NuSTAR Analysis Goal:
Check high energy N132D standard model

- Use twos epochs of NuSTAR data (~150-ks total)

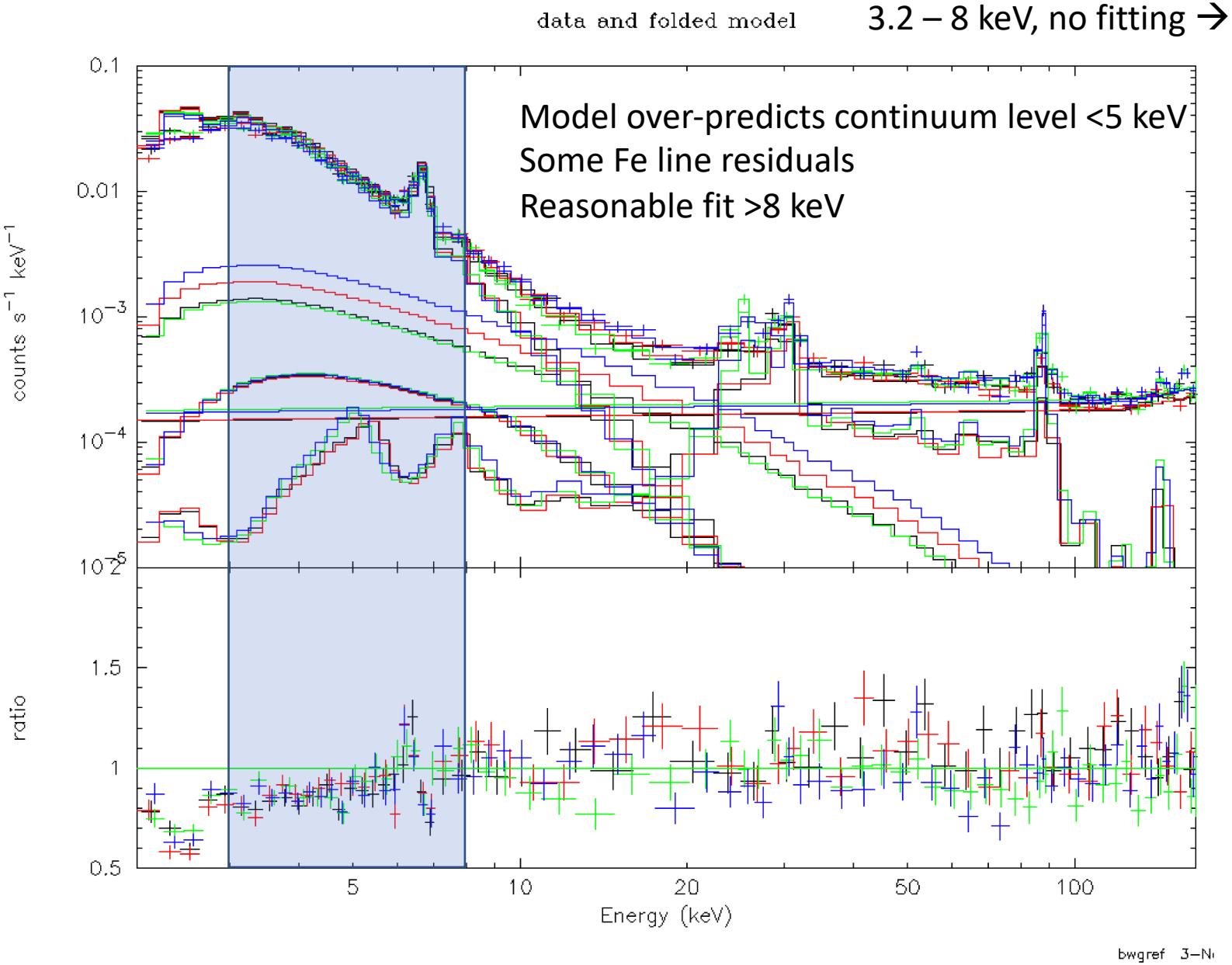
- Use background models fit for each epoch

- Use optimal binning and check v2.14 IACHEC model with:
  - 1.14 keV norm = 3.97e-2 (source:52)
  - 5.47 keV norm = 9.6e-4 (source:56)
  - Fe XXV norm = 3.21e-6 (source:434)

- Use latest NuSTAR CALDB release
  - → Includes effective area / vignetting / RMF updates

v2.14 model with consensus update

3.2 – 8 keV, no fitting → cstat/dof = 479.1 / 78



~10% difference in continuum strength

Mismatch in Fe line

Modifications

(or, How do we capture offsets between current soft X-ray effective areas and NuSTAR?)

- Option 1: Allow overall normalization to float

  → cstat / dof = 173 / 78

  - thaw source:1 → 0.88(1)

- Option 2: Allow both 1.14 keV norm and 5.47 keV norm to vary
  - cstat / dof = 136 / 75
  - 1.14 keV norm → 3.0(1)e-2 (was ~4, range was 3.4 tp 4.2)
  - 5.47 keV norm → 1.2(1)e-3 (was 0.96e-3, but range was 0.8 to 1.1)
  - Fe XXV norm → 2.6(2)e-6 (was 3.2e-6, range was 2.9 – 3.6)

Take Aways

- One large spectral shape discrepancy between NuSTAR and other missions
  - “Neutral Fe line” excess has been seen in other observatories (and in science papers)
  - Also need to allow redshift of lines → known shift ~10s of eV, so not enough to explain Fe line red tail.
  - More analysis need to firm up consensus on Fe region

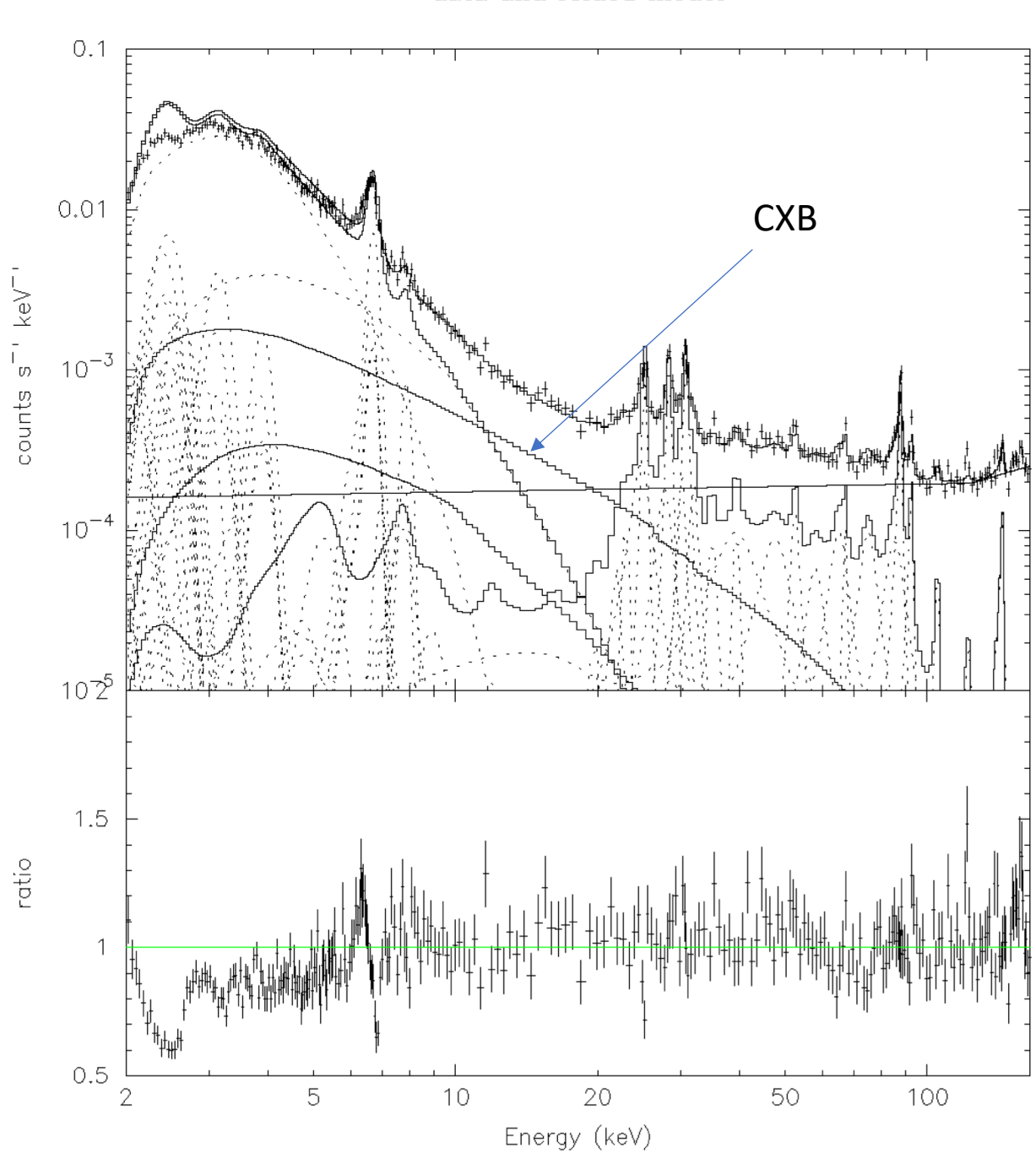
Take Aways

- Overall continuum normalization difference between NuSTAR and soft-Xray consensus model “in family” with expectations for difference between observatories (12%)
  - *for an “achromatic” correction

Take Aways

- However, main difference between NuSTAR/others is the relative strength of the 5.47 keV and 1.14 keV continuum components
  - NuSTAR wants 1.14 keV flux to be lower, 5.47 keV higher
  - **NB**: Actual shape of 5.47 keV component unknown, but difficult to constrain parameters
    - Has to be “hot” and can’t contribute much at low energies (so probably thermal?). But have work to do to figure out if this is 4, 5, 10 keV…
  - Did sims for NuSTAR Cycle 07, estimated ~1 Ms additional time probably required to constrain hot component (is it worth it?)

Backups


data and folded model
CXB
counts s⁻¹ keV⁻¹
ratio
Energy (keV)
0.1
0.01
10⁻³
10⁻⁴
10⁻⁵
1.5
1
0.5
2
5
10
20
50
100

Overview

- Reprocessed N132D with latest CALDB (gain, no effect for these)
- Used latest NuSTAR CALDB (VIGN update)
- No significant change vs base model (as expected)