The phenomenological XMM-Newton RGS model of N132D (Status report)

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Overview

- Motivation
- Data selection
- Modelling
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- Future planning

Motivation

Same as for 1 E0102.2-7219 campaign:

Define a “standard candle” spectrum for instrument/mission cross calibration without caring (too much) about physics.

1 E0102.2-7219:

+: Simple line spectrum thanks to absense of Iron.

±: Small size remnant.

-: Soft spectrum (E < 2 keV).

N132D:

+: Harder spectrum than 1 E0102-7219 (E < 8 keV).

±: Iron rich remnant: Lines over lines over lines…

-: More extended.

Data selection

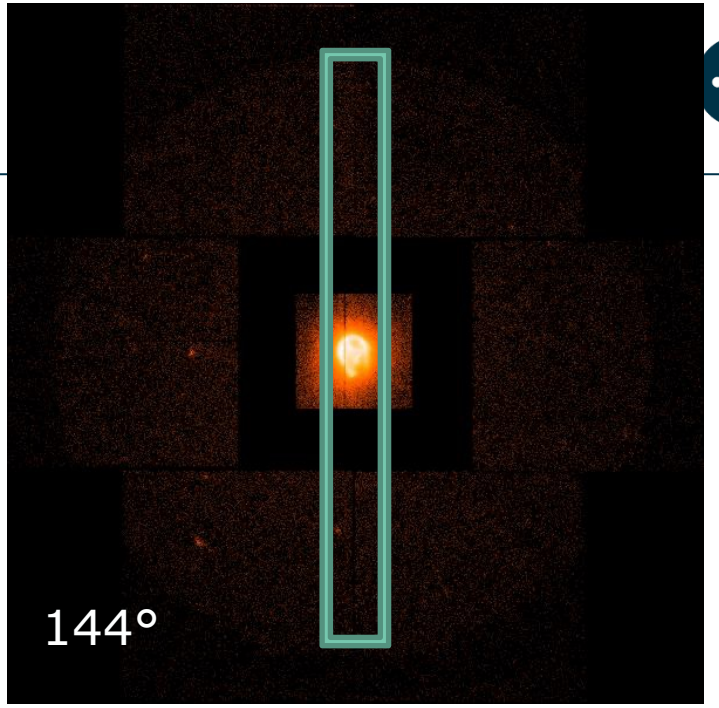
Two data sets of combined exposures:

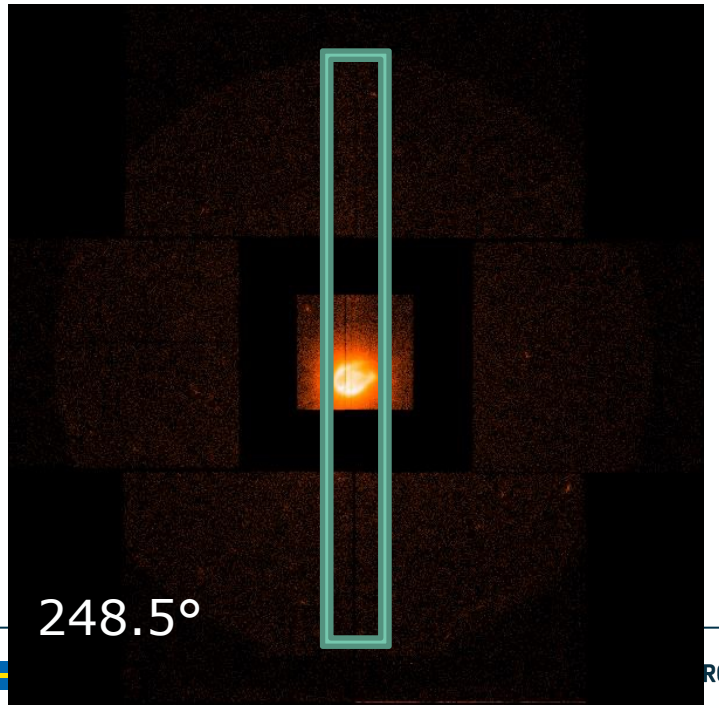
Data set one:

- 8 exposures between revs. 0535-0606 (ObsIDs 0157*).
- Boresight position: RGS1.
- Position angles increasing from 144 to 288 degrees.

Data set two:

- 8 exposures between revs. 1311-3149 (ObsIDS 041418*)
- Boresight position: EPIC-pn.
- Position angles: 6 x 247 + 2 x 248.5 degrees.





Modelling

First phenomenological model:

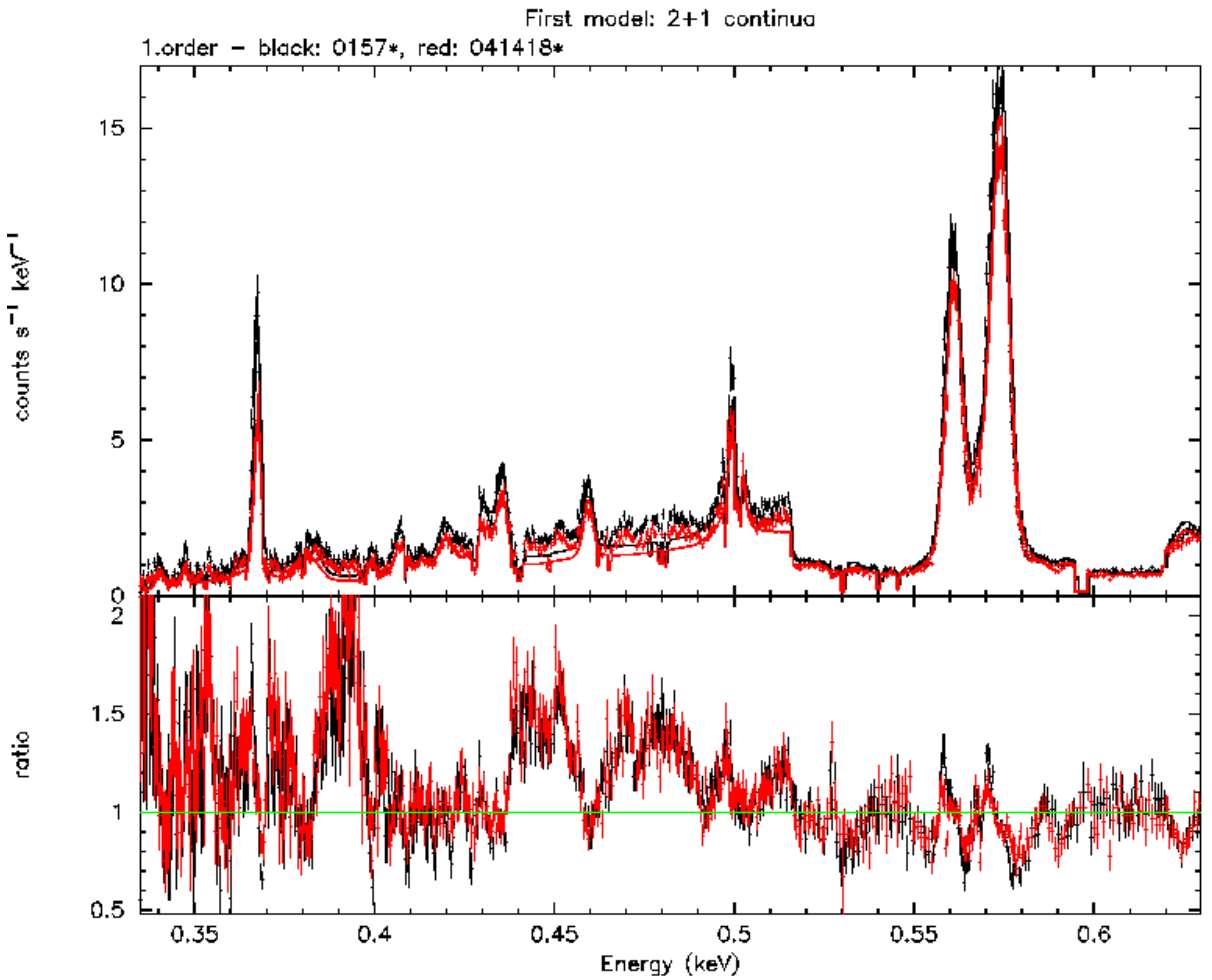
- Absorption: local (TBabs) and LMC (TBvarabs)
- Continua: 2 x nlapec for RGS + 1 x nlapec for high energies beyond RGS (E > 2 keV).
- Lines: until the residuals become flat.
- General normalisation constant.

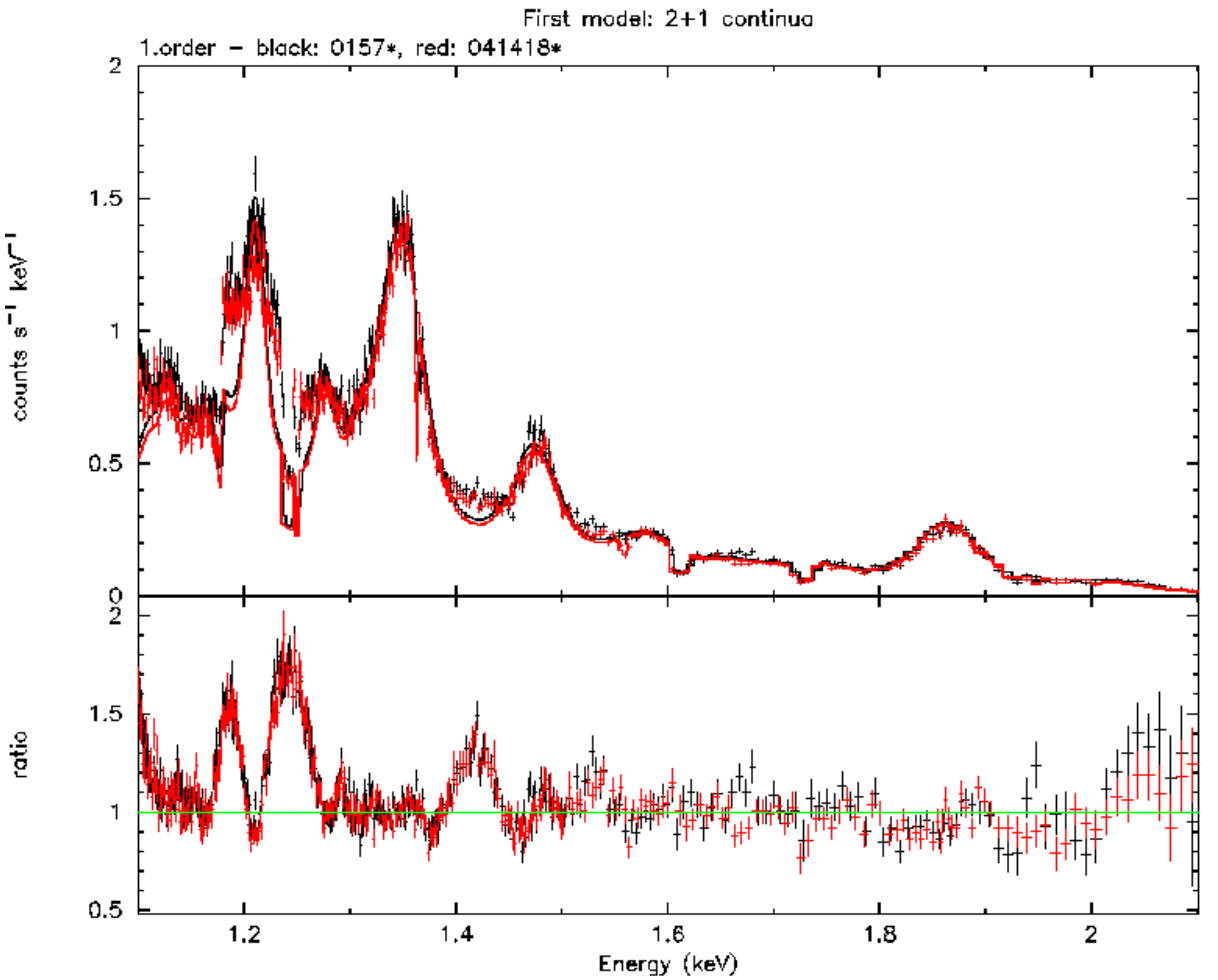
Methology:

- Absorption: taken from literature.
- Guess continua (slopes+normalisations).
- Define line widths per ion: find none/barely blended lines.
- Identify lines (2. order for E > 0.66 keV)
- Link line normalisations for reasonable energy bins to fit continua.

Never have reached this last point yet. Complex parameter linking can cause trouble.

Modelling


First model: 2+1 continua
1.order – black: 0157*, red: 041418*
counts s^{-1} keV^{-1}
ratio
Energy (keV)


First model: 2+1 continua
1.order – black: 0157*, red: 041418*
counts s^{-1} keV^{-1}
ratio
Energy (keV)

Modelling

Indeed somebody did the job caring for the physics:

Suzuki et al. 2020ApJ,900,39S:

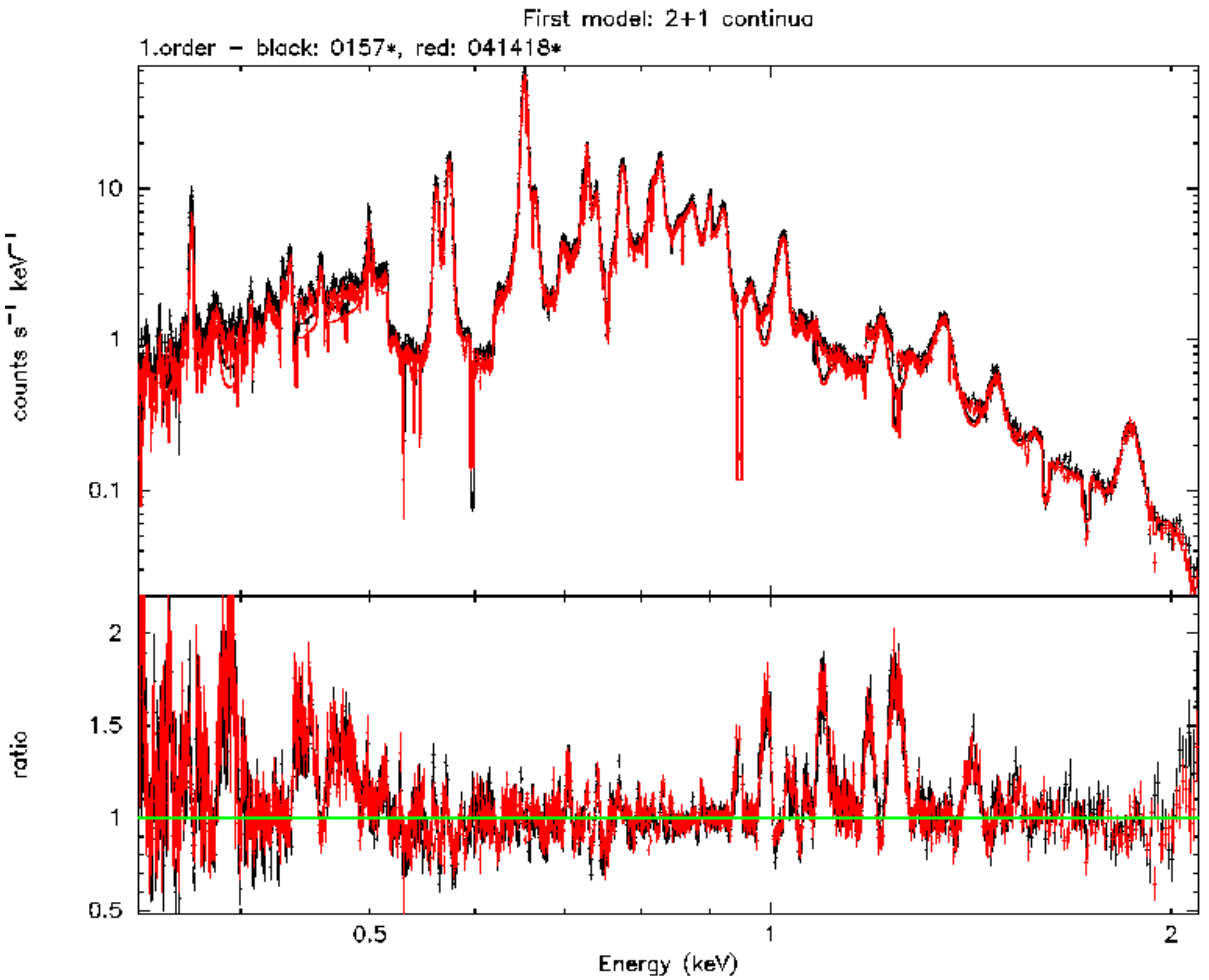
Plasma diagnostics of SNR N132D using deep XMM-Newton observations using RGS

Second phenomenological model:

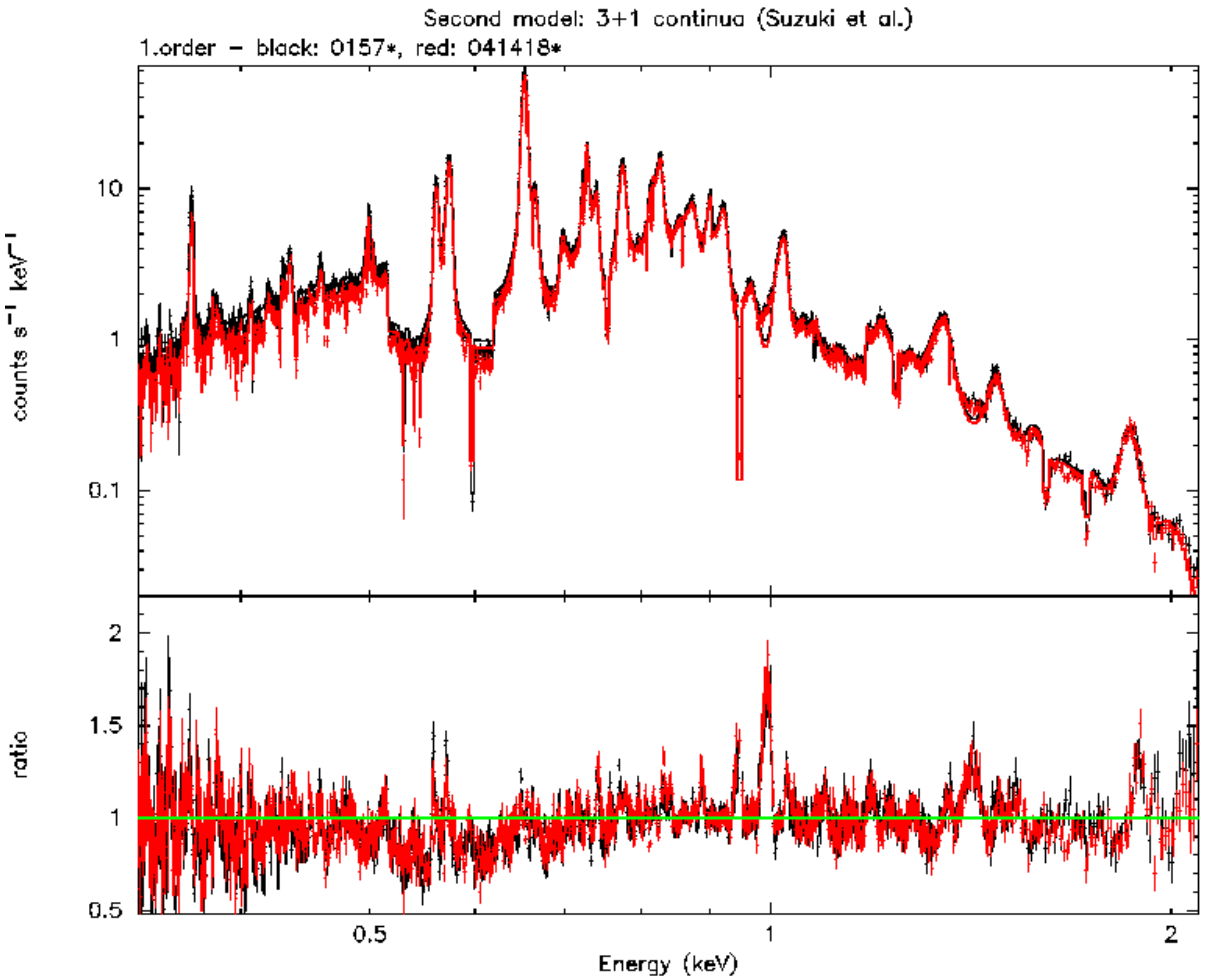
- Absorption: local (TBabs) and LMC (TBvarabs)
- Continua: 3 x nlapec for RGS (Suzuki et al.) + 1 x nlapec for high energies (E > 2 keV).
- Lines: until the residuals become flat (currently 105 lines within RGS band).
- General normalisation constant.

Modelling

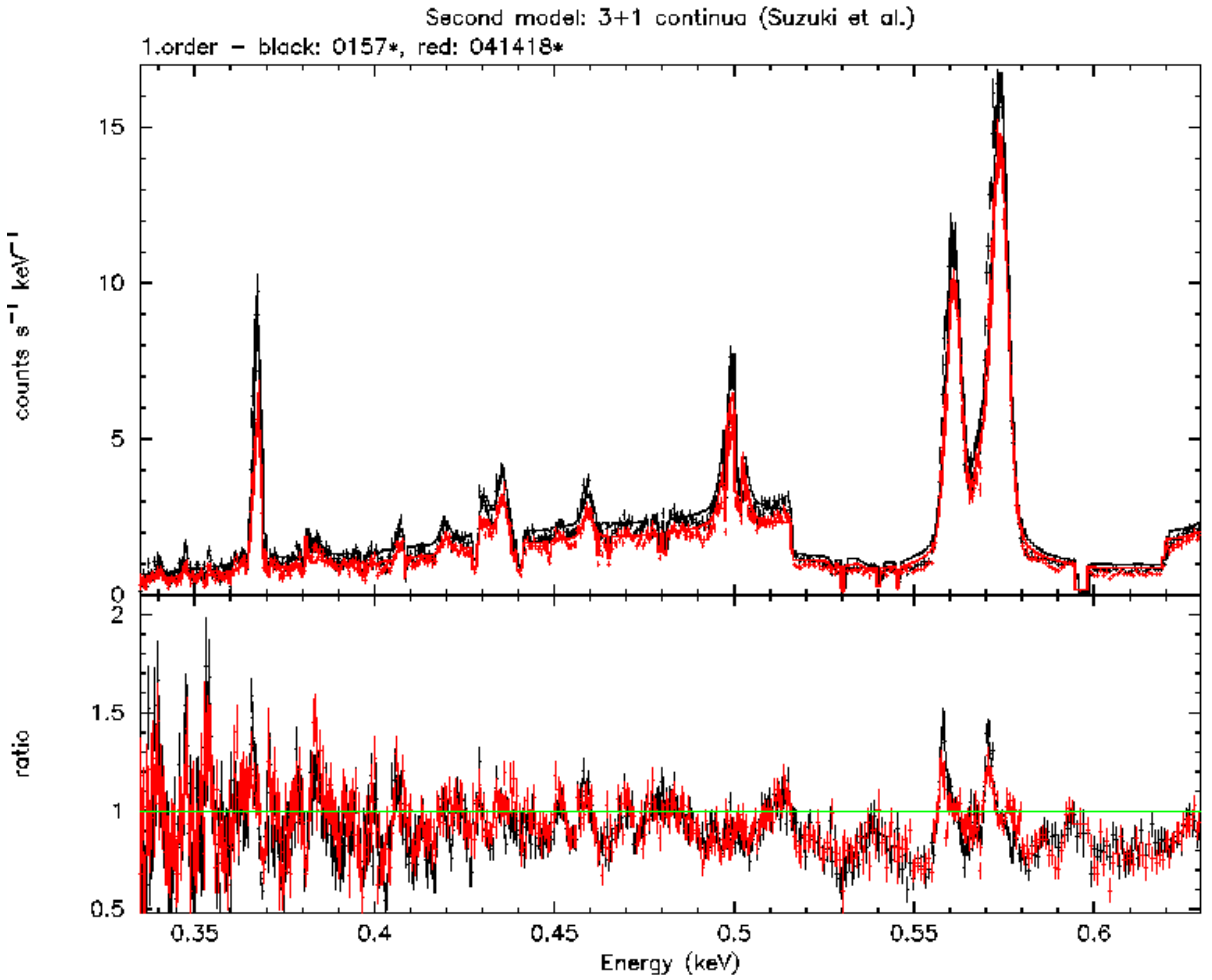
First model:

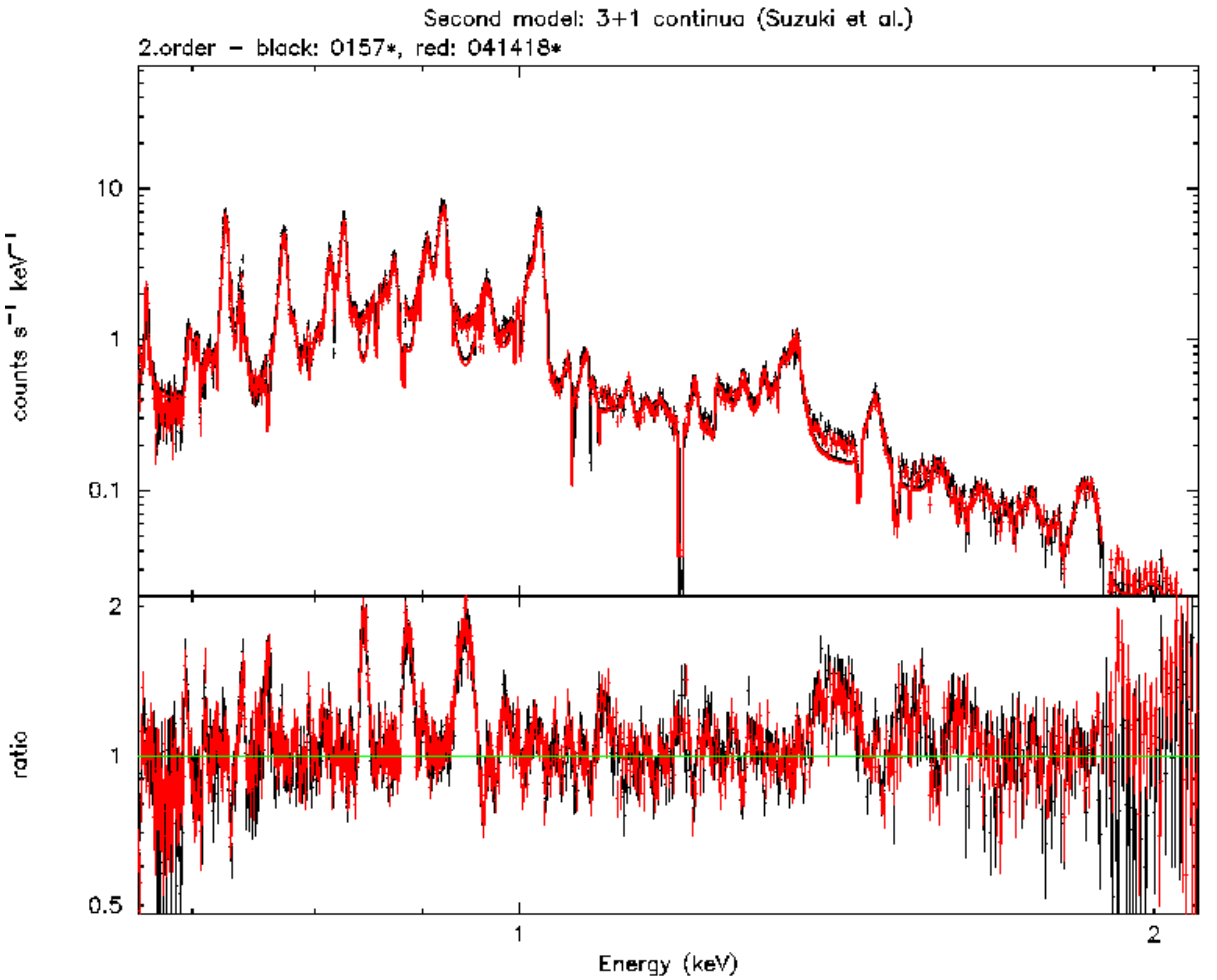


Second model: Suzuki et al. continua



Modelling


Second model: 3+1 continua (Suzuki et al.)
1.order – black: 0157*, red: 041418*
counts s^{-1} keV^{-1}
ratio
Energy (keV)


Second model: 3+1 continua (Suzuki et al.)
2.order – black: 0157*, red: 041418*
counts s^{-1} keV^{-1}
ratio
Energy (keV)

Modelling

Summary:

First model:

Continua are underestimated for E < O VII.

Good continua levels between O VII and O VIII (used for guess).

Continua are likely underestimated for E > Ne X.

Second model:

Continua are overrestimated for E < O VIII.

Continua are likely underestimated for E > O VIII.

Future planning

Continua:

- Review transferred Suzuki et al. values (normalisation conversions, rounding/precision, abundances).
- Fit with some TBD linked line normalisations.

Emision lines:

- Basic consistency check (especially Fe).

Documentation.

Also in the near future…

42 or Getting the final question

Solve with

Resolve@XRISM