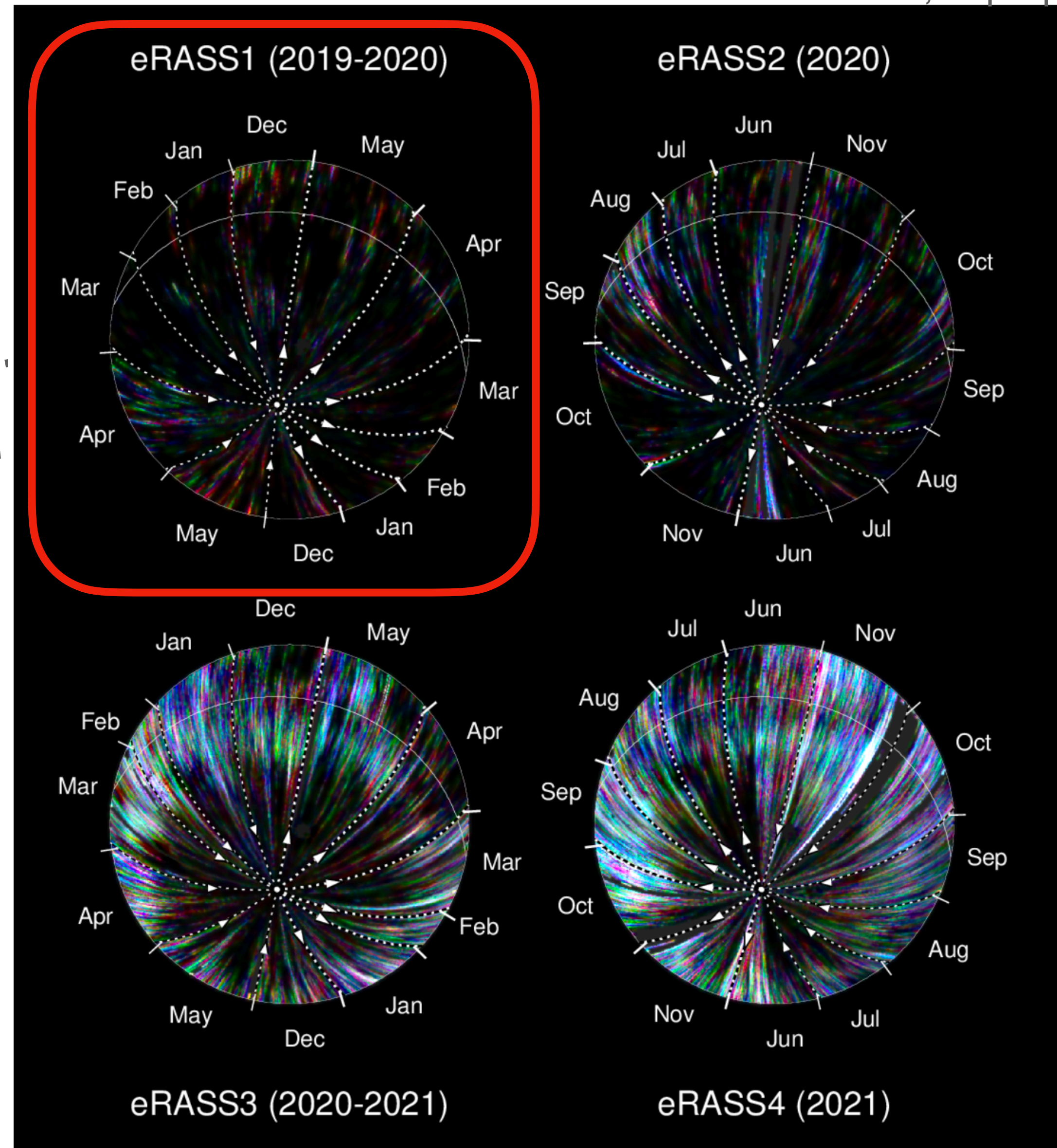
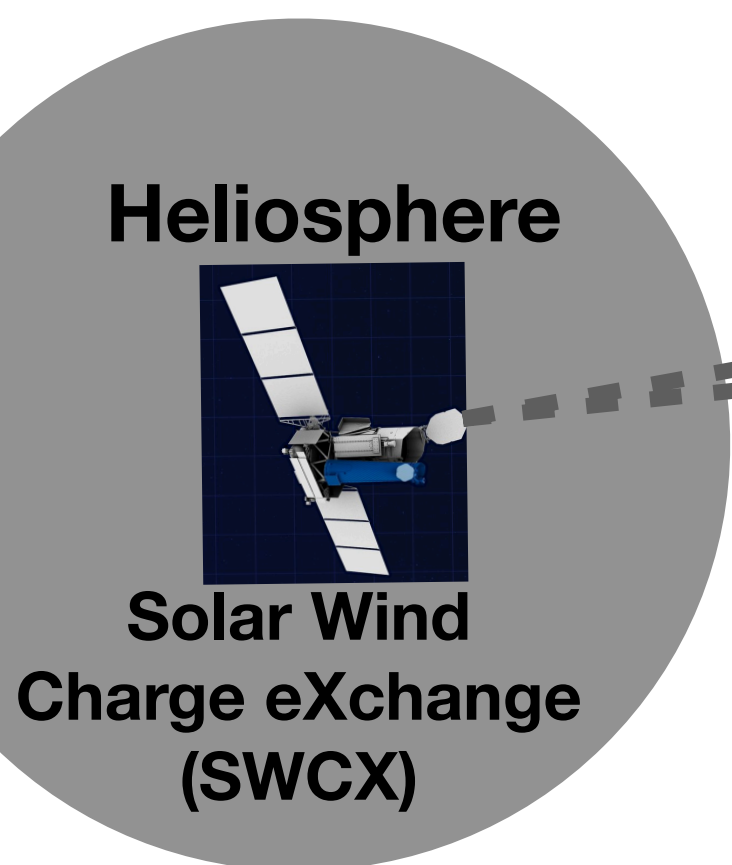


Diffuse Soft X-ray Background (SXRFB)

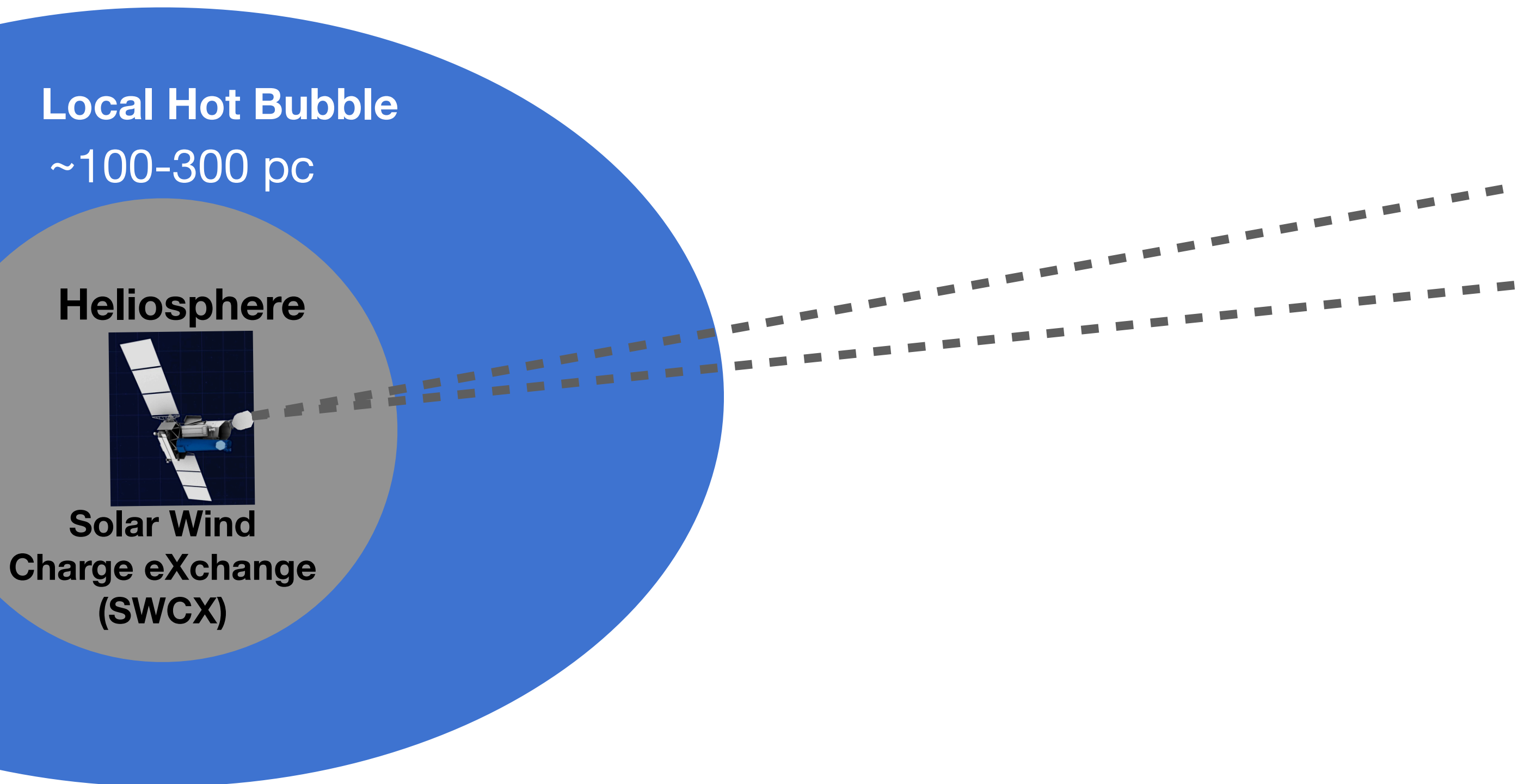


***Absolutely not to scale**

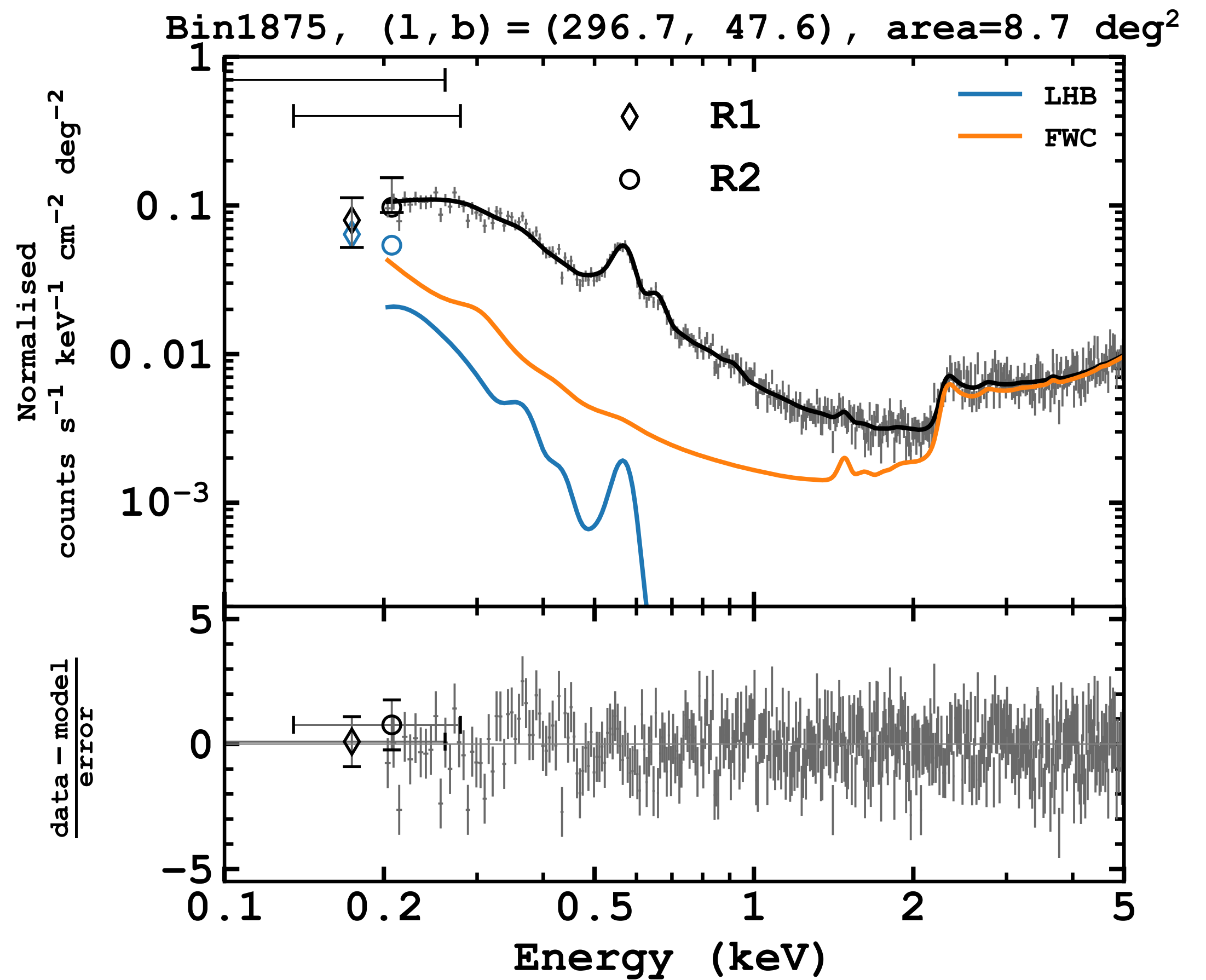
Diffuse Soft X-ray Background (SXRFB)



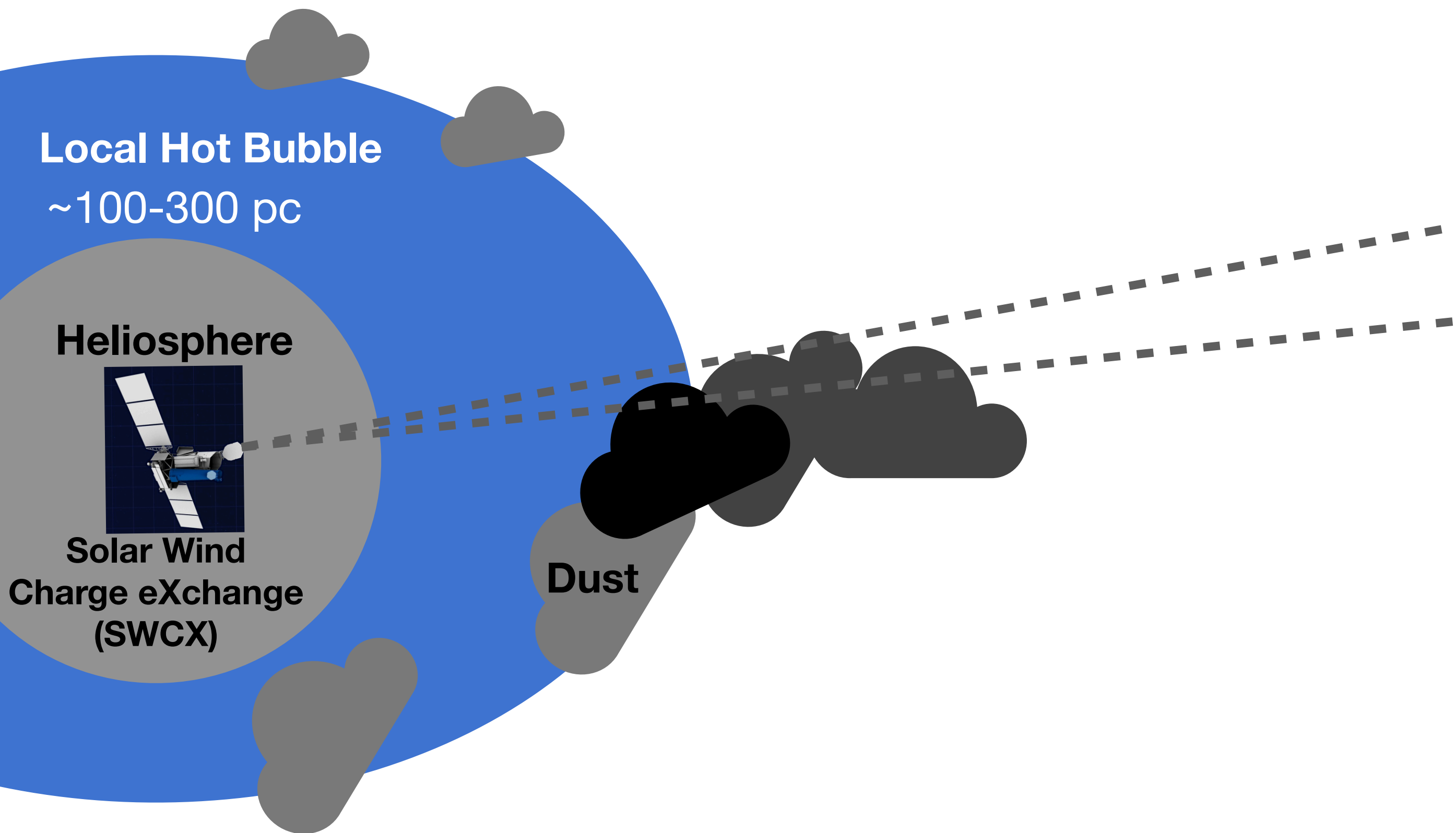
*Absolutely not to scale



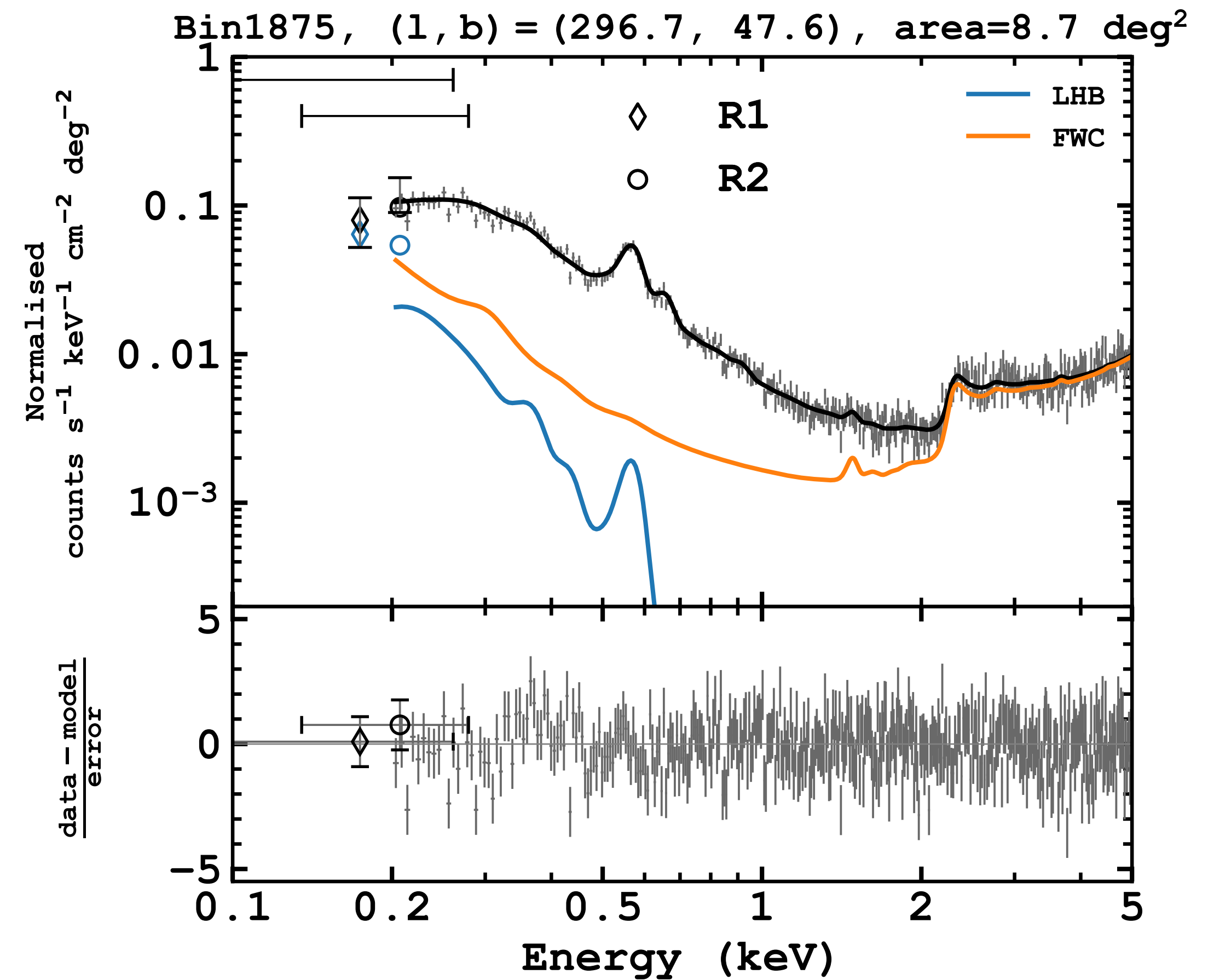
*Absolutely not to scale

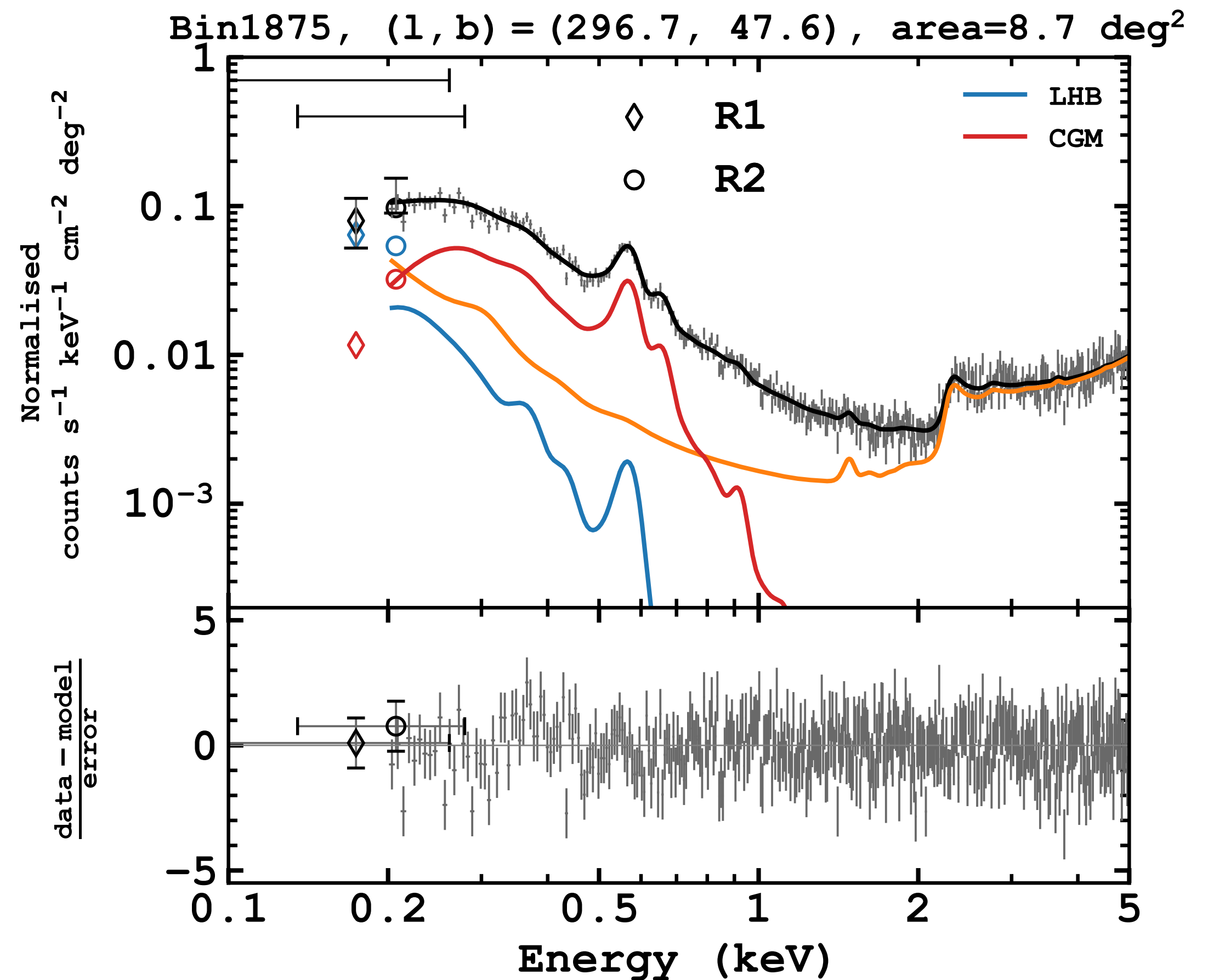
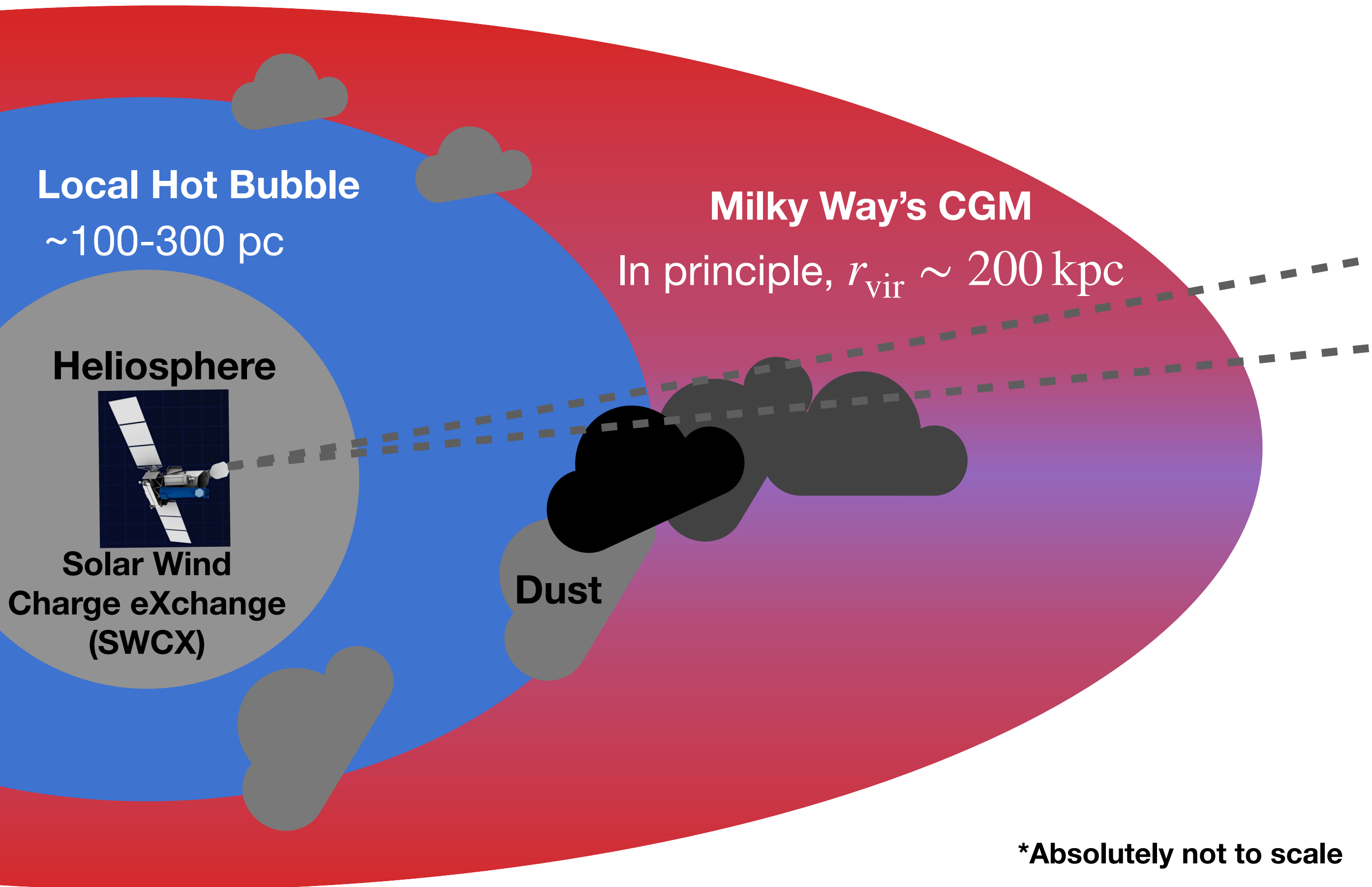


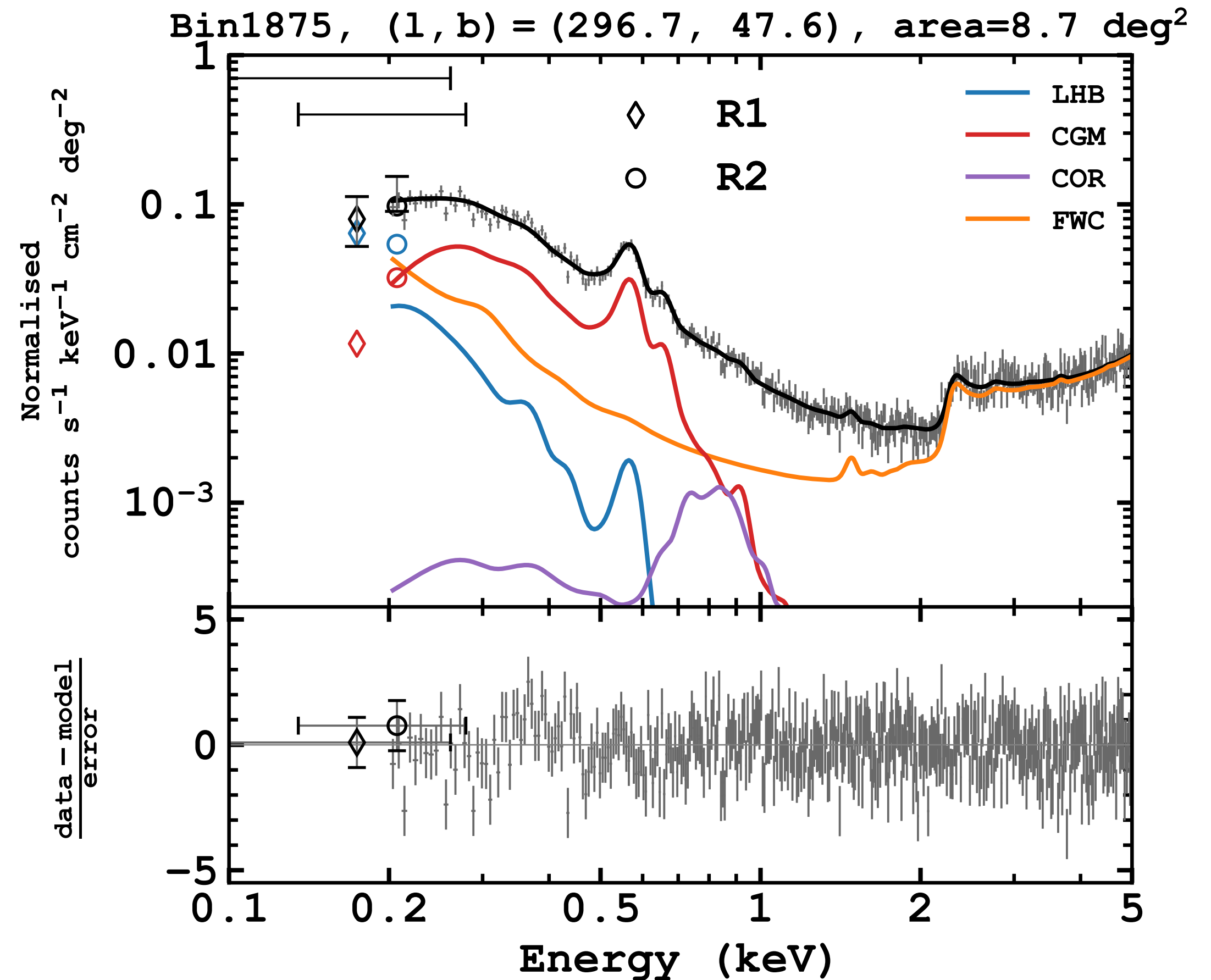
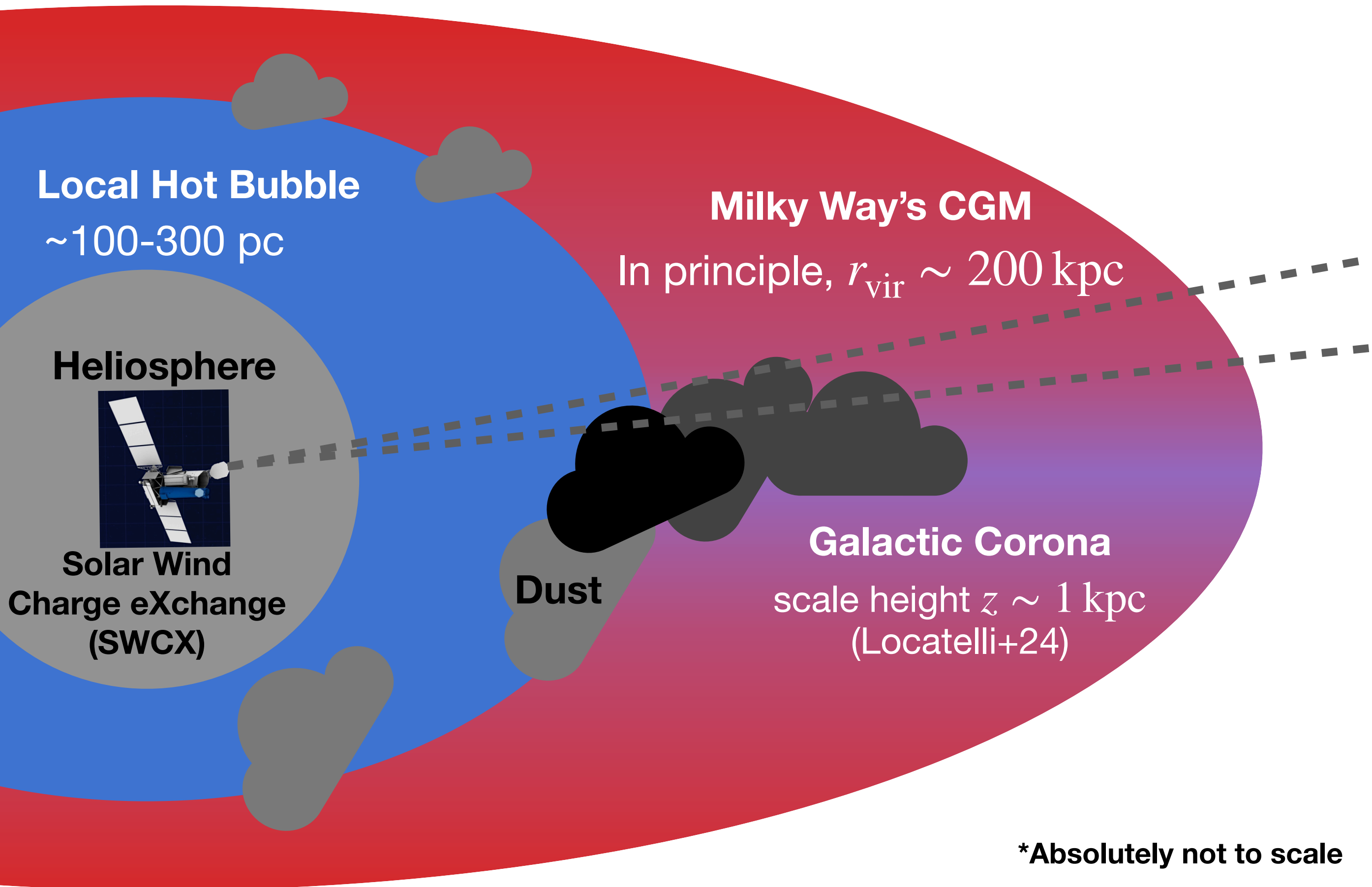
Diffuse Soft X-ray Background (SXRb)

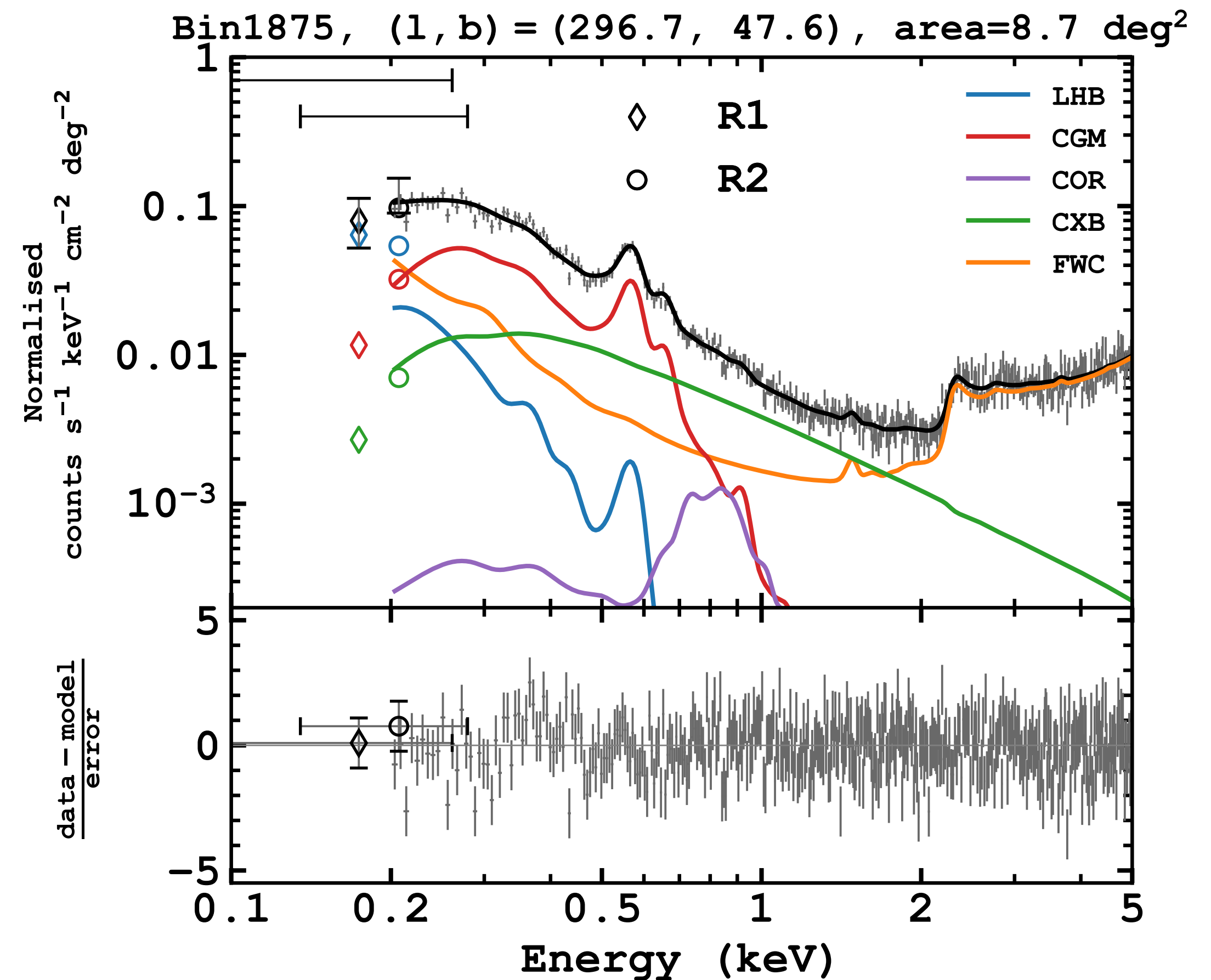
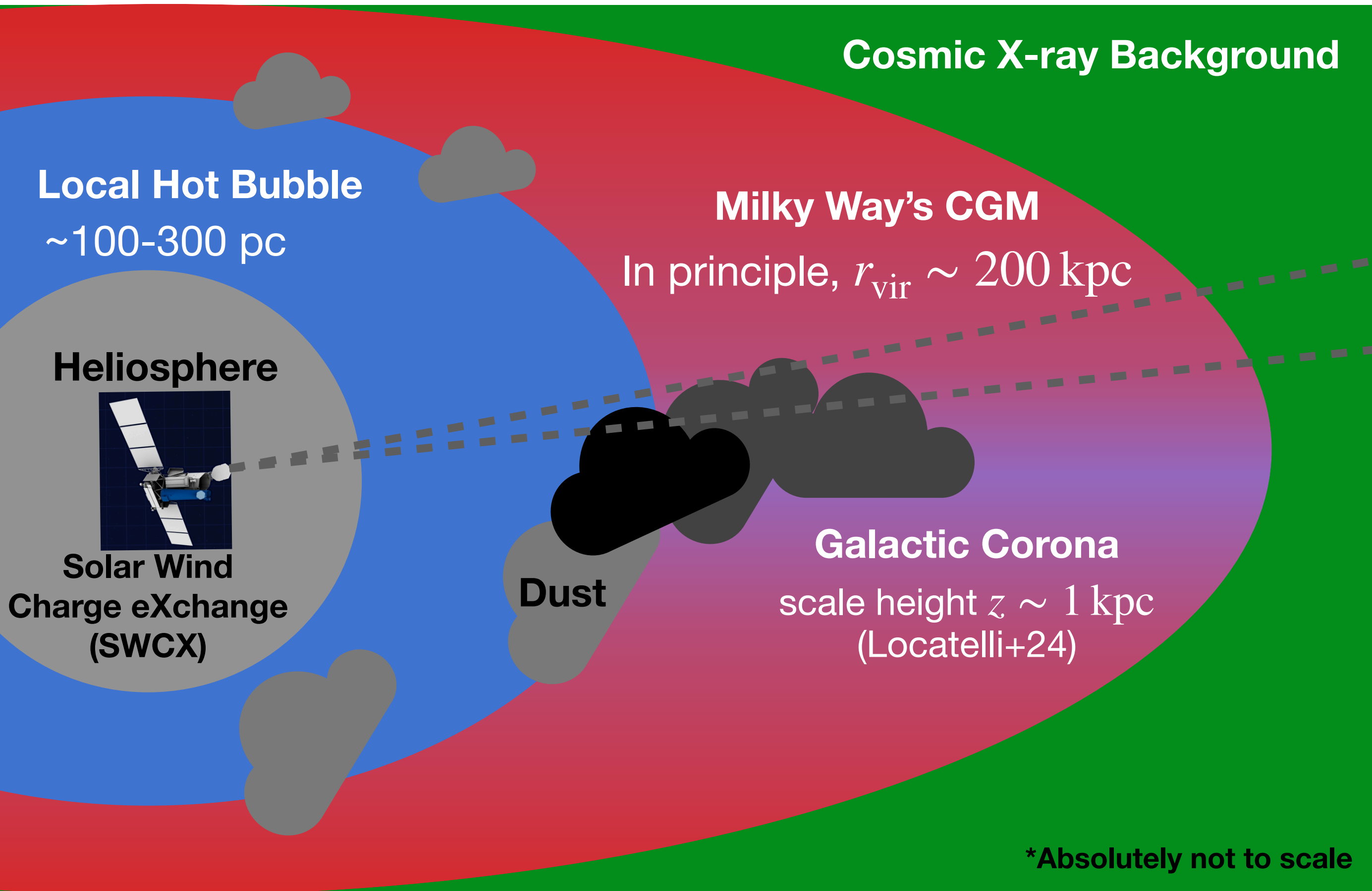


*Absolutely not to scale

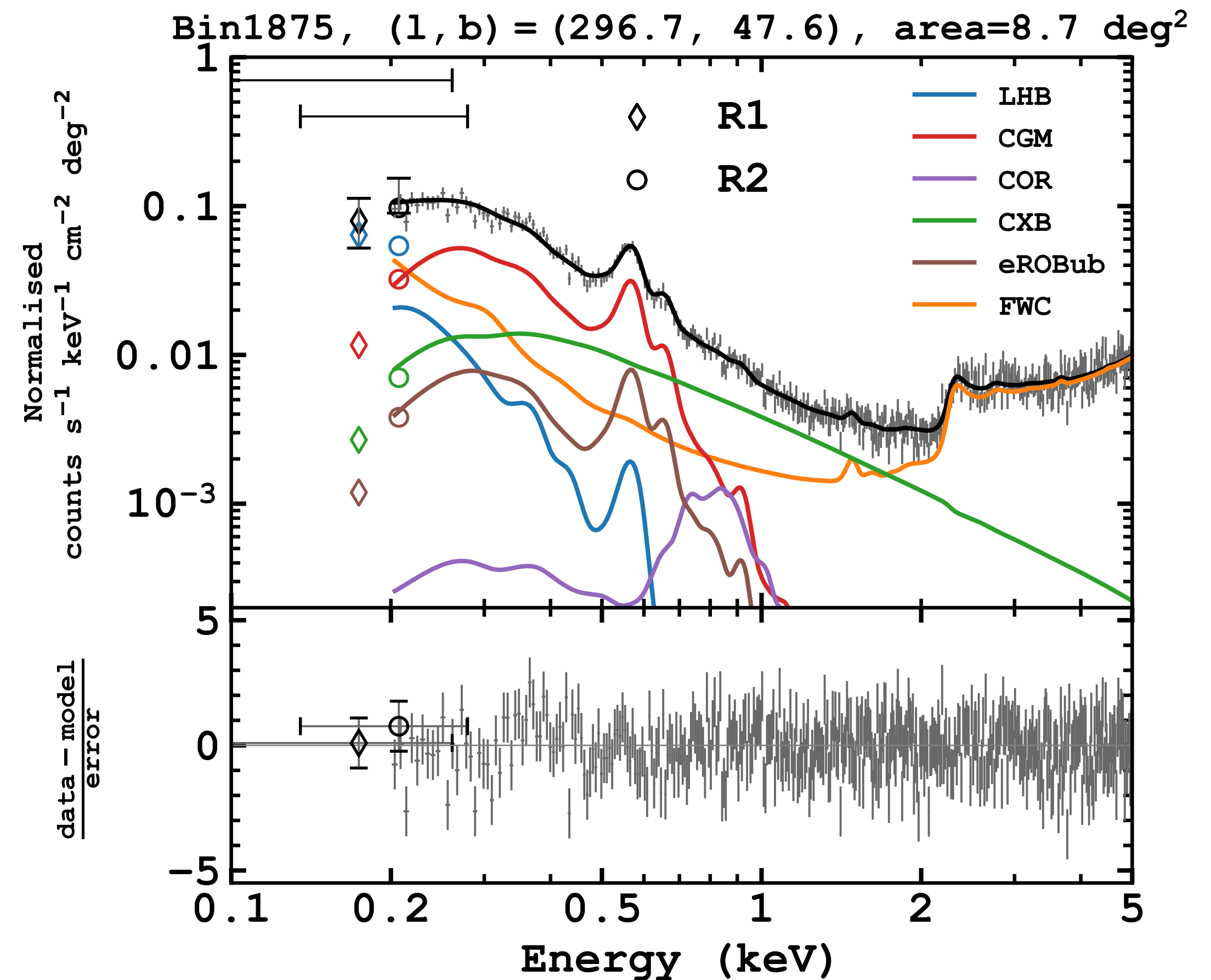
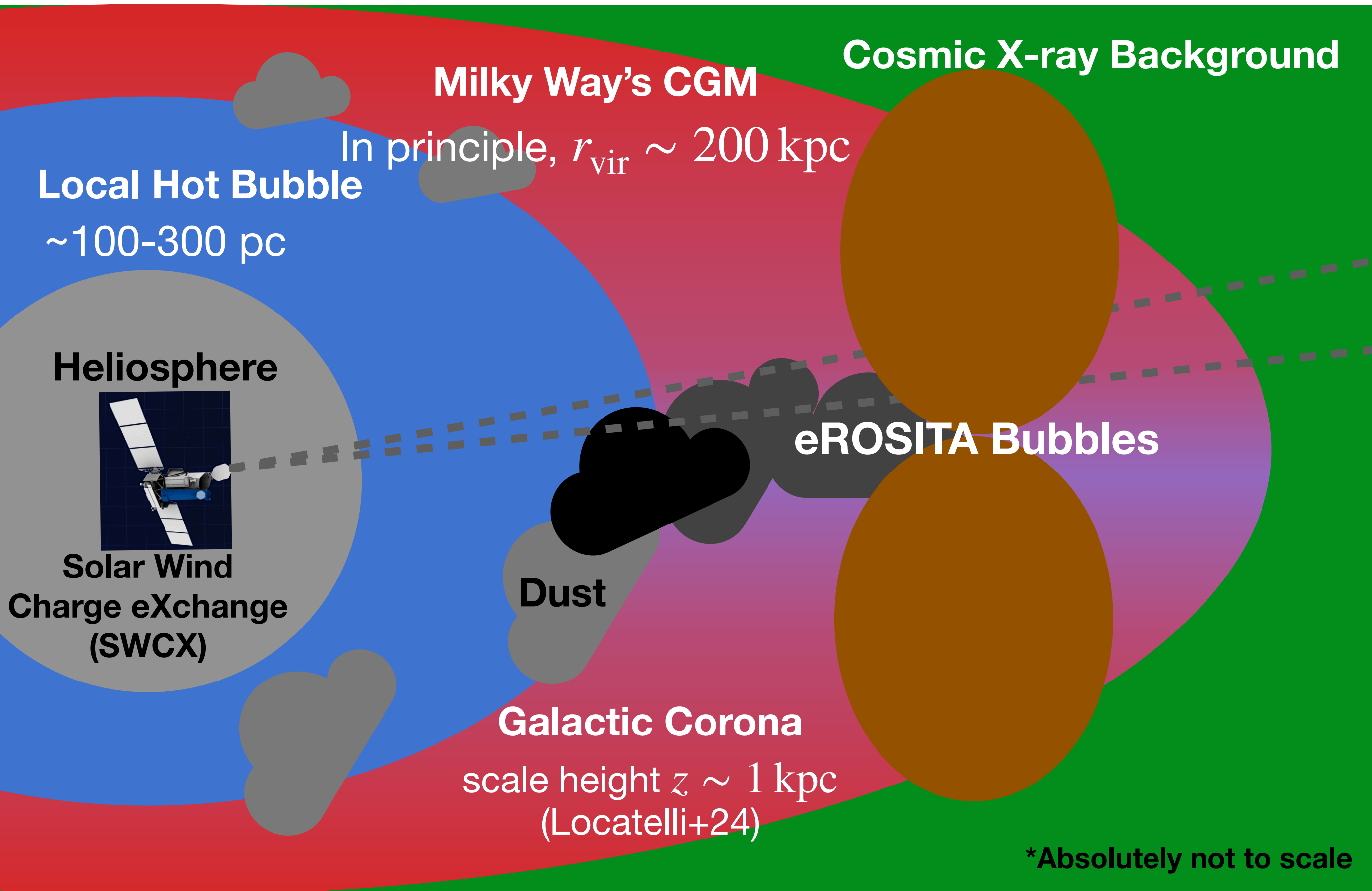






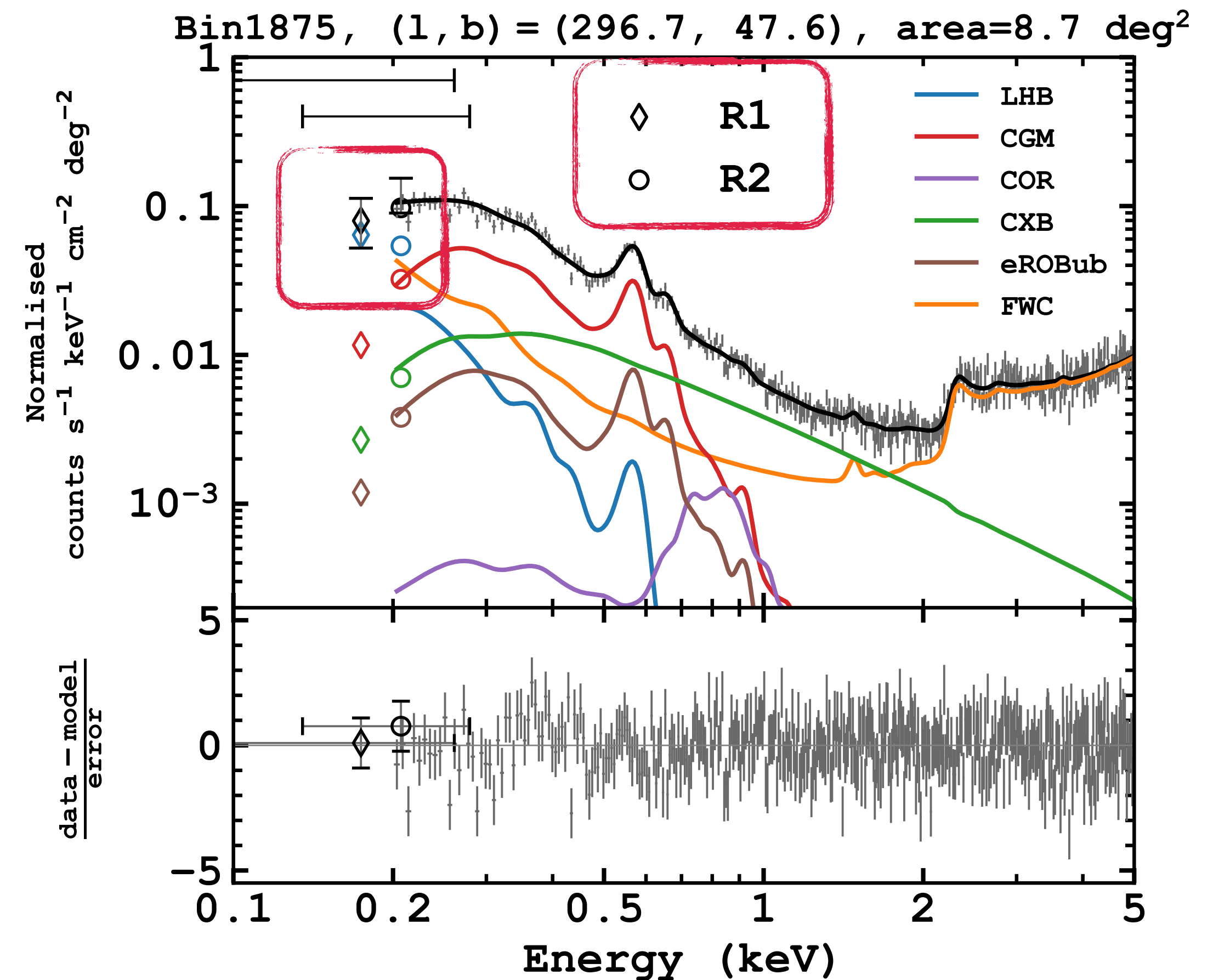
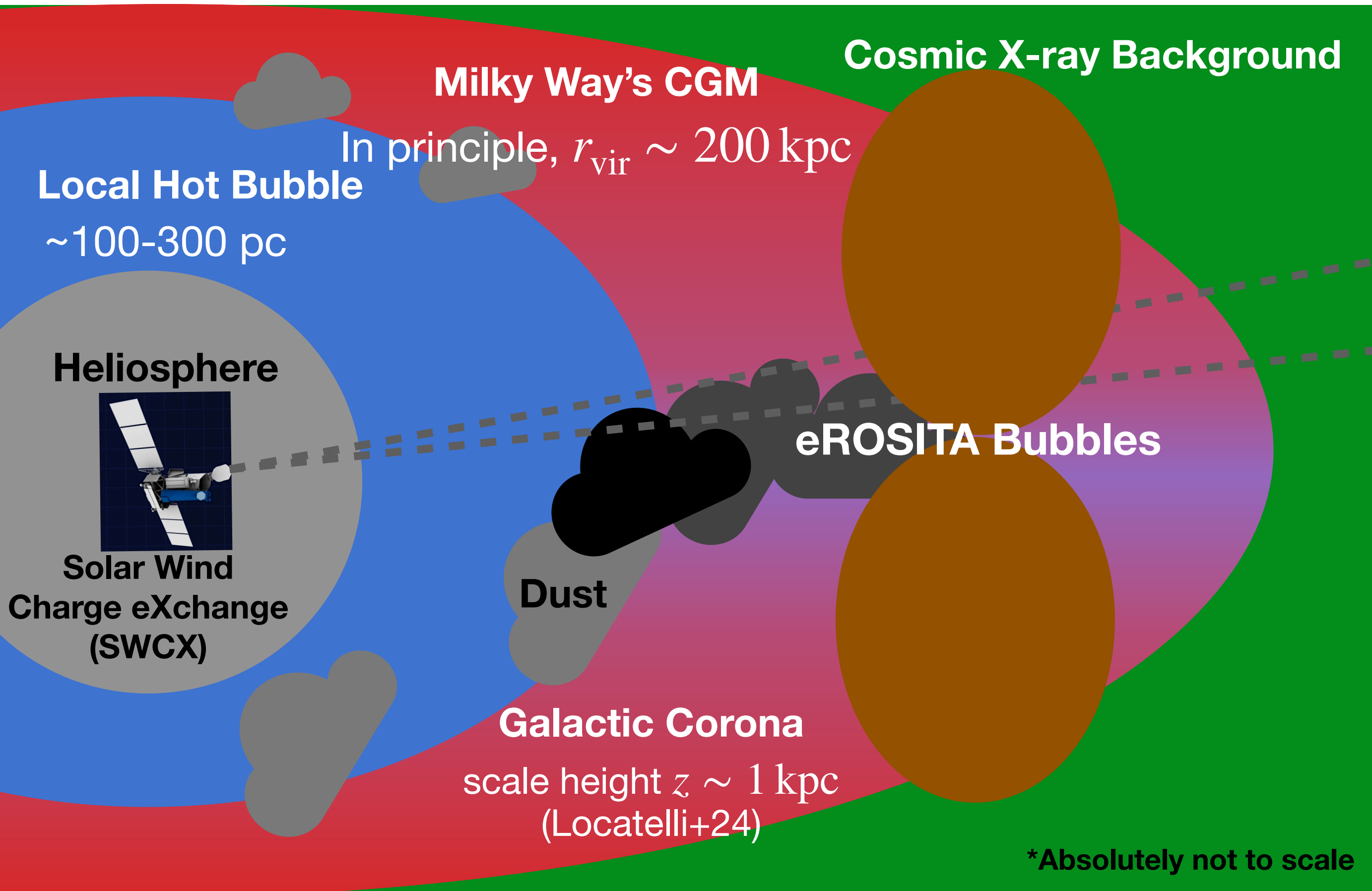
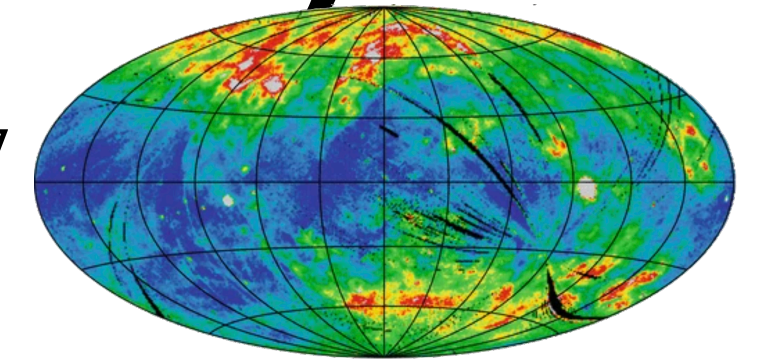


Diffuse Soft X-ray Background (SXRFB)



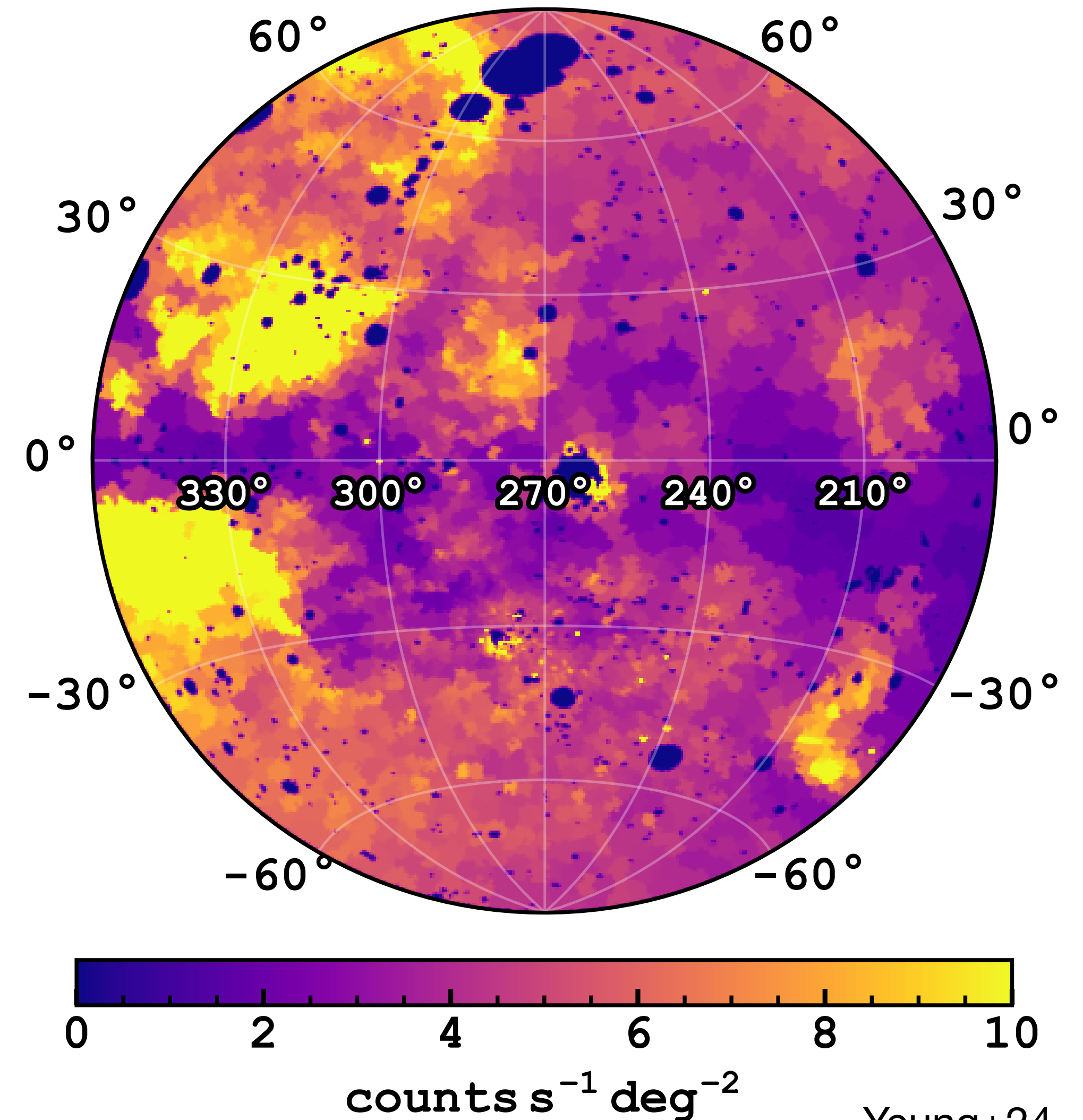
Diffuse Soft X-ray Background (SXRb)

Snowden+97

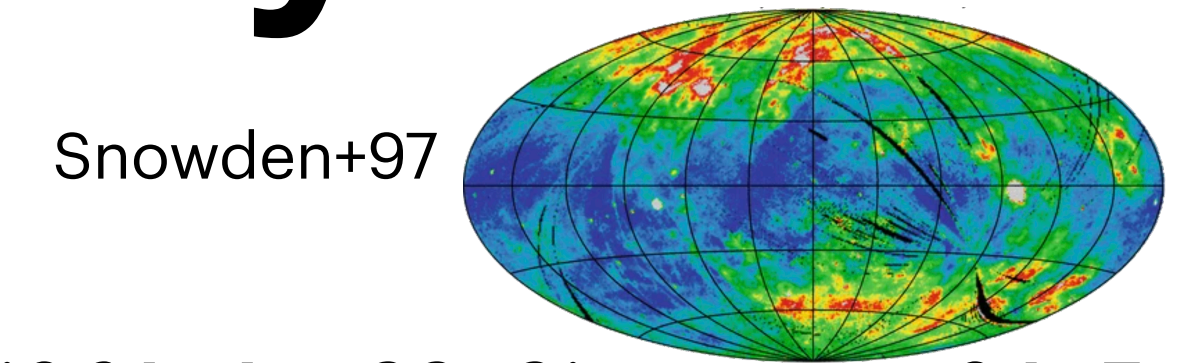


Half-sky Spectral Analysis

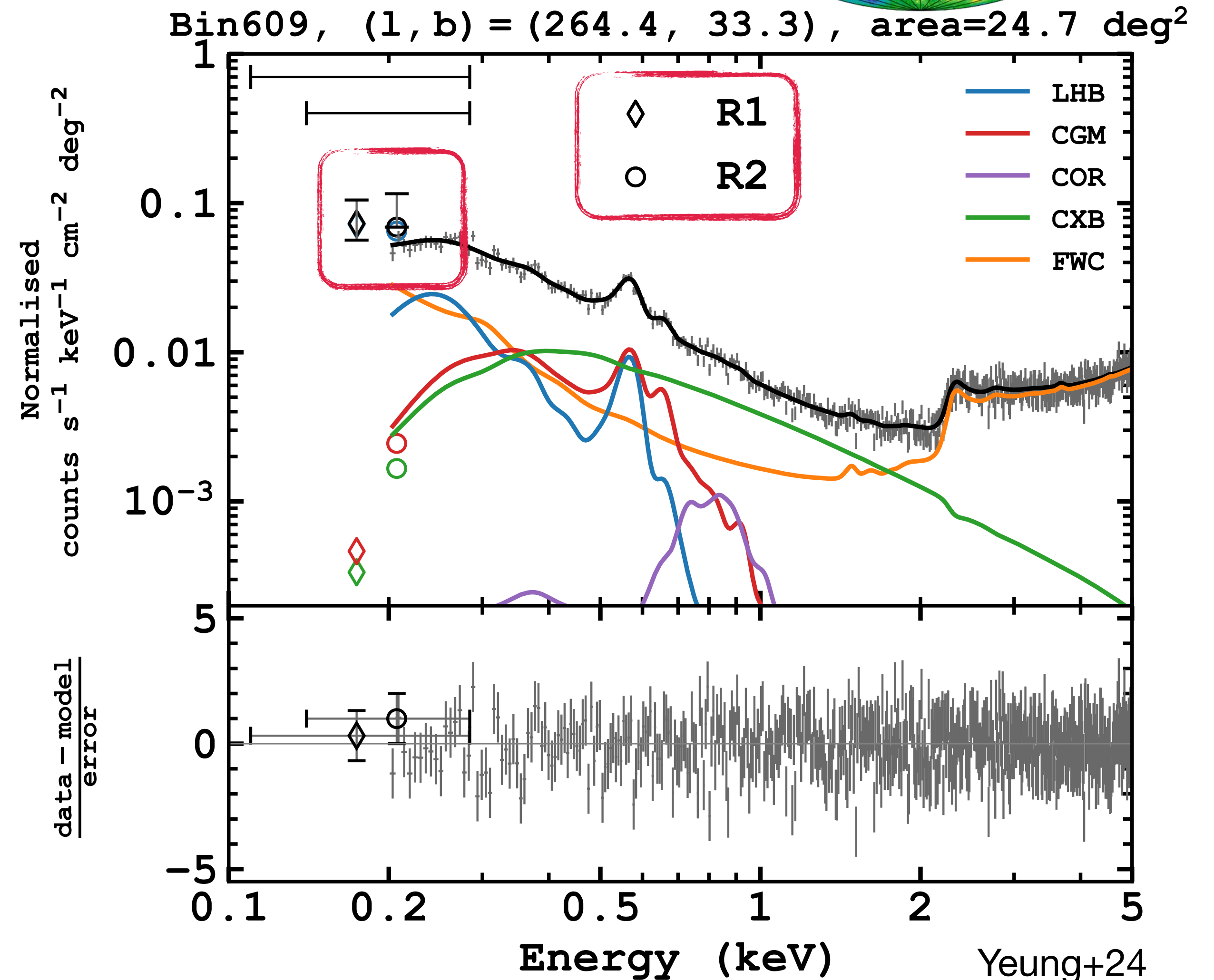
- Binned in equal S/N (=80) in 0.2 – 0.6 keV band (contbin; Sanders 2006)
- Spatial & Spectral properties of background components



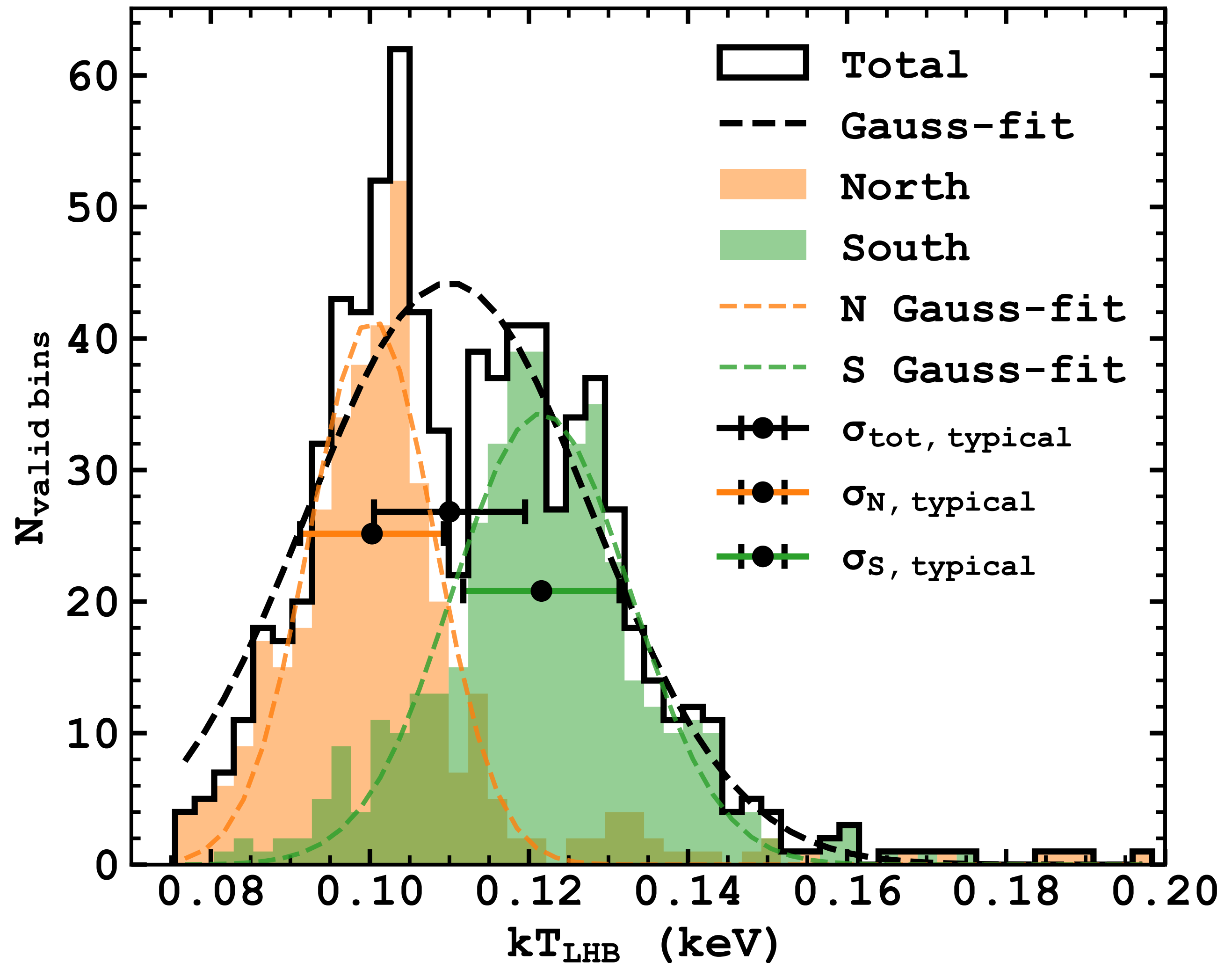
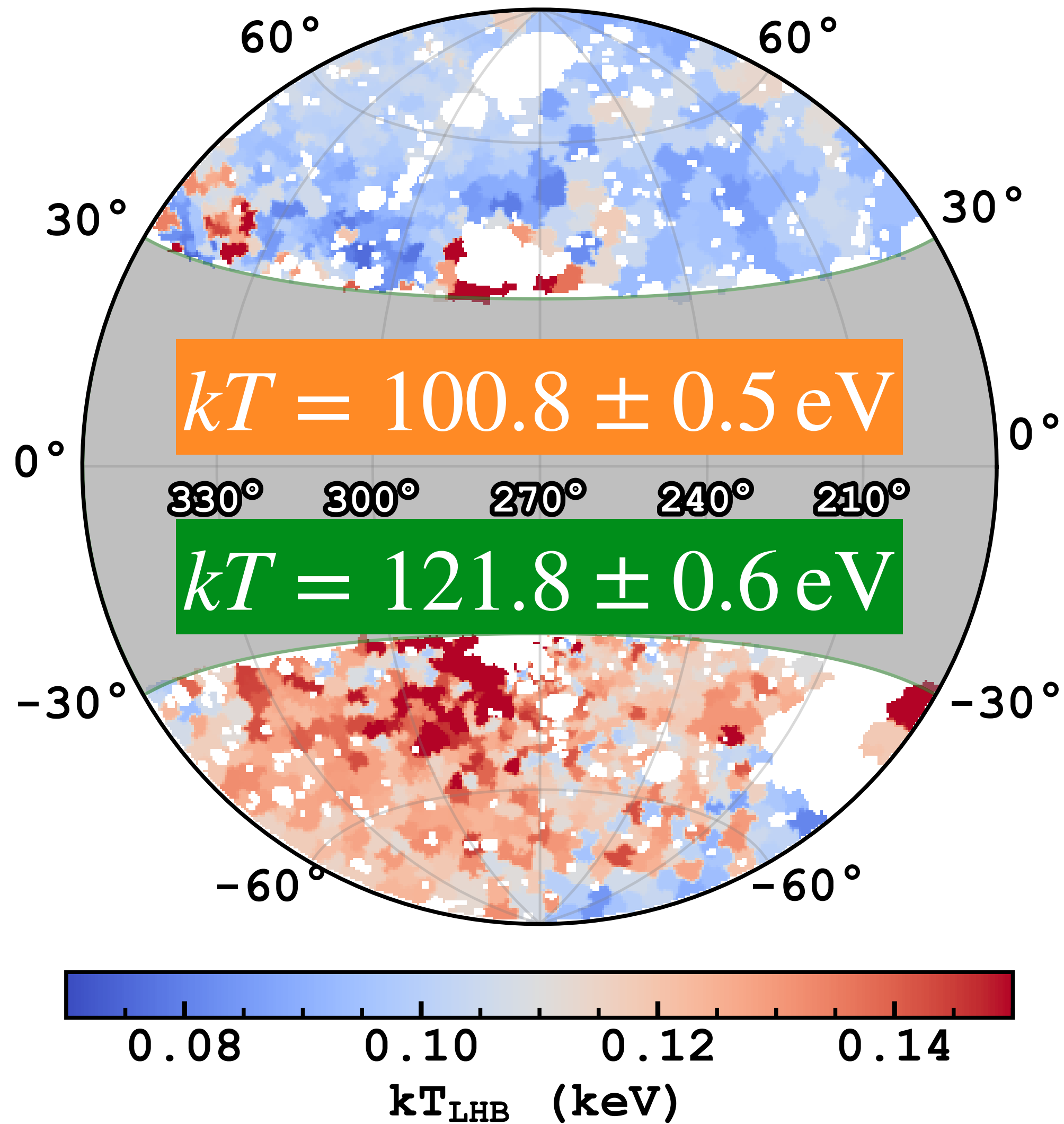
Half-sky Spectral Analysis



- Binned in equal S/N (=80) in 0.2 – 0.6 keV band (contbin; Sanders 2006)
- Spatial & Spectral properties of background components
- ROSAT R12 bands
 - Break degeneracy between **LHB** & **CGM**

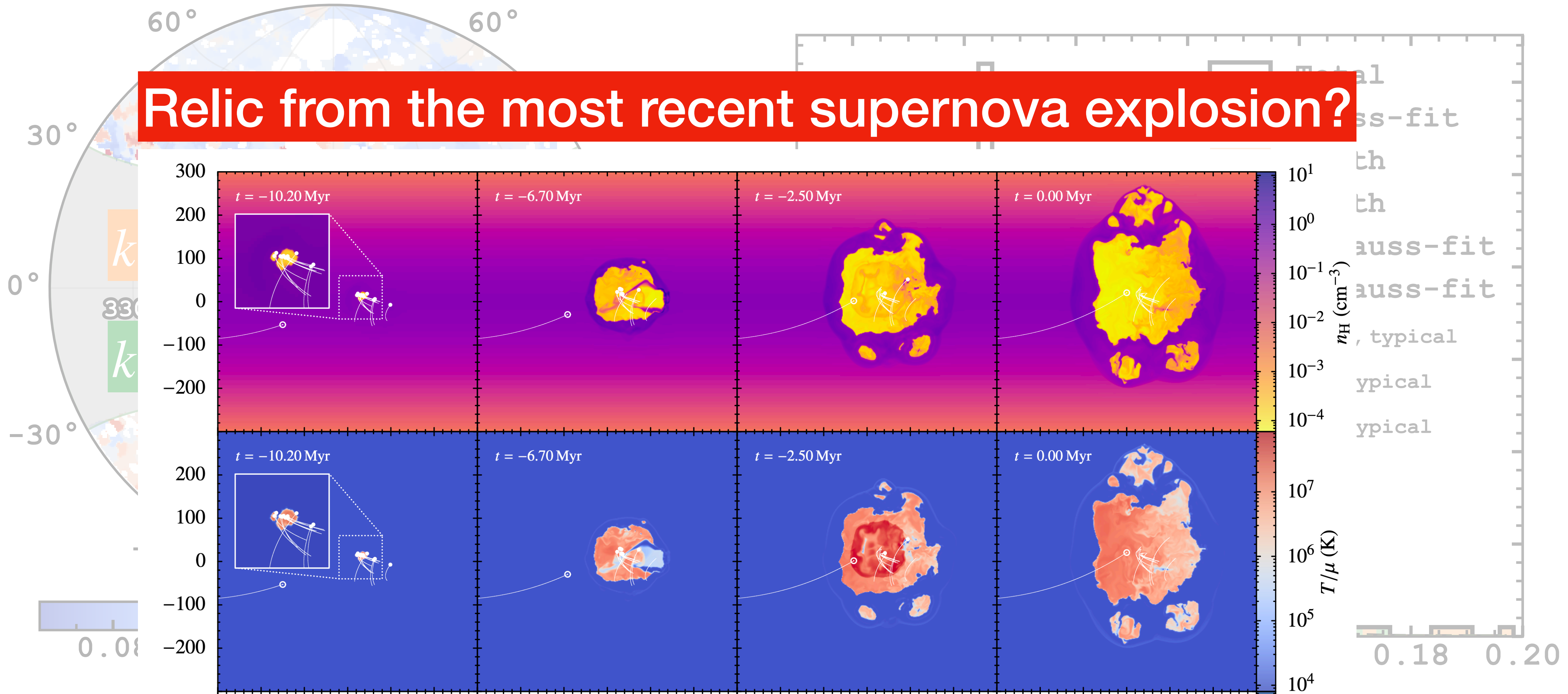


LHB Temperature Dichotomy



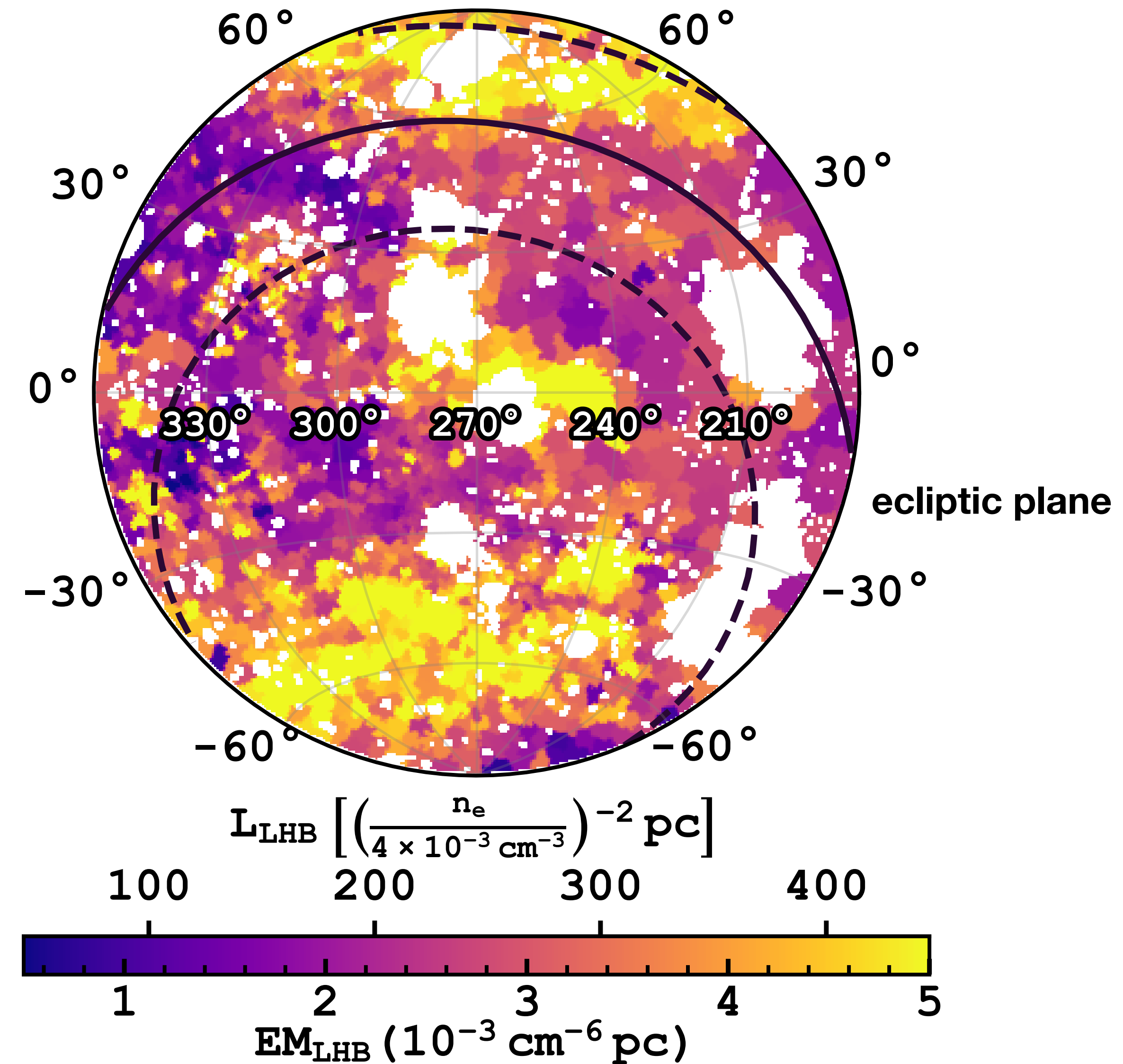
LHB Temperature Dichotomy

Relic from the most recent supernova explosion?



3D Structure of the LHB

- Emission measure (EM) has no obvious correlation with Ecliptic latitude
- Consistent with min. SWCX

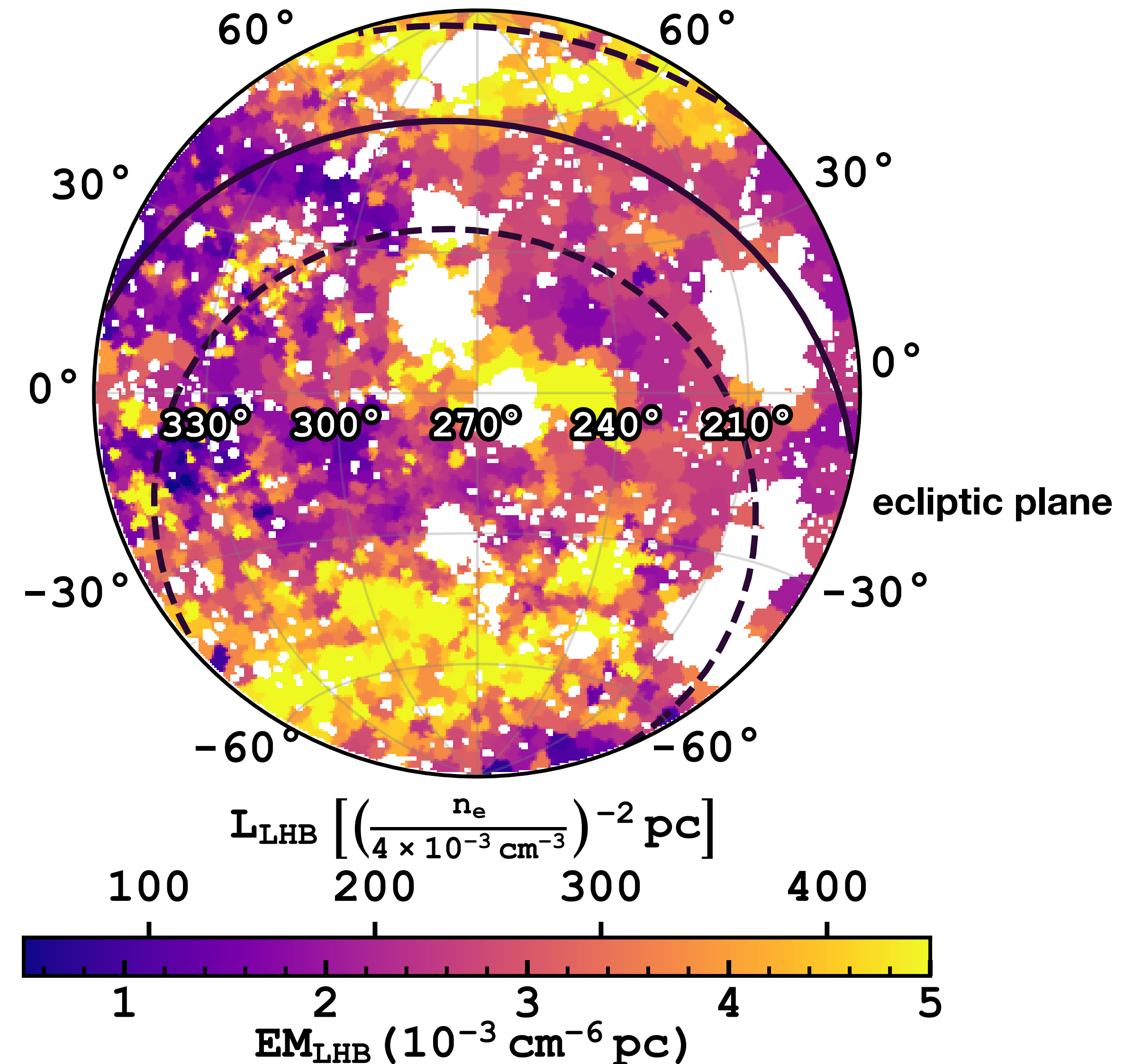


3D Structure of the LHB

- Emission measure (EM) has no obvious correlation with Ecliptic latitude
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- 3D structure of the LHB

$$L = \frac{1.2EM}{n_e^2}$$

- But, what is n_e ?

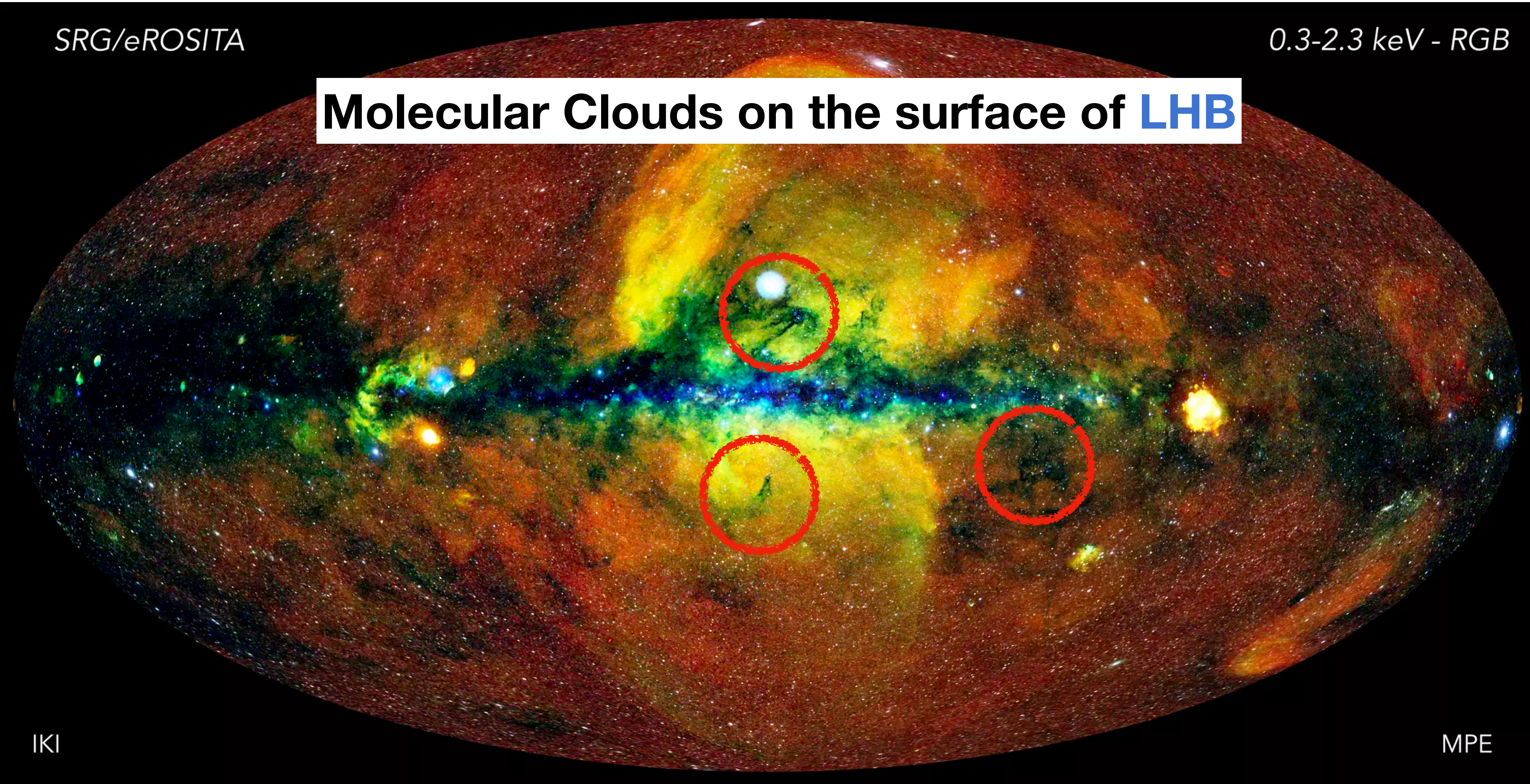


X-ray shadows as calibration points

SRG/eROSITA

0.3-2.3 keV - RGB

Molecular Clouds on the surface of **LHB**



IKI

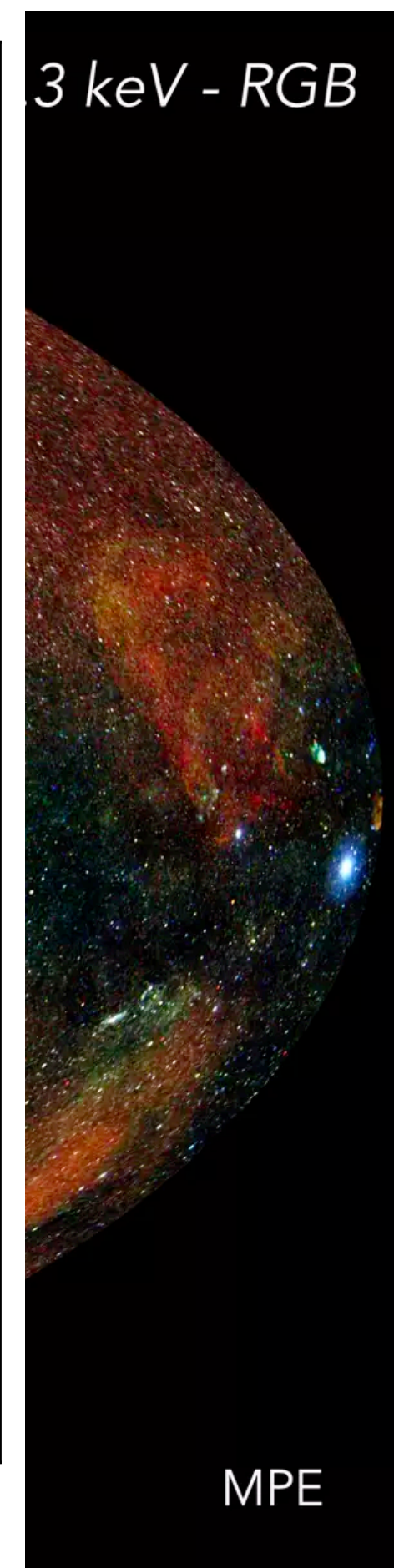
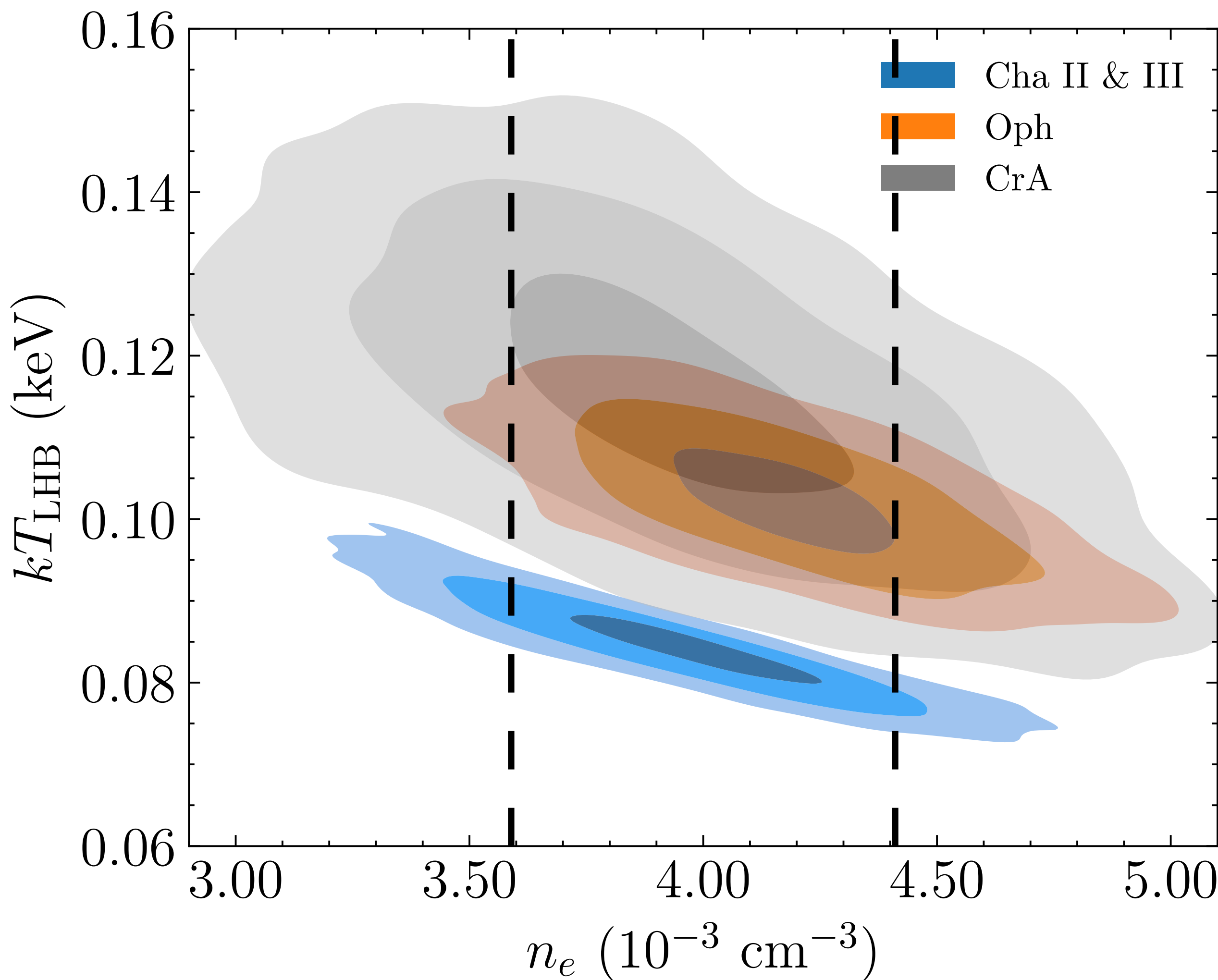
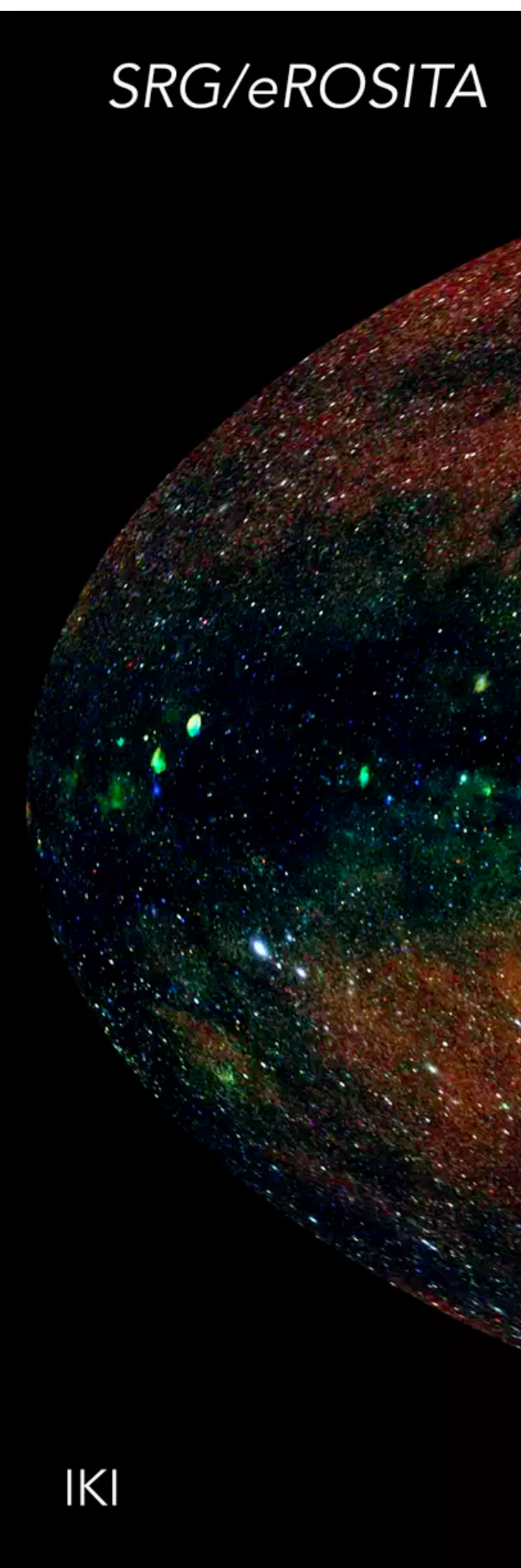
MPE

Predehl+20

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With known L ,
we can calibrate n_e

X-ray shadows as calibration points



$$L = \frac{1.2EM}{n_e^2}$$

With known L ,
we can calibrate n_e

$$n_e = (4 \pm 0.4) \times 10^{-3} \text{ cm}^{-3}$$

Predehl+20

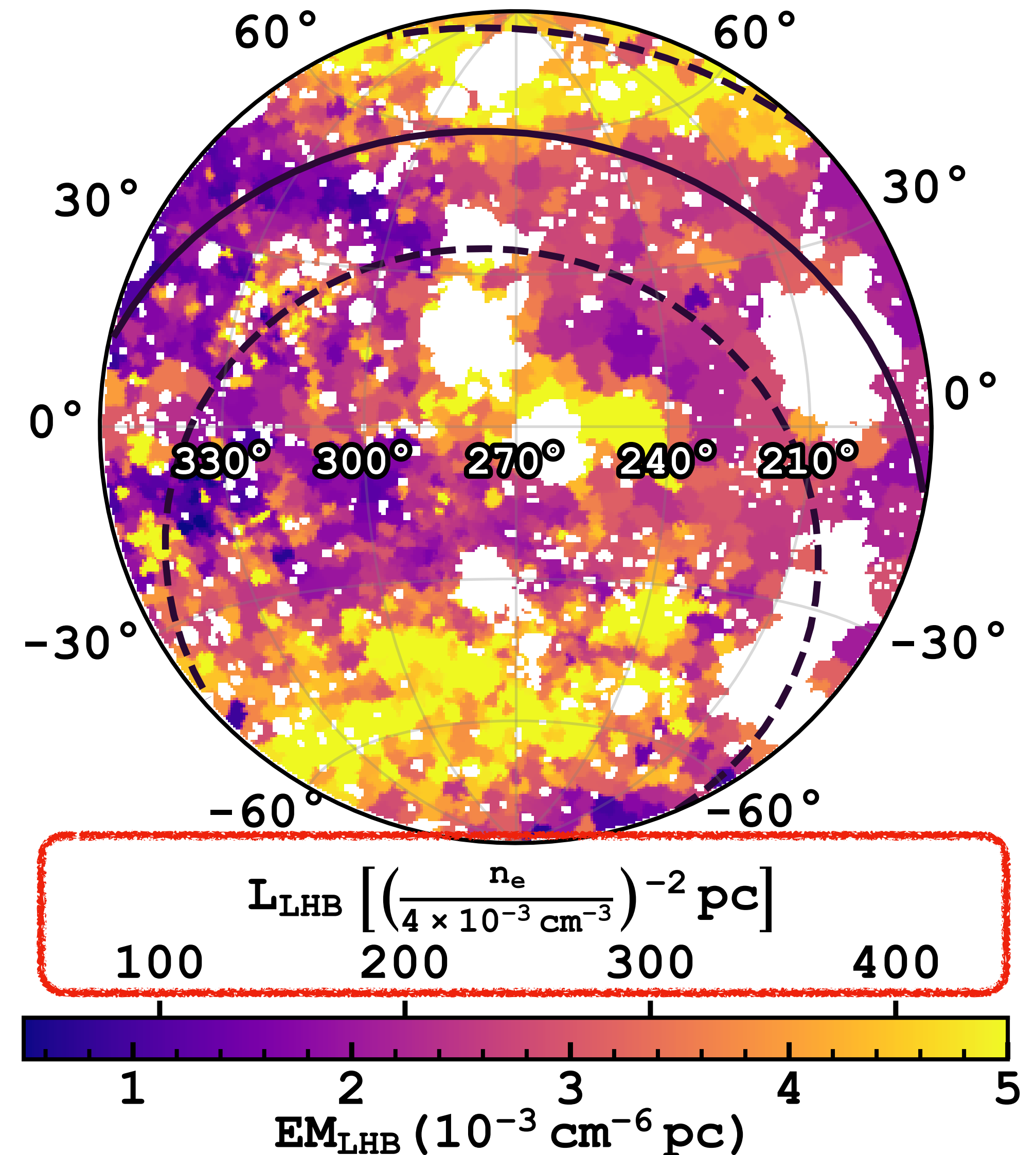
Yeung+23

3D Structure of the LHB

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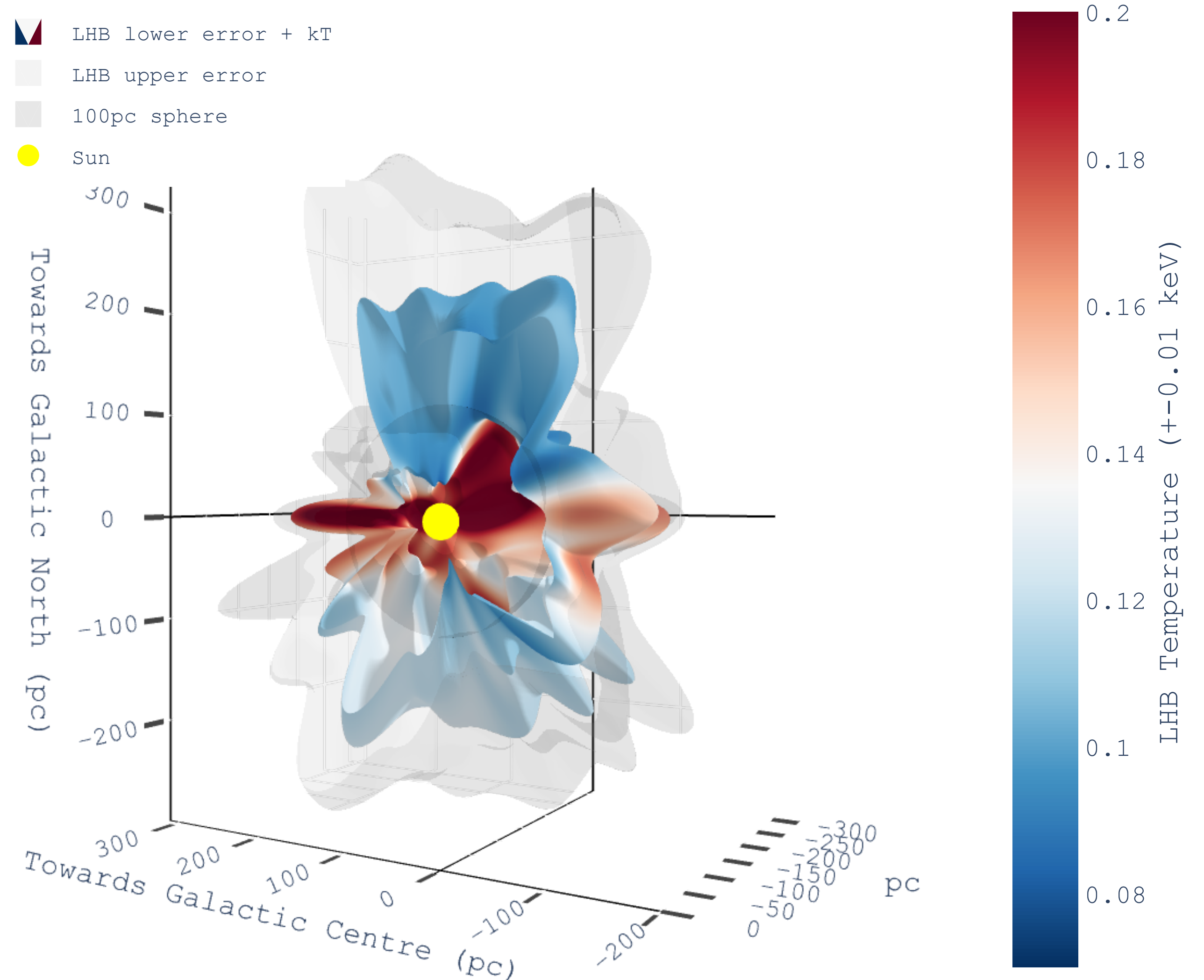


3D Structure of the LHB

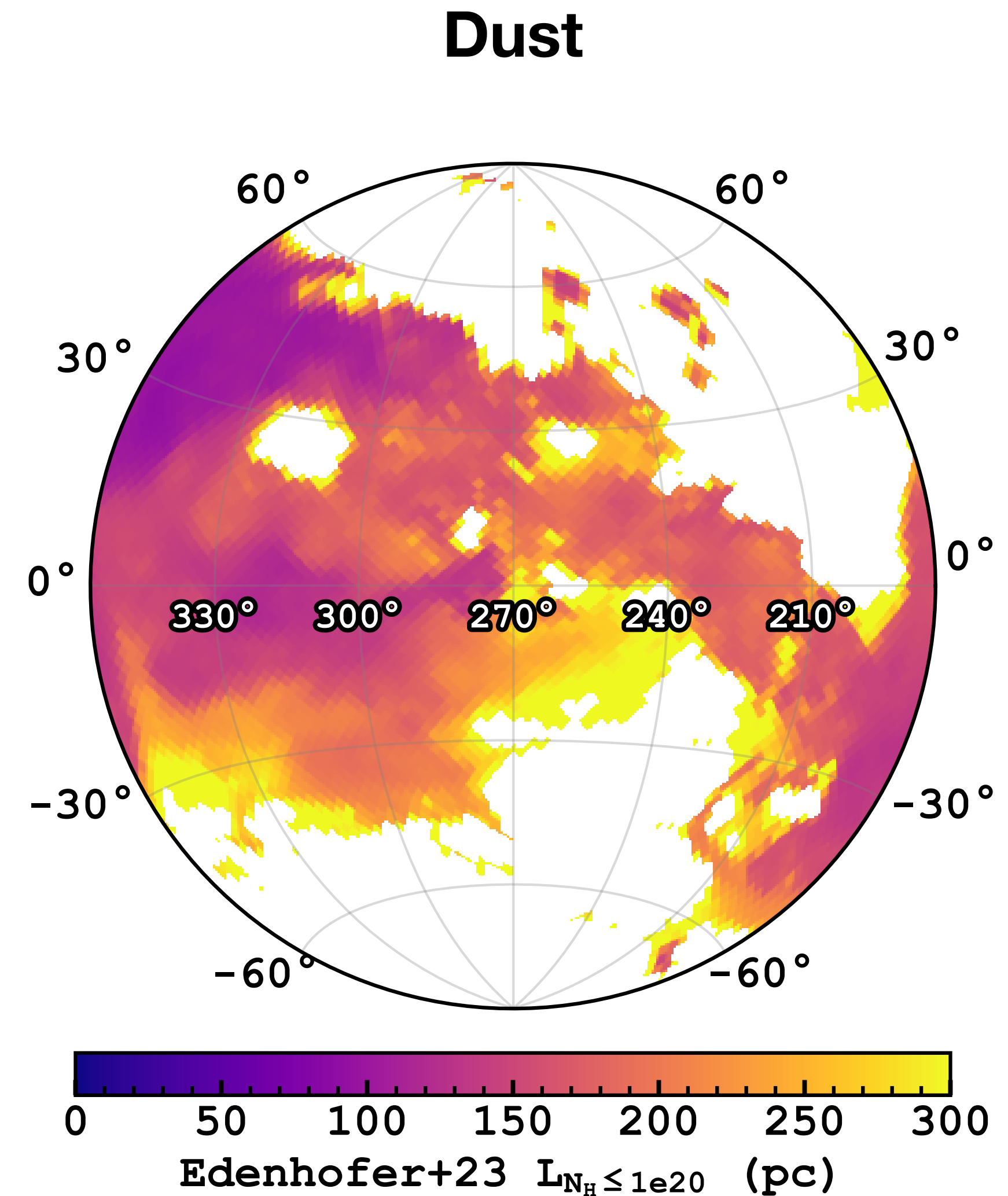
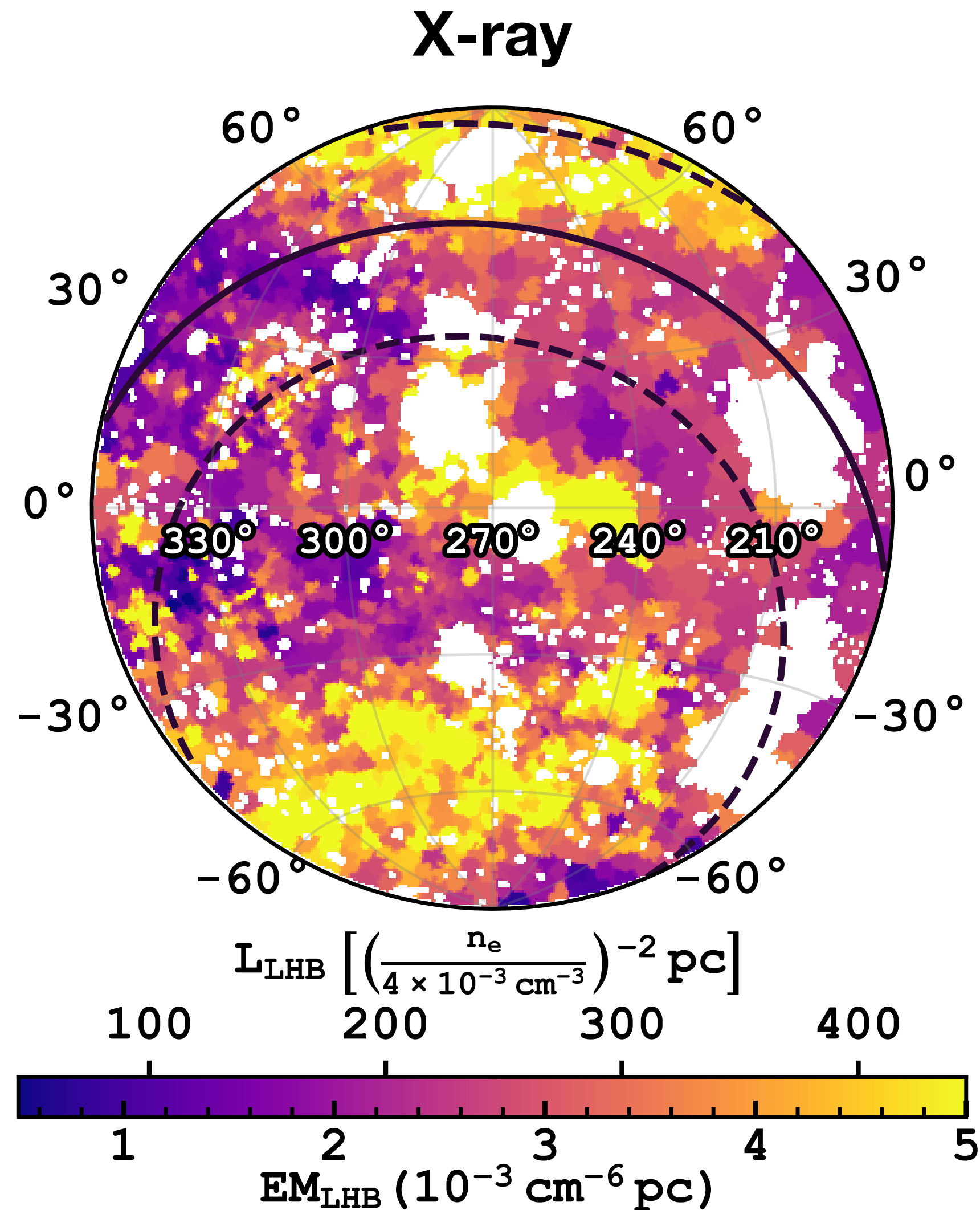
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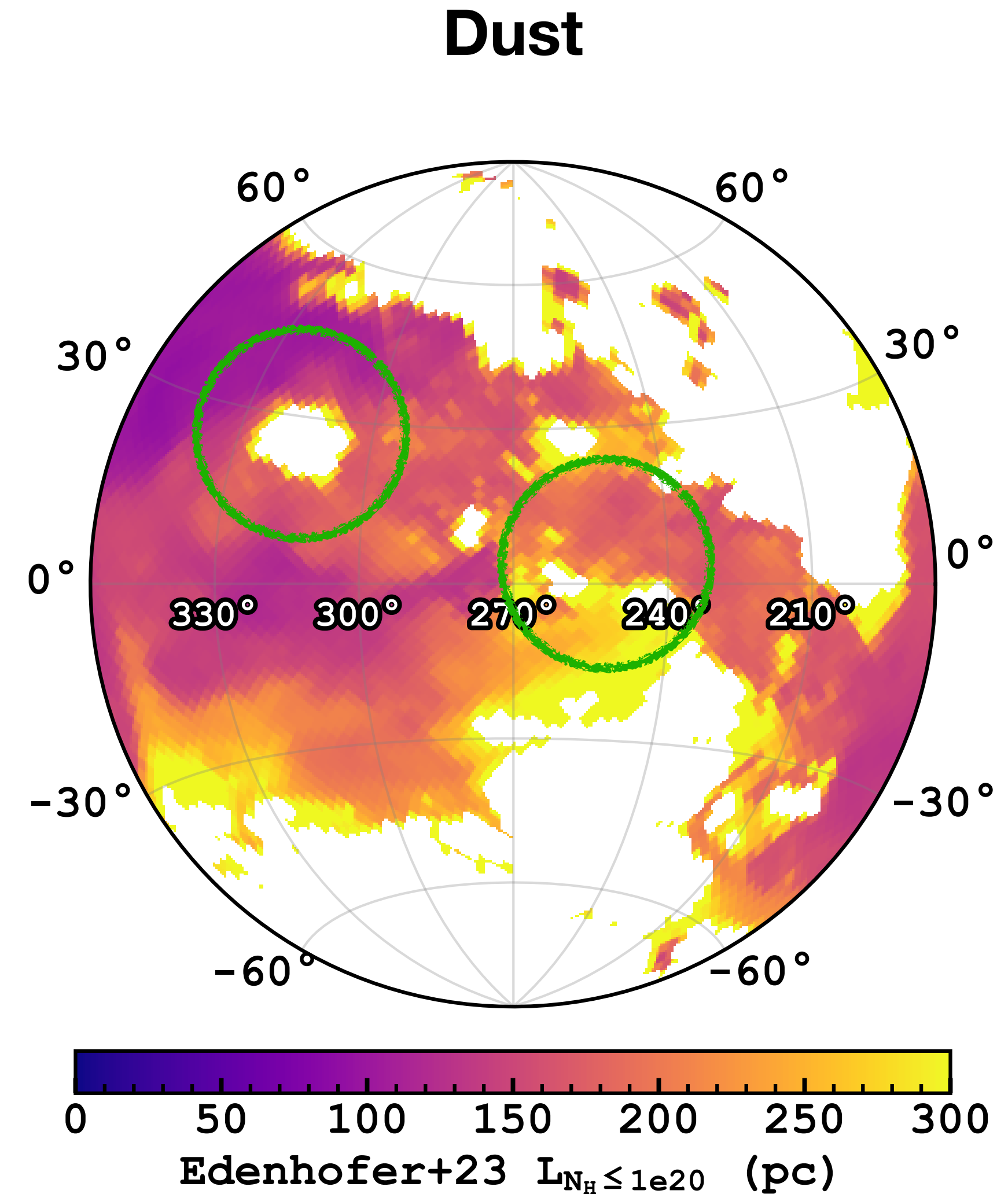
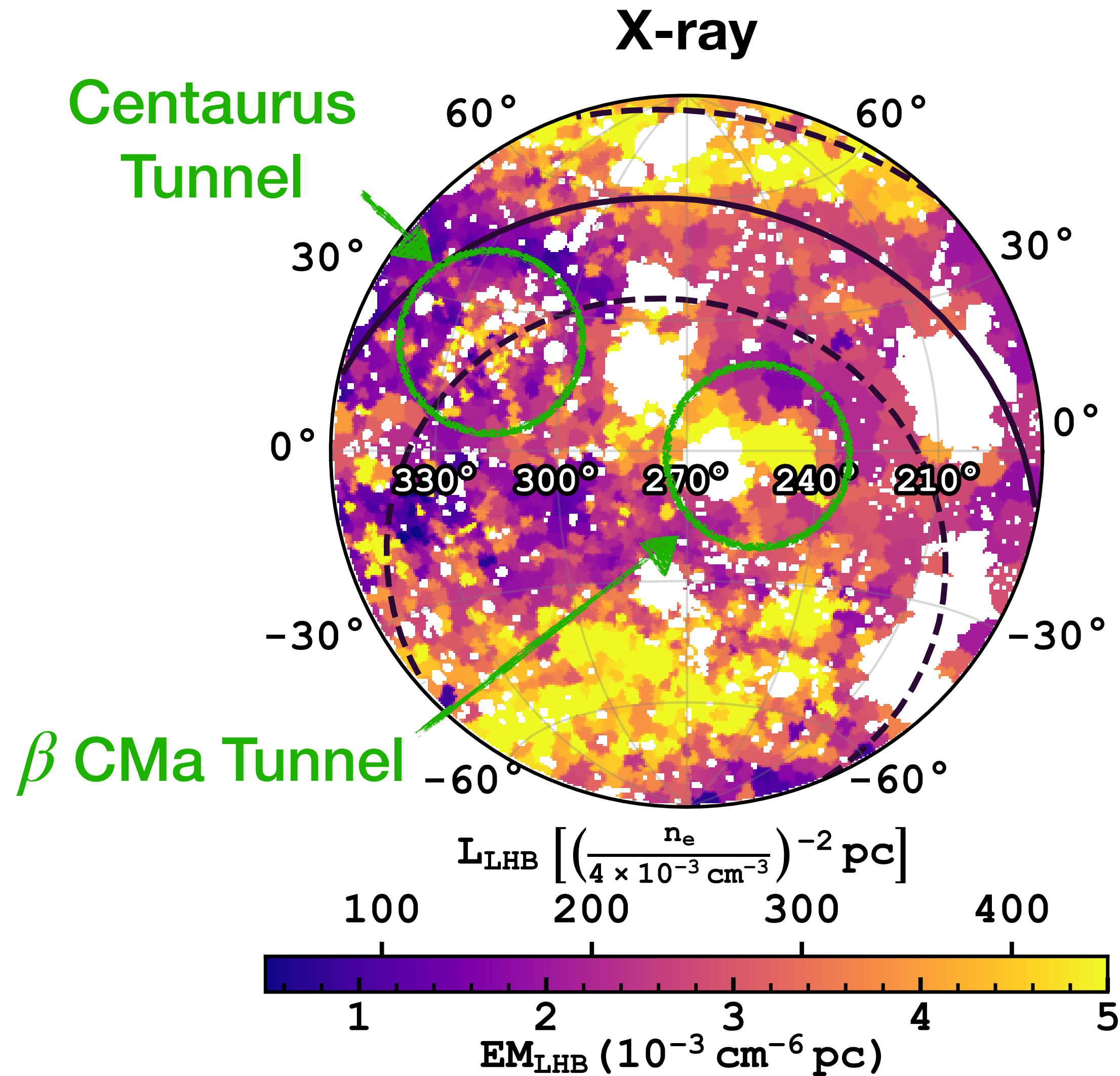
- But, what is n_e ?



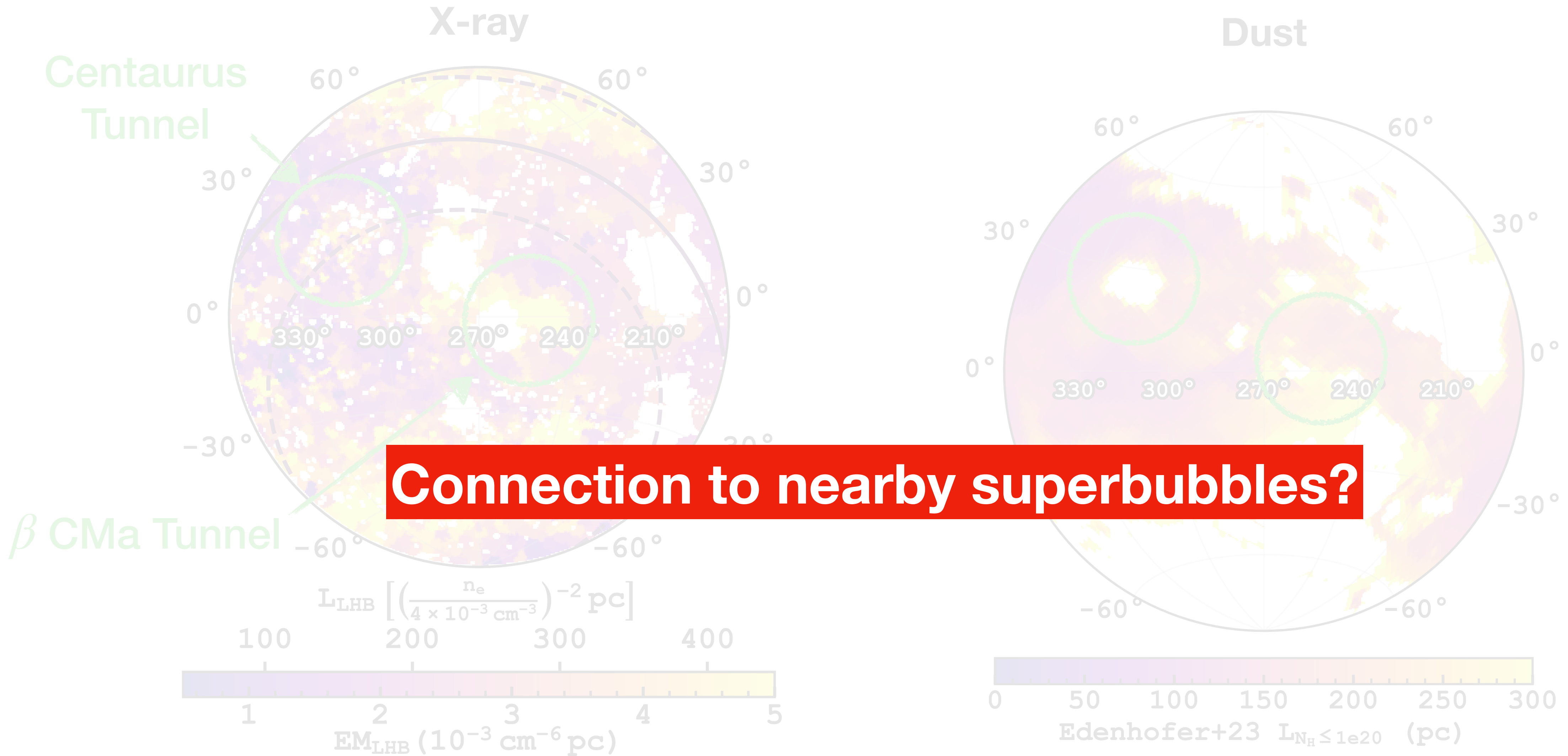
Anti-correlation with Dust



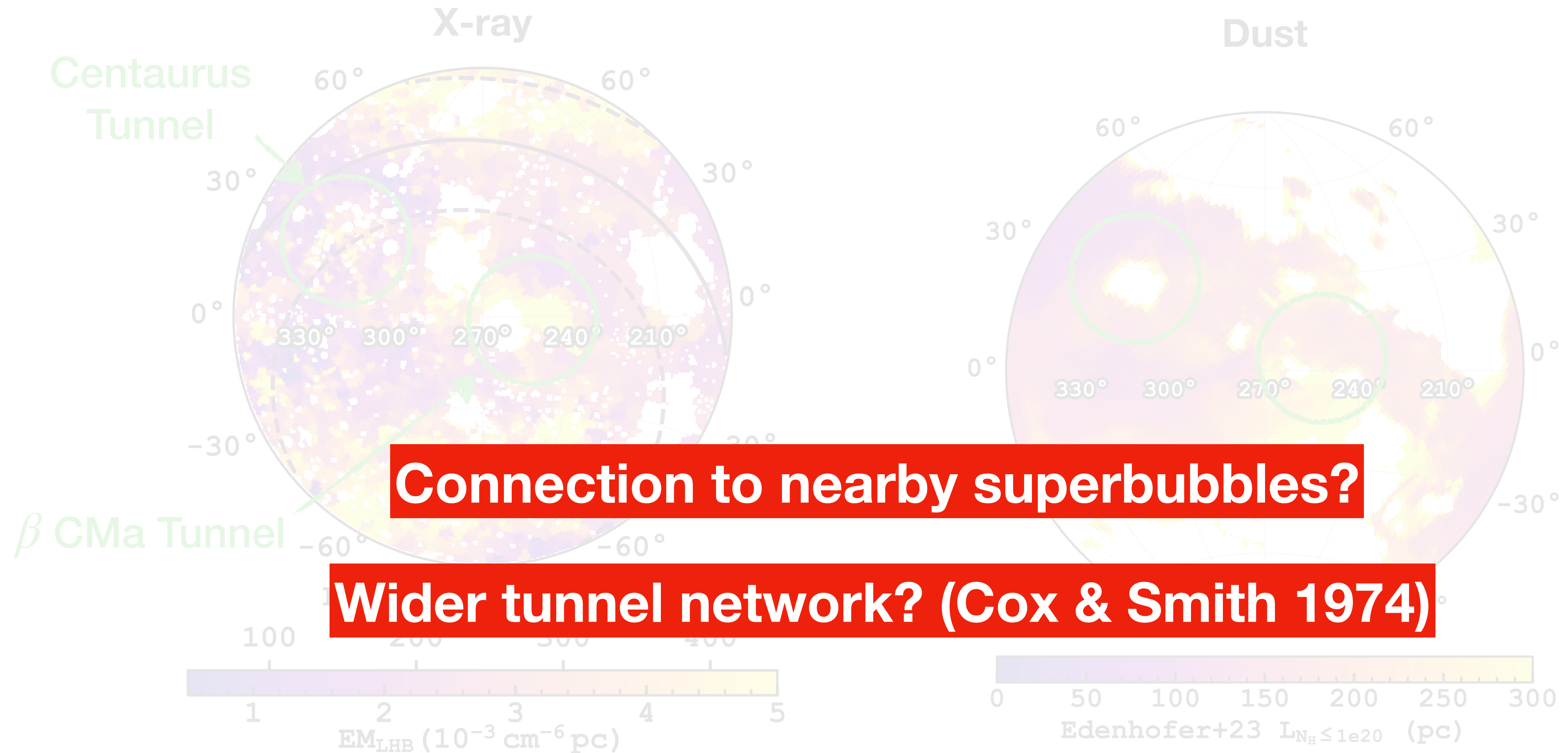
Interstellar Tunnels



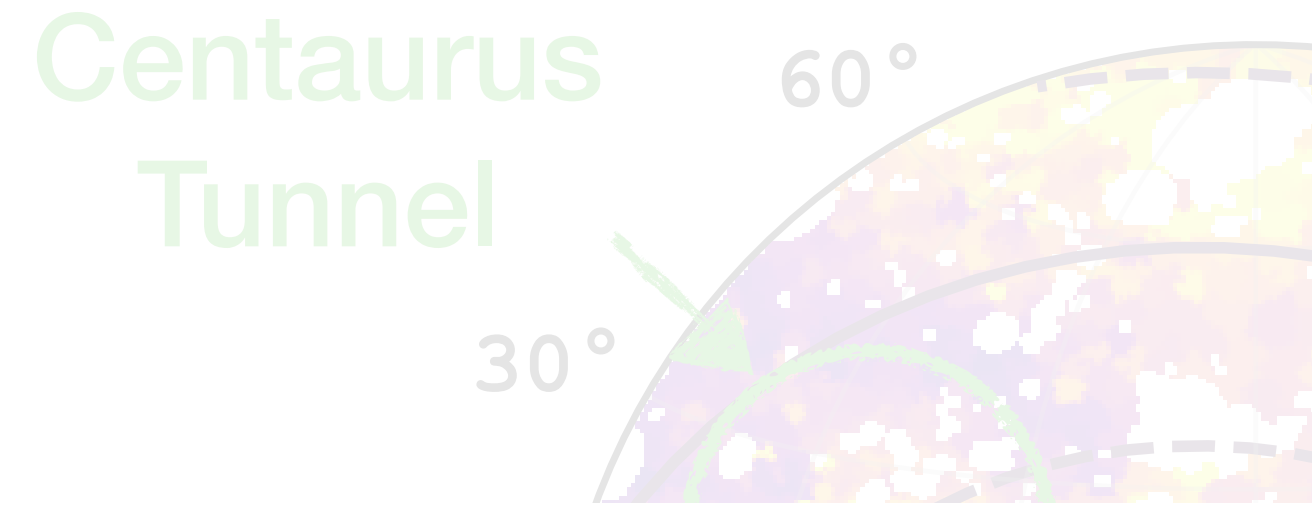
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Interstellar Tunnels

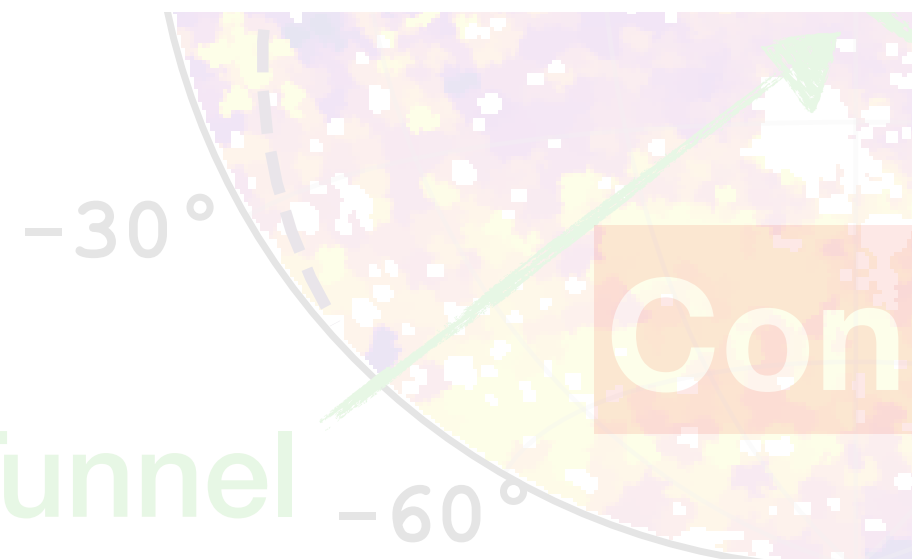


Interstellar Tunnels



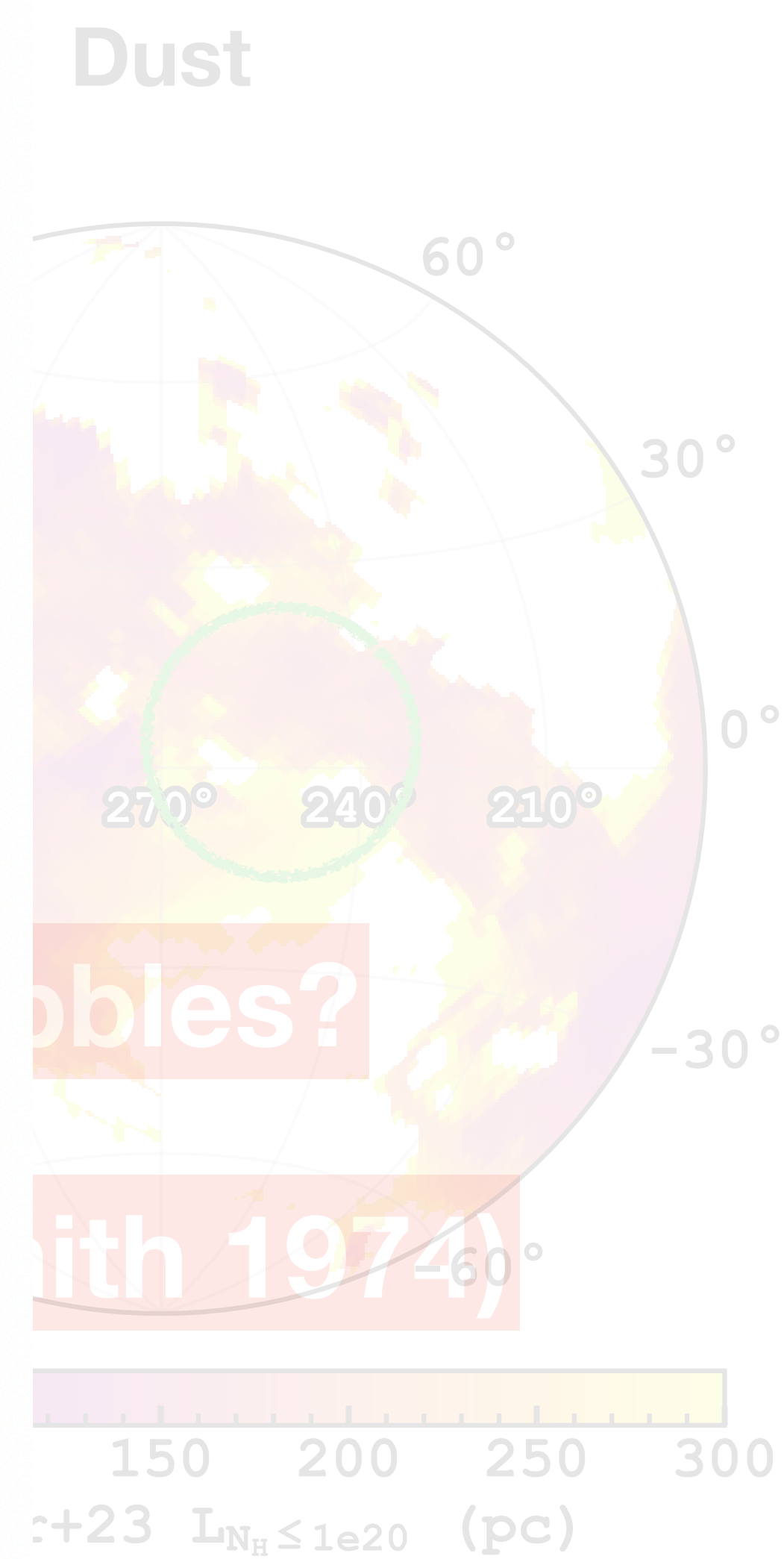
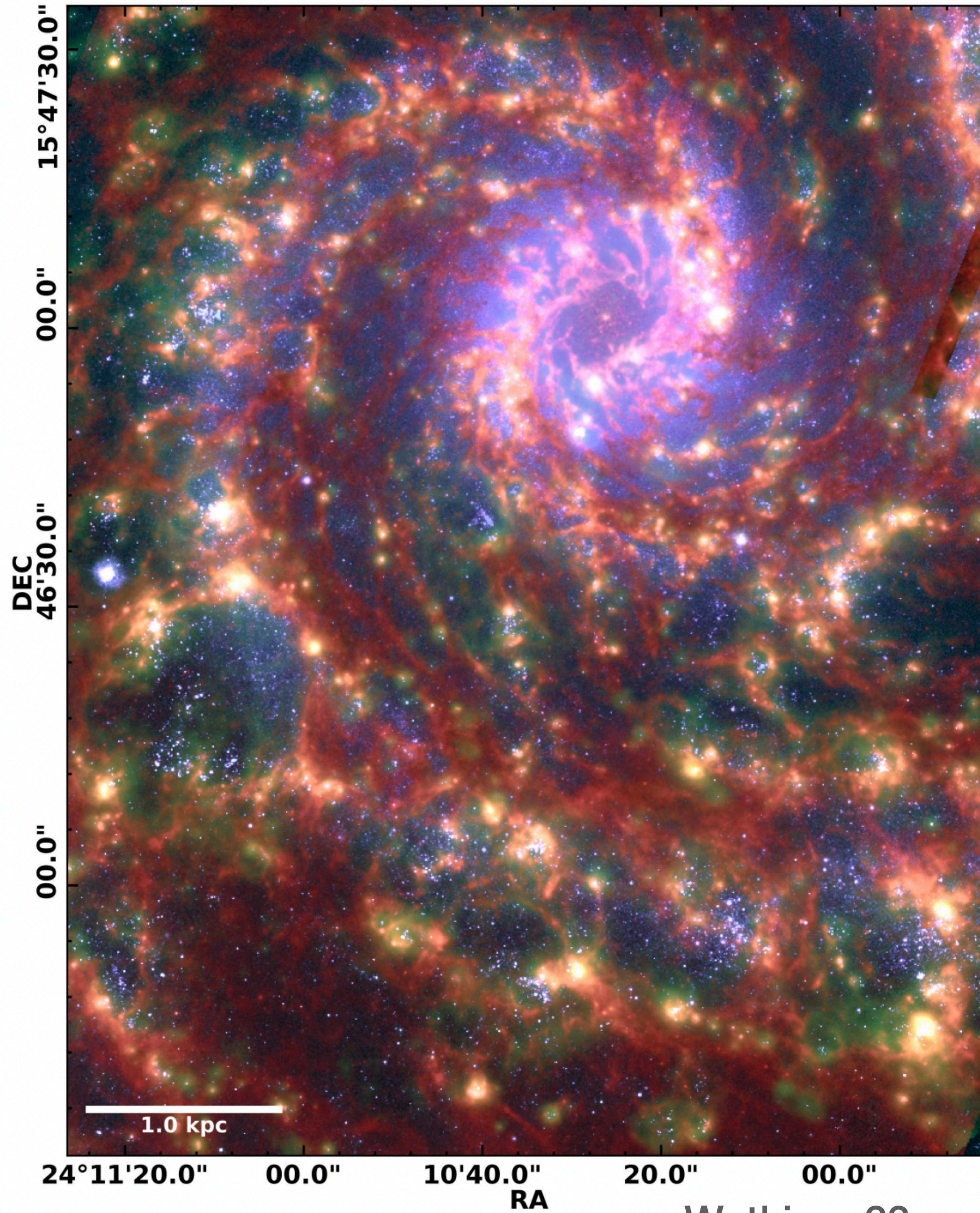
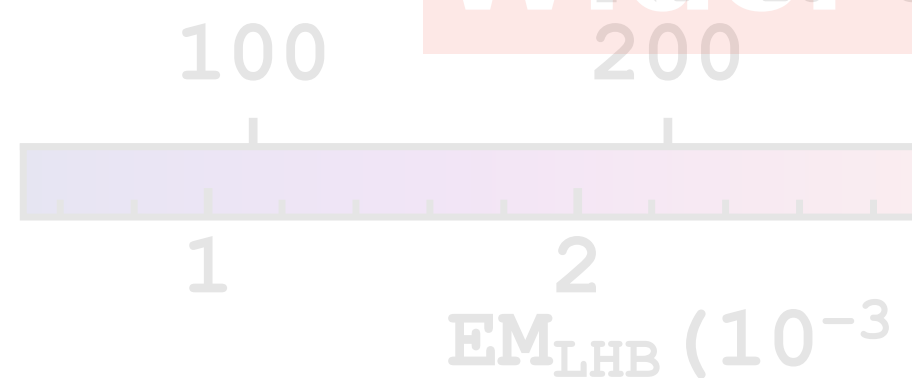
M74

Phantom Galaxy

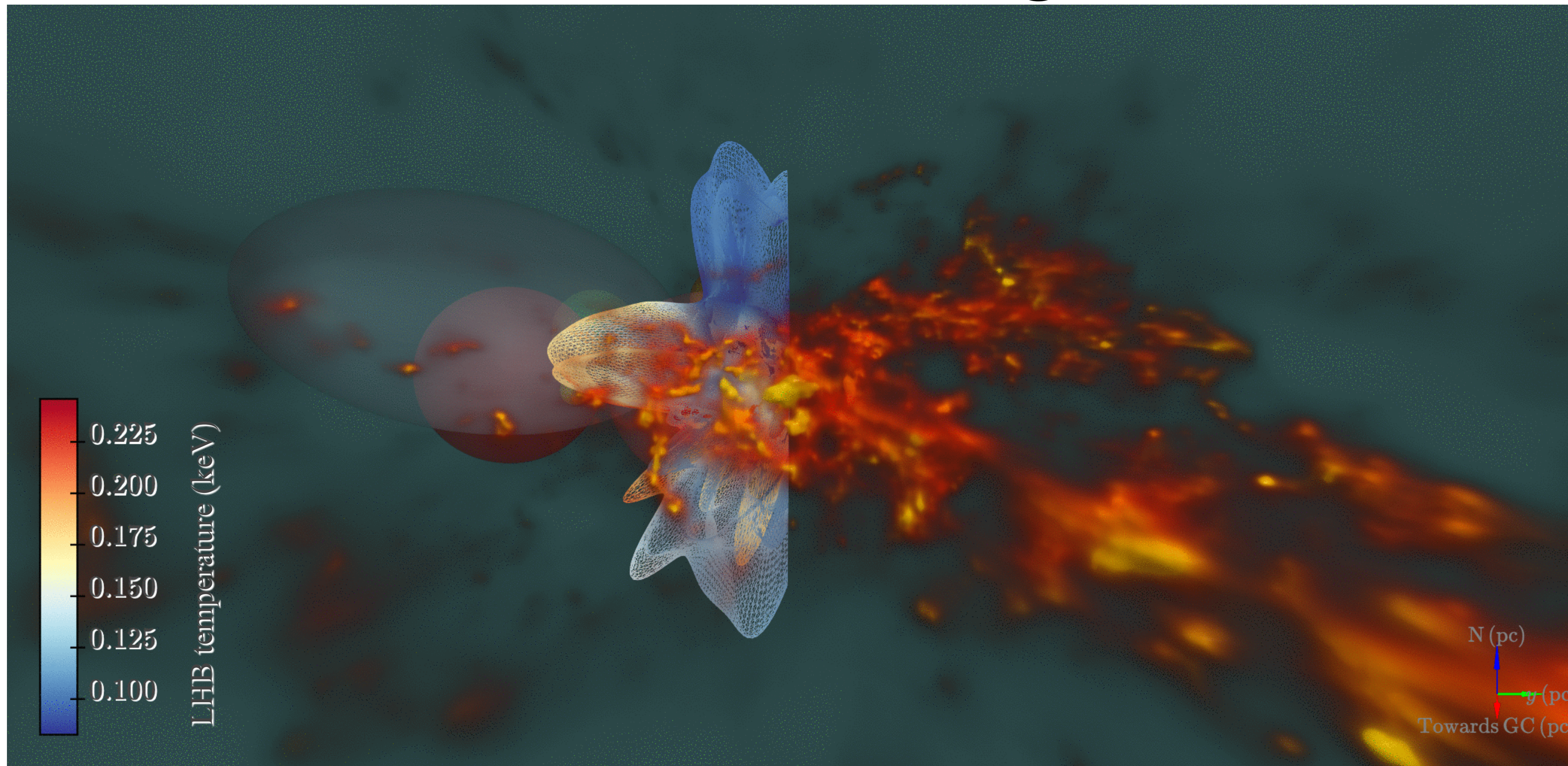


Wider

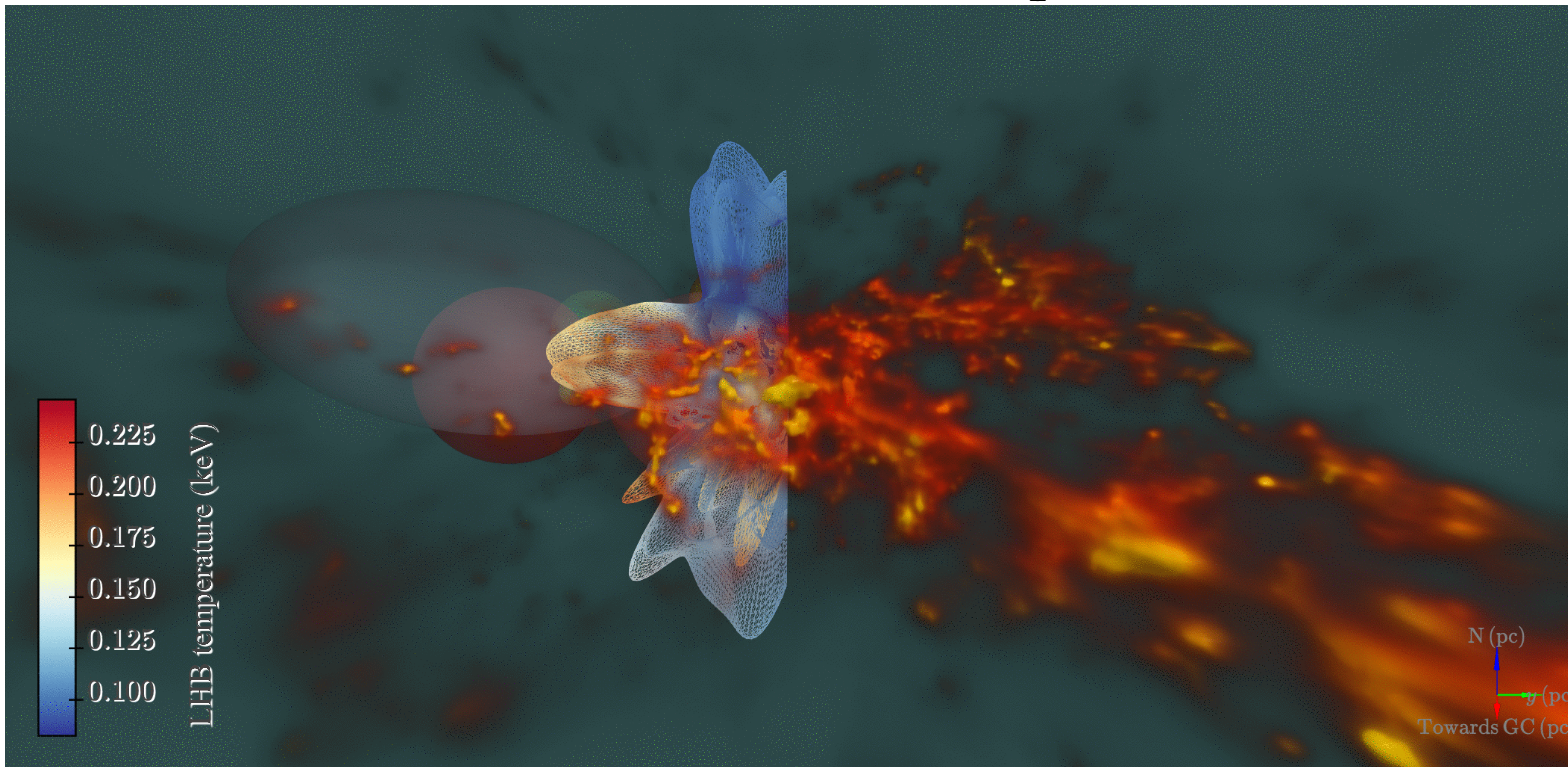
$L_{LHB} (4 \times 10^{-3} c)$



3D view of the solar neighbourhood

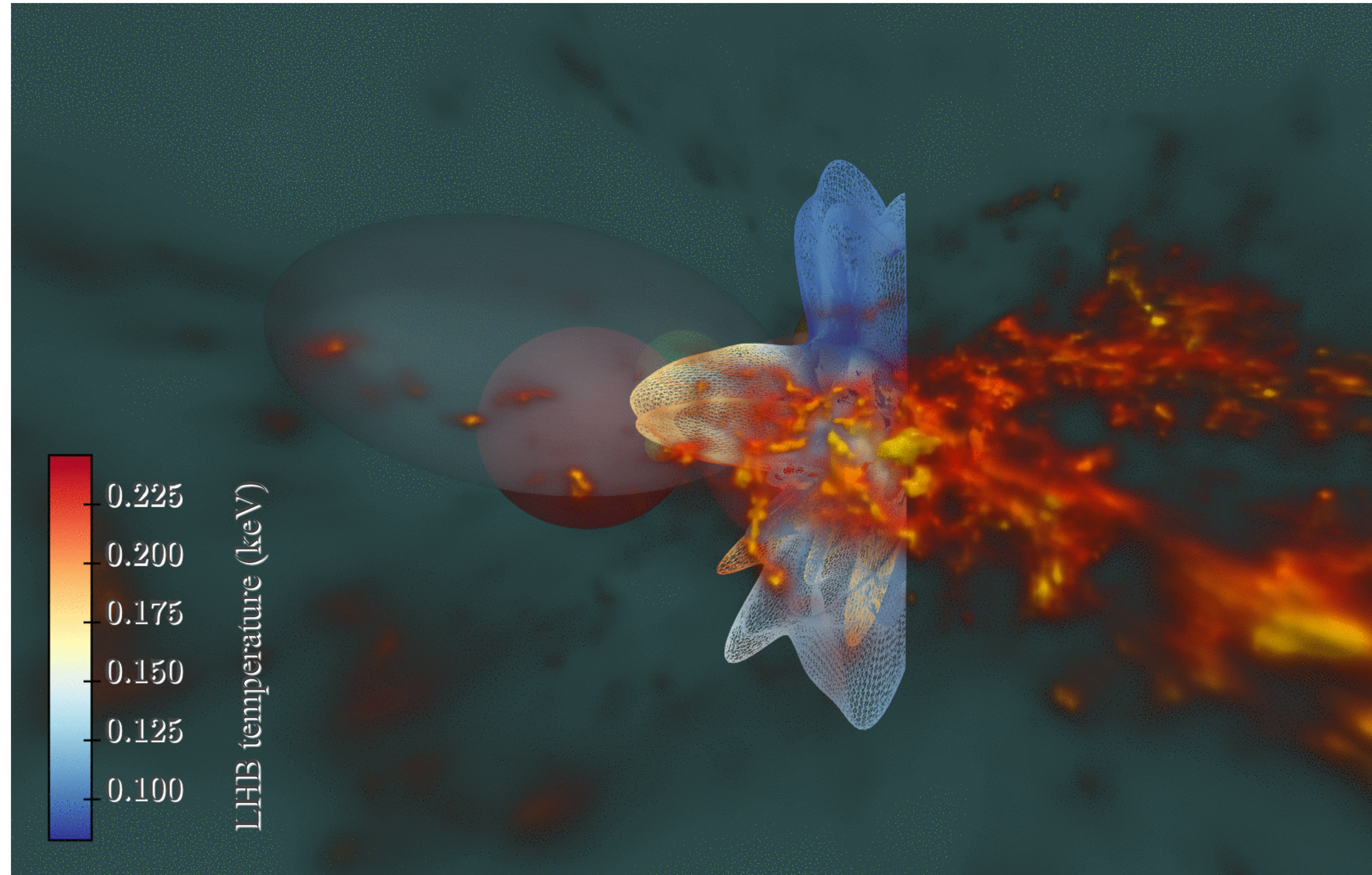


3D view of the solar neighbourhood



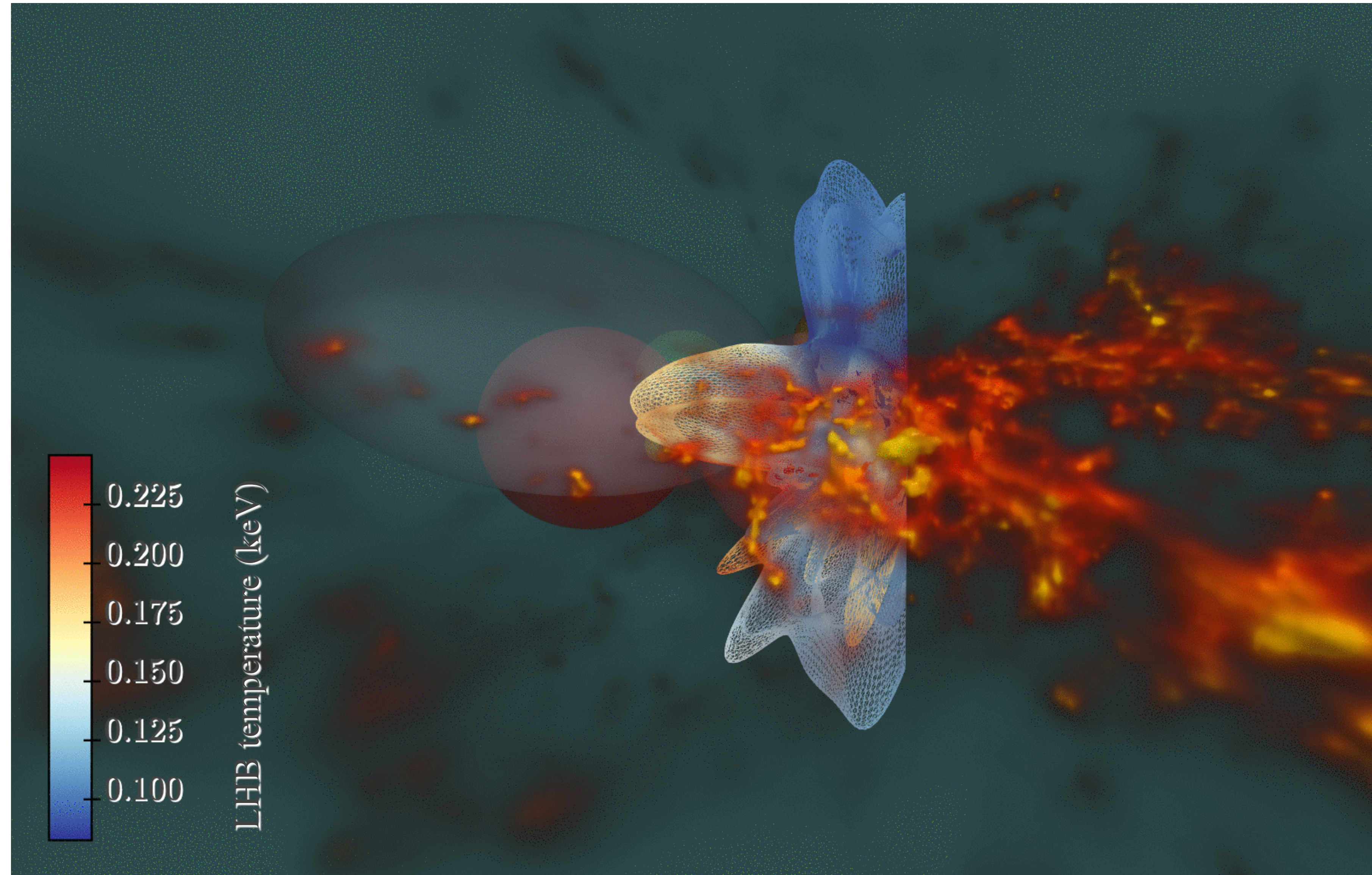
Summary

- Spectral analysis of the diffuse X-ray background in eRASS1



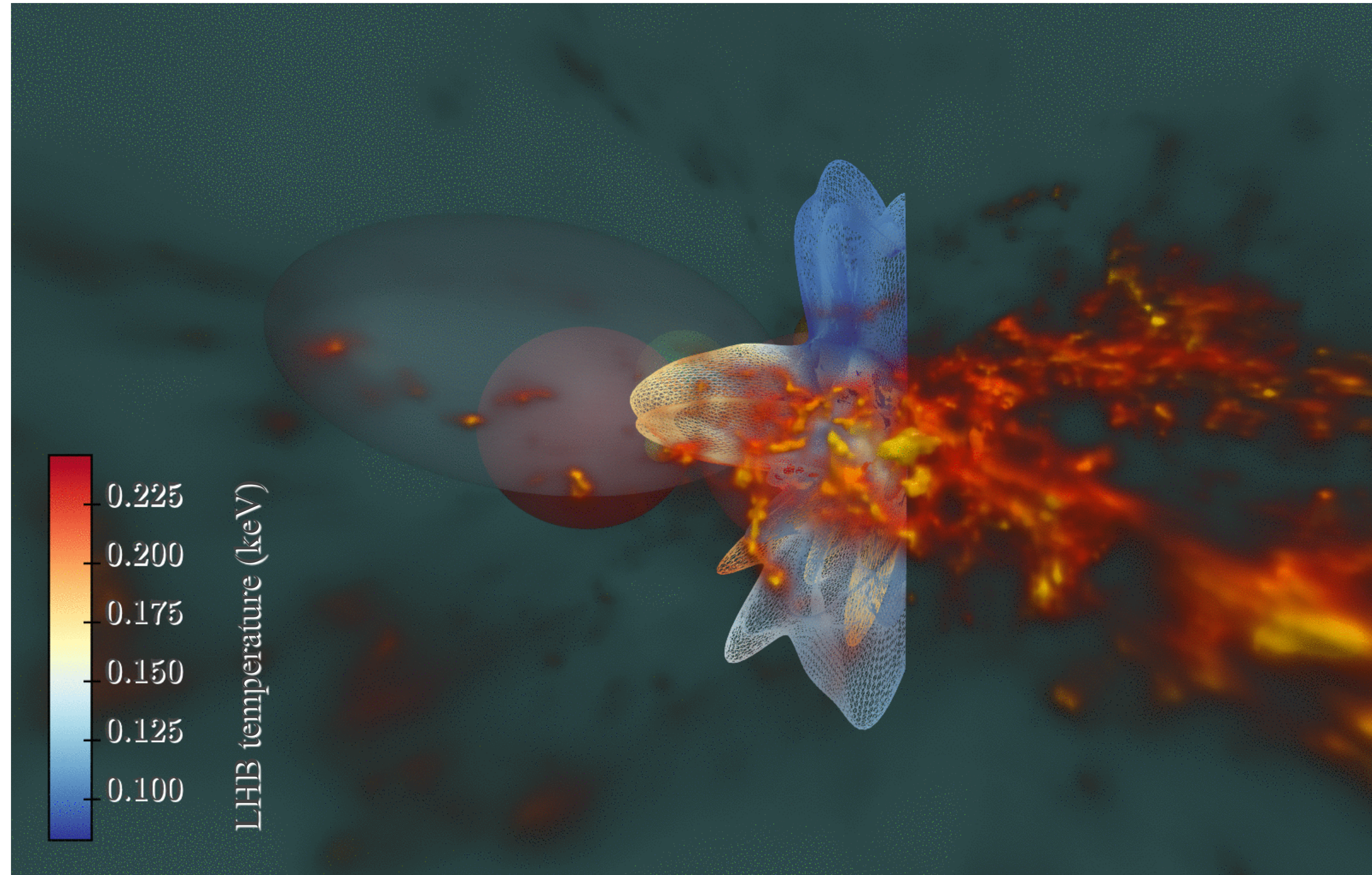
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- Spectral analysis of the diffuse X-ray background in eRASS1
- LHB:
 - North-south temperature dichotomy



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 - New 3D model



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- Spectral analysis of the diffuse X-ray background in eRASS1
- LHB:
 - North-south temperature dichotomy
 - New 3D model
 - Discovery of an interstellar tunnel in Centaurus

