Nicolas Cerardi

- 1st year PhD student at CEA DAp
- XXL Consortium, under the supervision of M.Pierre

XXL Northern Field (25deg2)
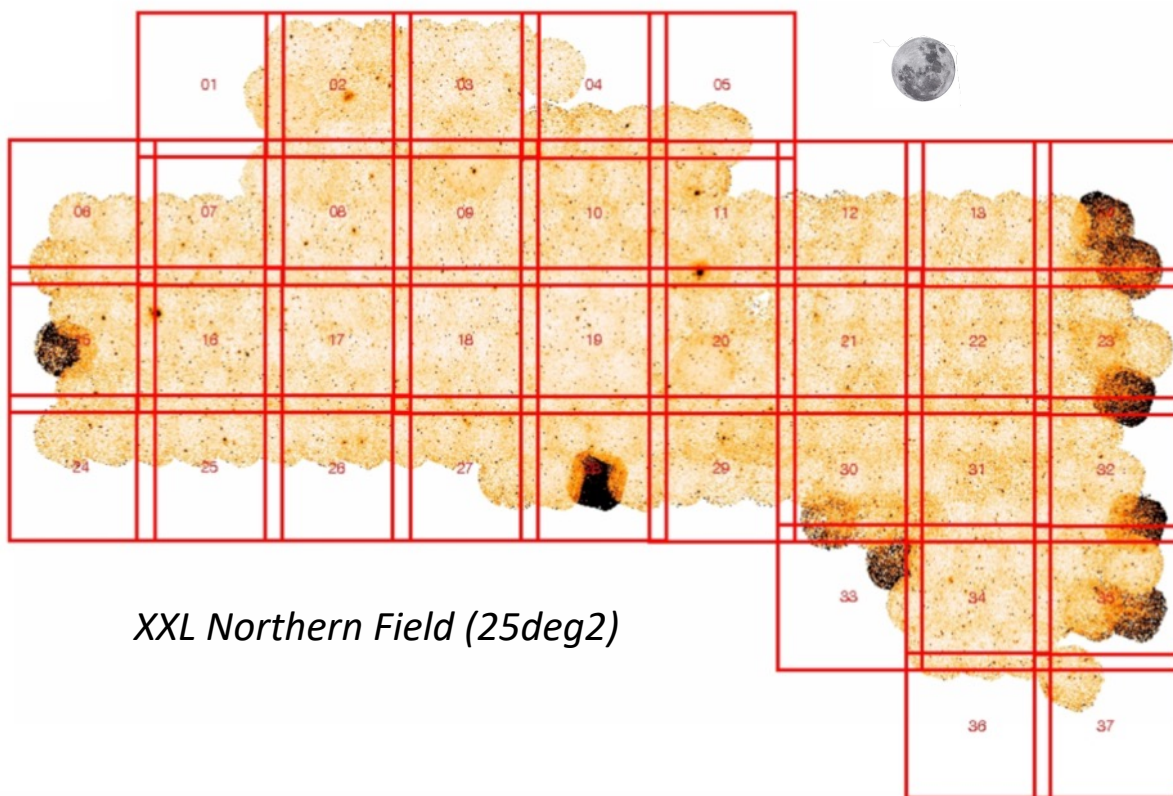
<u>Cosmological analysis of the XXL Cluster Sample</u>

Research includes
- Redshift measurement from NTT + VLT
- Forecasts for Athena
- Cosmological analysis
- Use of IA to
  - Generate X-ray fields from DM sims
  - Cosmological analysis with scaling laws parameters as nuisance parameters
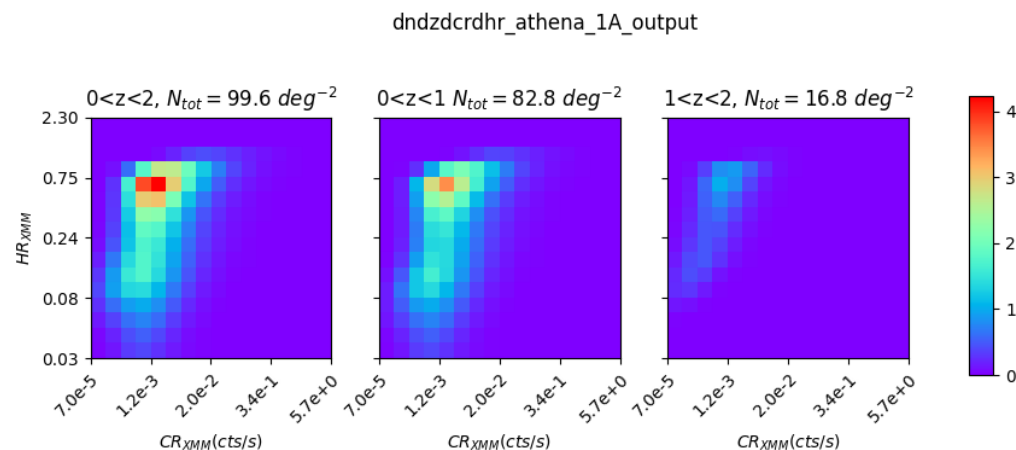
Cosmological analysis - principles

Cluster catalogue :

- 50 deg2 at 10ks depth with XMM Newton (7Ms)
- Sample of X-ray detected Clusters
    Up to z=1
    Down to a few 1e13Msol/h

Cosmological analysis

- Forward modelling of the cluster population
- Cosmological fit on Xray observables diagrams (Number counts)
- Dimensions : CR, HR, z

dndzdcrdhr_athena_1A_output

**= Coulour Magnitude diagram in Xray !**

avoids M estimation which is cosmo dependant
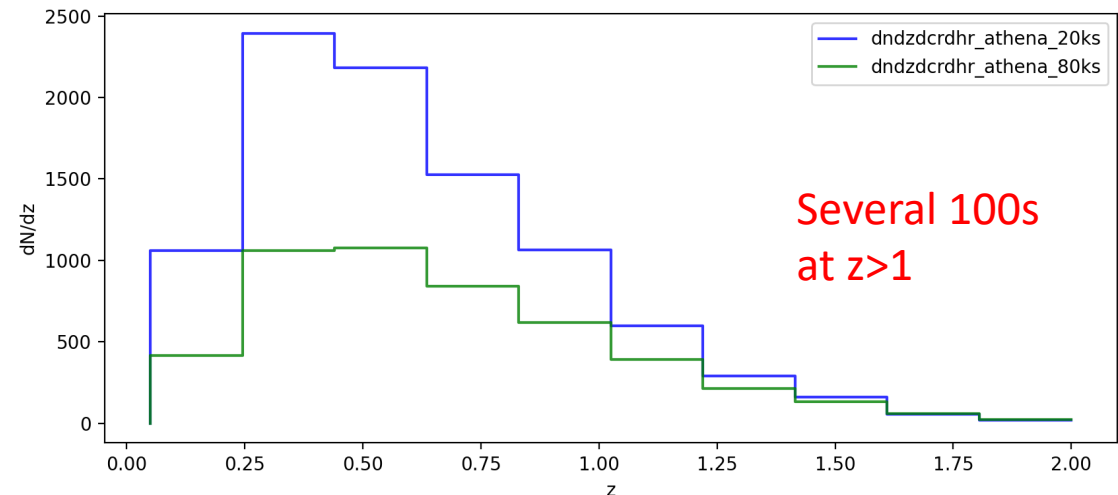
Athena related work

- Detect clusters in Athena/WFI AGN Survey

- 2 configurations
  - 50 deg2, 80ks
  - 200 deg2, 20ks

- Approximation of the selection function in M-z plane

Next step : Fisher analysis to provide cosmological forecasts

Mass detection limit in Mass – z plane

Number counts

Several 100s at z>1
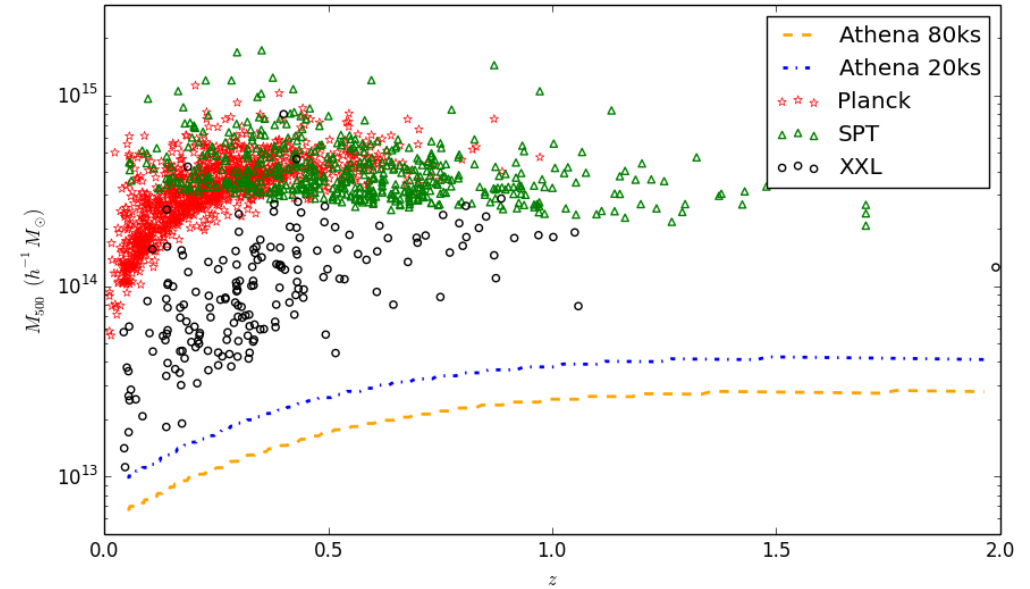
Asif Iqbal Ahangar
# Post-Doctoral Research Fellow
CEA Saclay

RESEARCH EXPERTISE

- Galaxy clusters

  - **Thermal properties of ICM**: Using X-ray data from XMM-Newton and Chandra

  - **Feedback in the ICM**: Comparing the thermal profiles from non-radiative simulations with the observations, Modeling the AGN feedback in the ICM using analytic models: Sound waves (Fabian 2004), effervescent heating (Ruszkowski & Begelman 2002)

- CMB Cosmology and Cluster cosmology

  - **CMB Power spectrum**: Understanding the Low CMB power anomaly in the Planck CMB

  - **SZ power spectrum**: Implication of Feedback on the SZ power spectrum which is important for robust cluster cosmology

Galaxy clusters

- Part of CHEX-MATE (originally called Heritage) collaboration with include a group more than 50 researchers with expertise in X-ray, lensing, radio, simulations

- CHEX-MATE project was awarded 3Ms of XMM-Newton observation time to study the sample 118 galaxy clusters in Planck SZ cluster catalog

- Currently developing the neural network technique to deproject the X-ray derived projected temperature and density radial profiles in CHEX-MATE collaboration **(CEA team: Iqbal, Pratt, Bobin)**

  - Neural networks are well adaptive constrain complex 2D maps and radial profiles; by changing the network topology it would be able to handle different level of complexity and non-linearity in the profiles.

  - This is crucial so as to make most use of hight quality data such as Athena
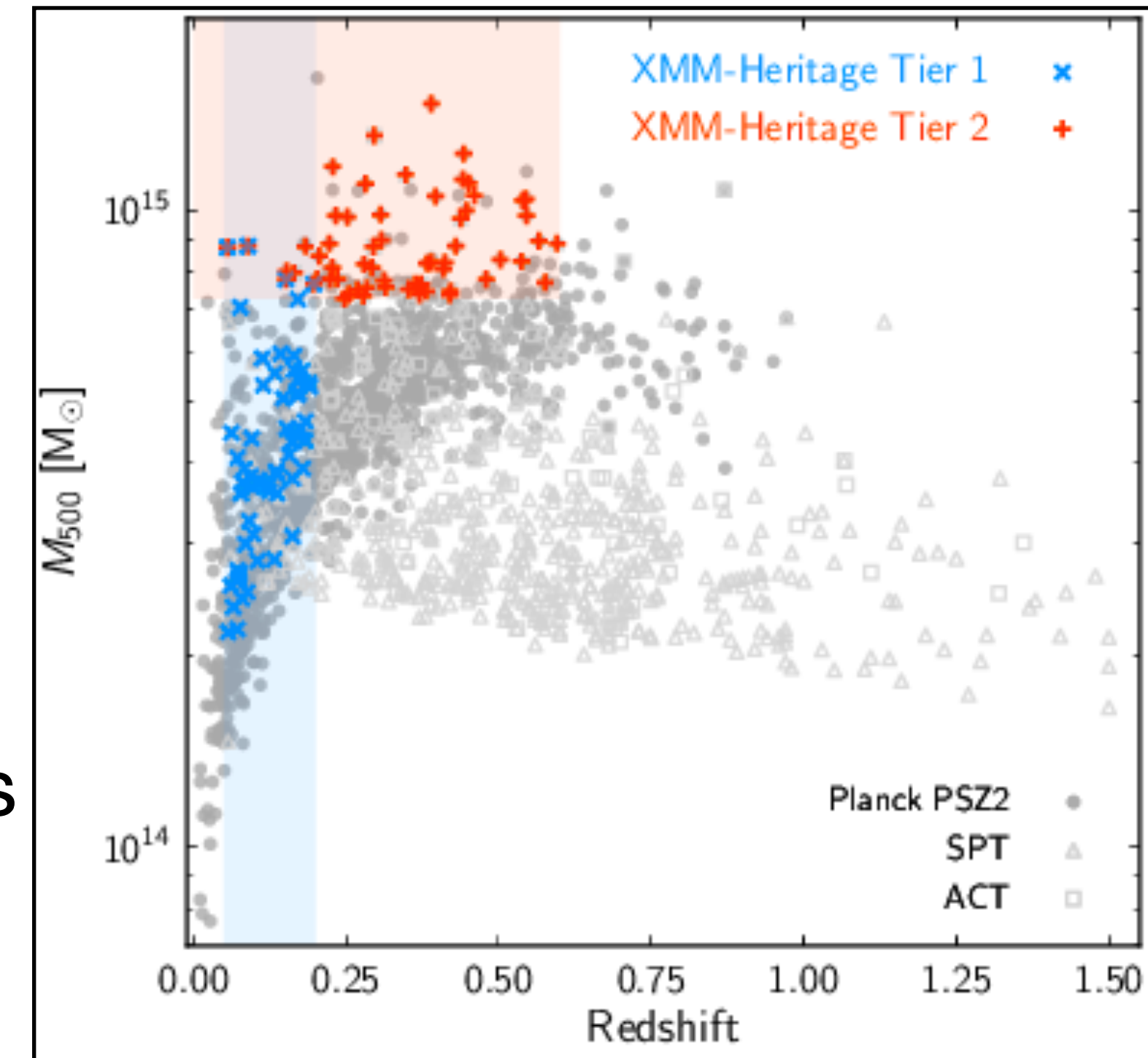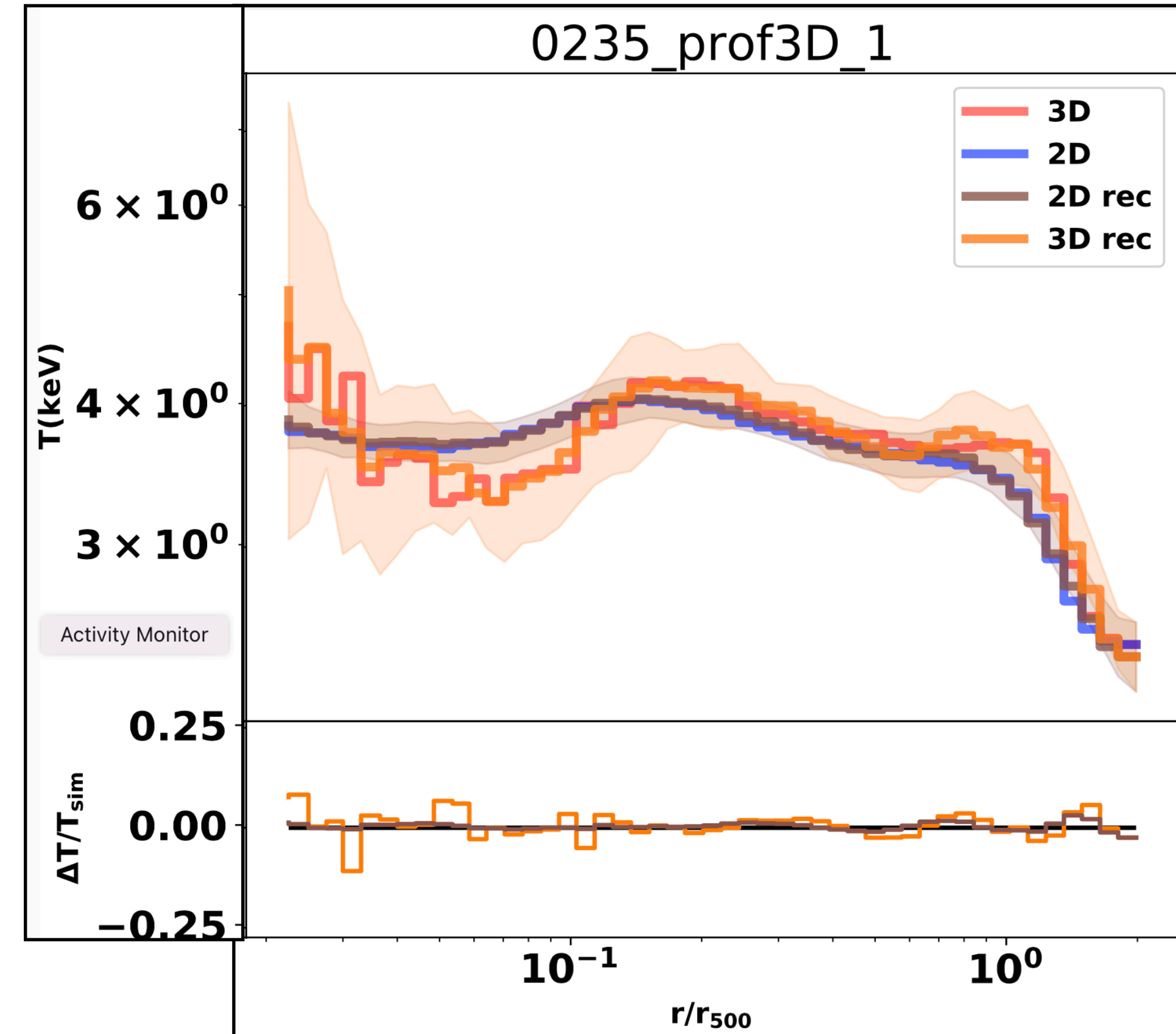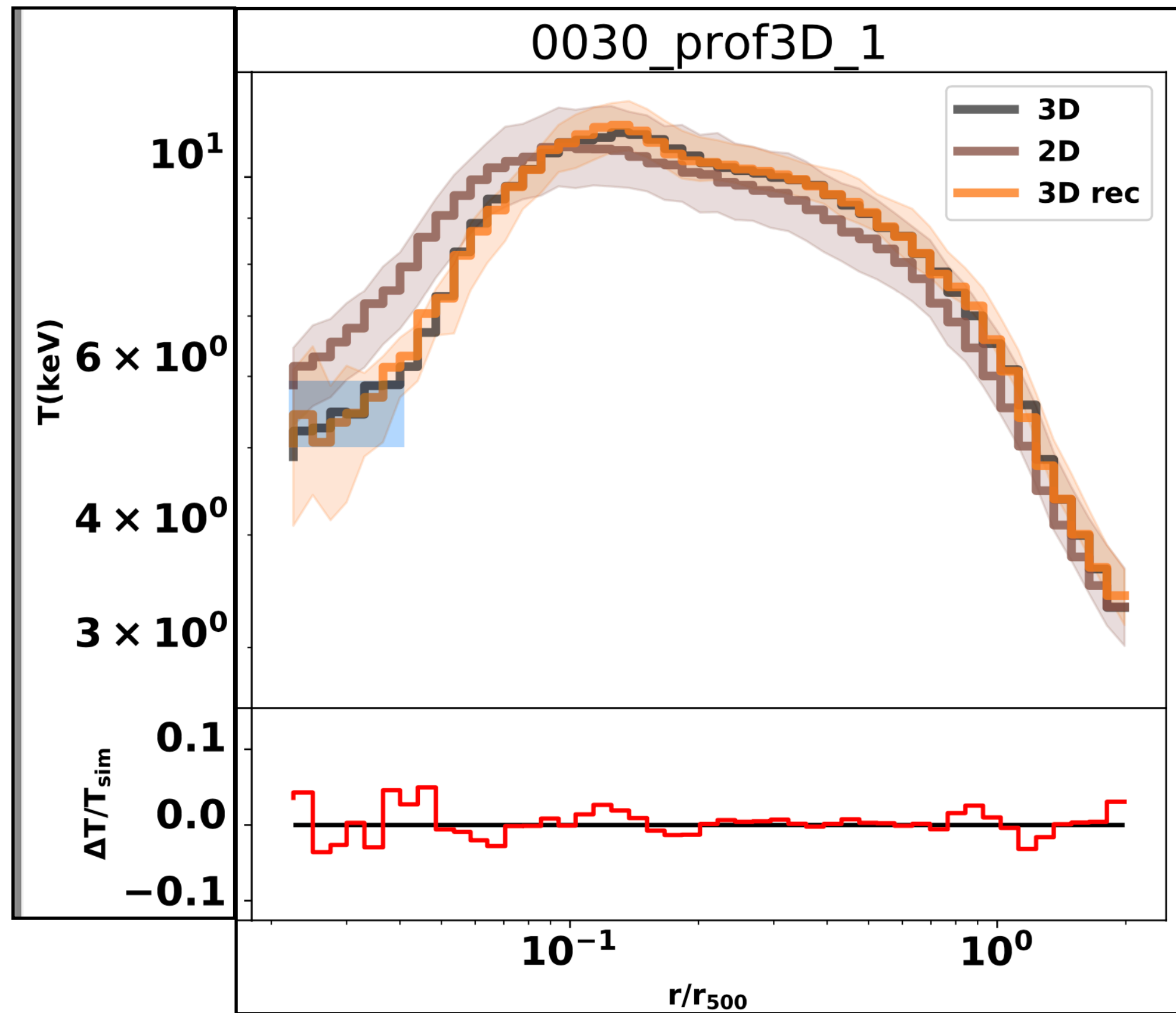

Tier-1: SNR>6.5, z=[0.05, 0.2]
Tier-2: SNR>6.5, z<0.6, M500>7.25e14

Some preliminary Neural Network model of True 3D temperature deconvolution from projected 2D profiles

- Built a temperature model using CNN using profiles from simulations
- Fit 2D Temperature profile with Noise (brown line) to CNN model
- Recovered 3D temperature profile (orange line)
- True 3D temperature profile (black line)