

Investigating galaxy cluster scaling relations for the eeHIFLUGCS sample

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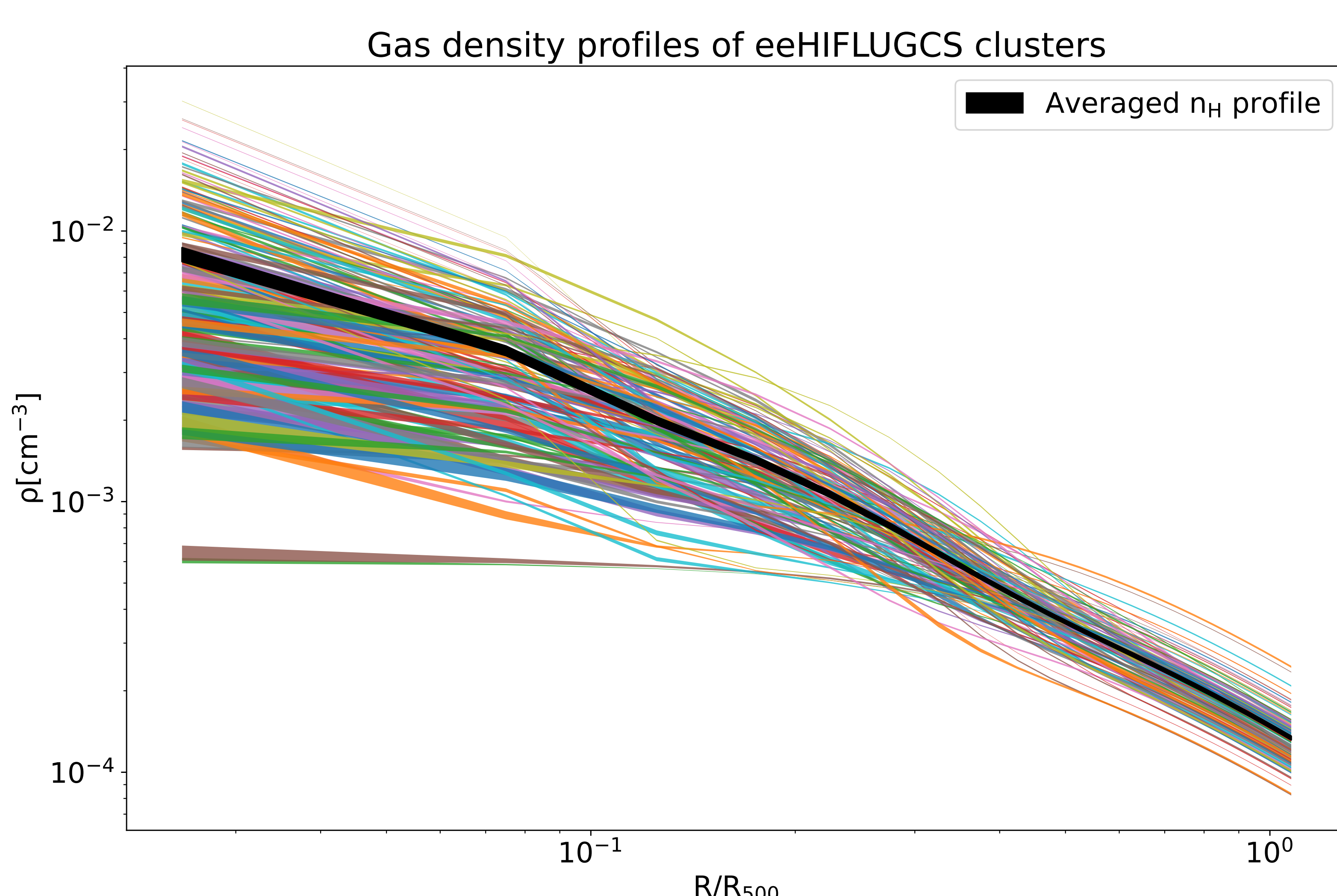
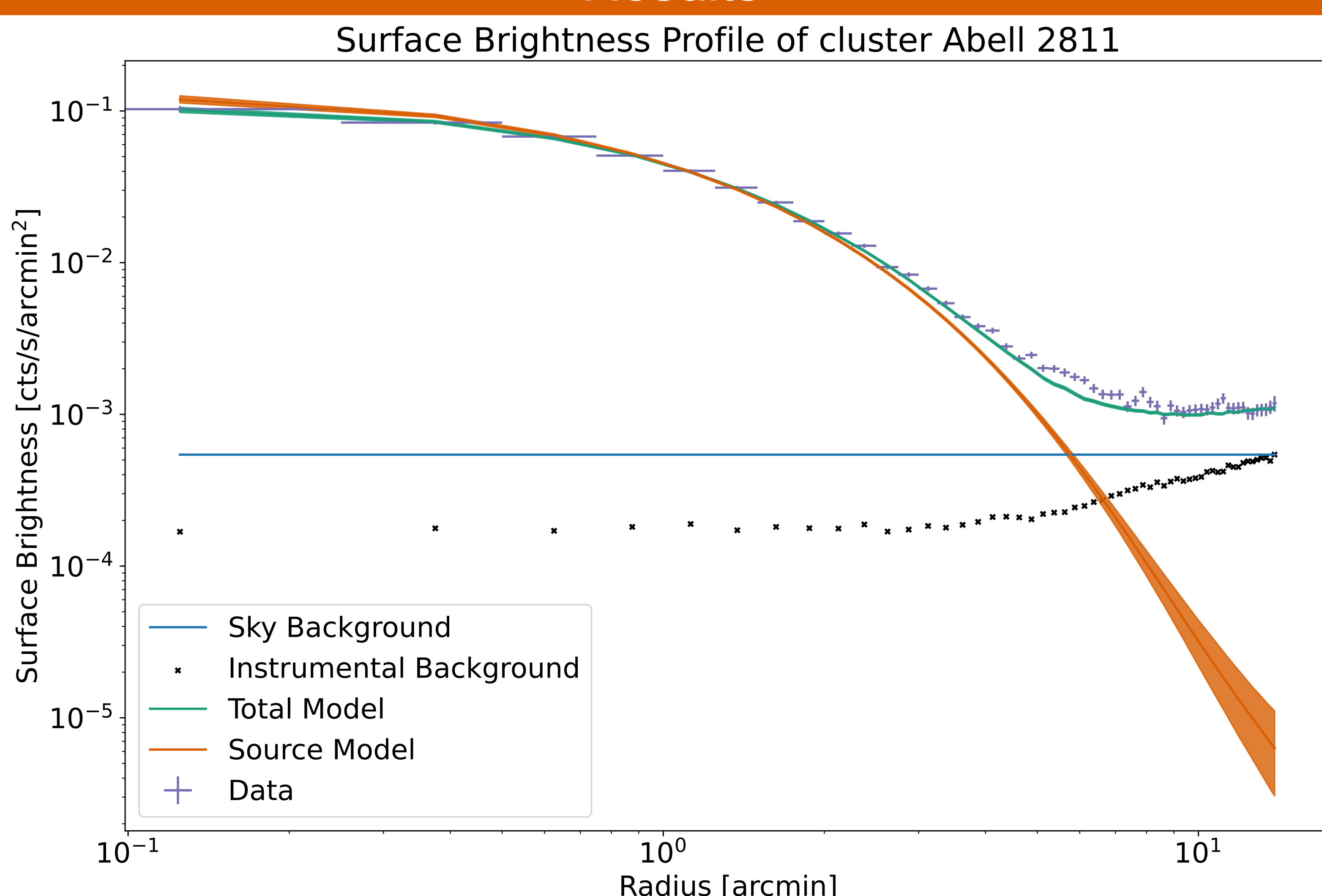
Introduction

- Scaling relations between cluster properties are powerful cosmological tools with numerous applications

Sample and Data

- eeHIFLUGCS: extremely expanded HIghest X-Ray FLUX Galaxy Cluster Sample^{1,2,3} contains the 387 brightest X-Ray clusters across the sky
- ~230 cleaned XMM-Newton images in (0.4-1.25)keV energy band were used as input
- Used X-Ray analysis code to obtain surface brightness profiles⁴
- Obtain 3D gas density and gas mass profiles using deprojection techniques
- Properties determined: R_{500} , M_{gas} , L_x , $R_{50\%}$, core included and core excised ($0.15R_{500}$ - R_{500})
- $R_{50\%}$: the radius within which half of total X-Ray emission is detected

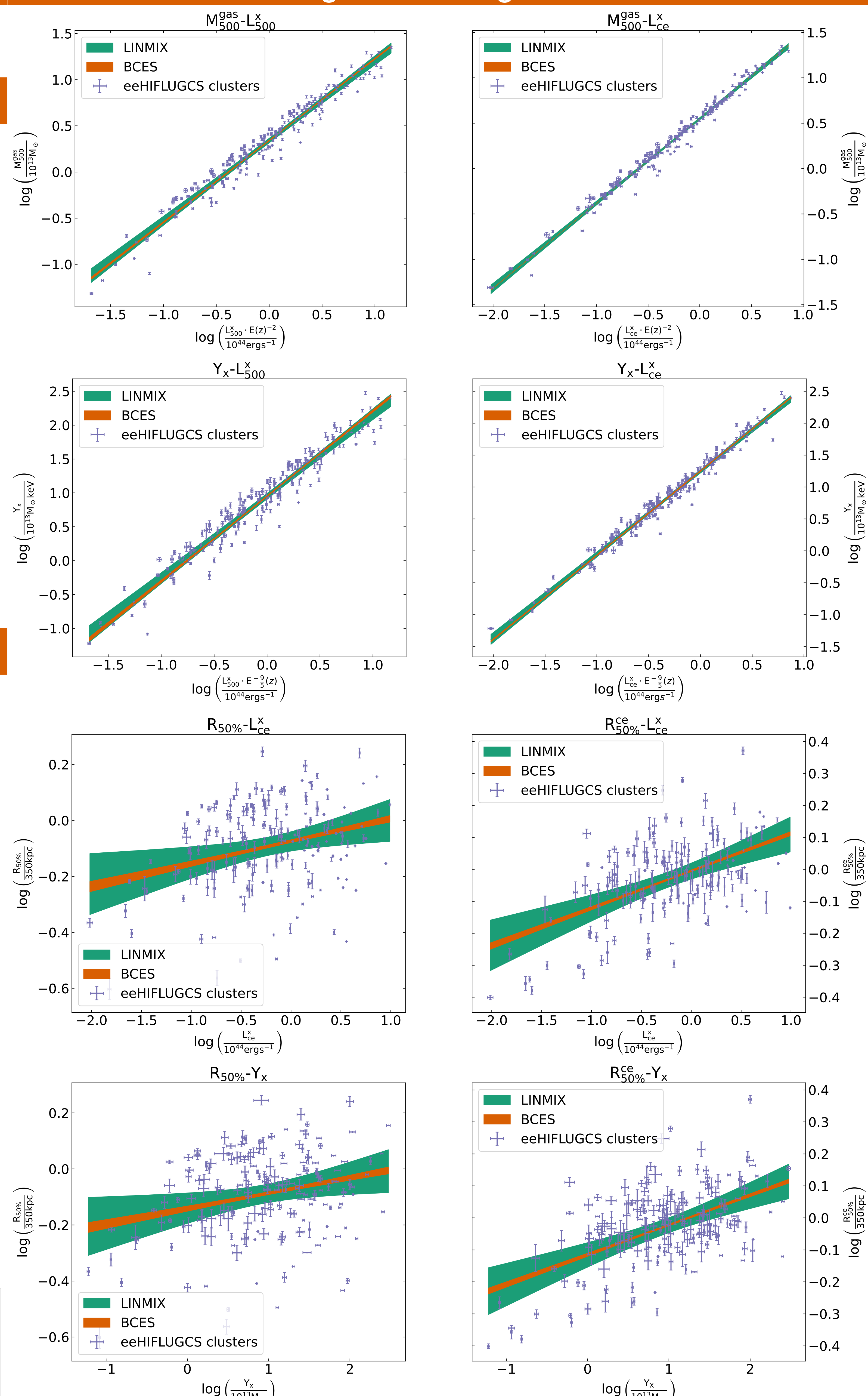
Results



Scaling relations

- Assumed self similar redshift evolution
- Linear regression with BCES(Frequentist)^{6,5} and LINMIX(Bayesian)^{7,8} methods
- Example slope and intrinsic scatter(Y direction) results:
- $M_{\text{gas}}-L_x$: slope= 0.885 ± 0.017 , $\sigma_{\text{intr}} = 0.110$
- $M_{\text{gas}}-L_{x(\text{core excised})}$: slope= 0.934 ± 0.009 , $\sigma_{\text{intr}} = 0.066$

Plotting the scaling relations



Conclusions

- Scaling relations with core excised properties have smaller intrinsic scatter
- Single power law in about 3 orders of magnitude for L_x-M_{gas} , L_x-Y_x , both core included and core excised relations
- Usage of XMM-Newton data is crucial, because it allows precise determination of several cluster properties

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