The Planck Cluster G287.0+32.9

Eduardo Cypriano (IAG/USP – Brazil; eduardo.cypriano@iag.usp.br**)**

Gastão B. Lima Neto (IAG/USP) , Joydeep Bagchi (IUCAA – India), Florence Durret (IAP – France) & Eric Jullo (OAM – France)

Introduction

- PLCK G287 was discovered via the S-Z effect (Planck Collaboration et al. 2011)
  - It is the highest S/N cluster of the Planck catalogue.
  - X-Rays (XMM): T~ 12-13 keV – Extremely hot
- Bagchi et al. (2011)
  - Radio: Discovery of a double radio relic. Characteristic of merging systems
- Gruen et al. (2014)
  - Weak Lensing: $M_{200m} = 37 \times 10^{14}\ M_\odot$ – Extremely massive
  - Detection of gravitational arcs up to ~1 armin. from the centre.

Main goals

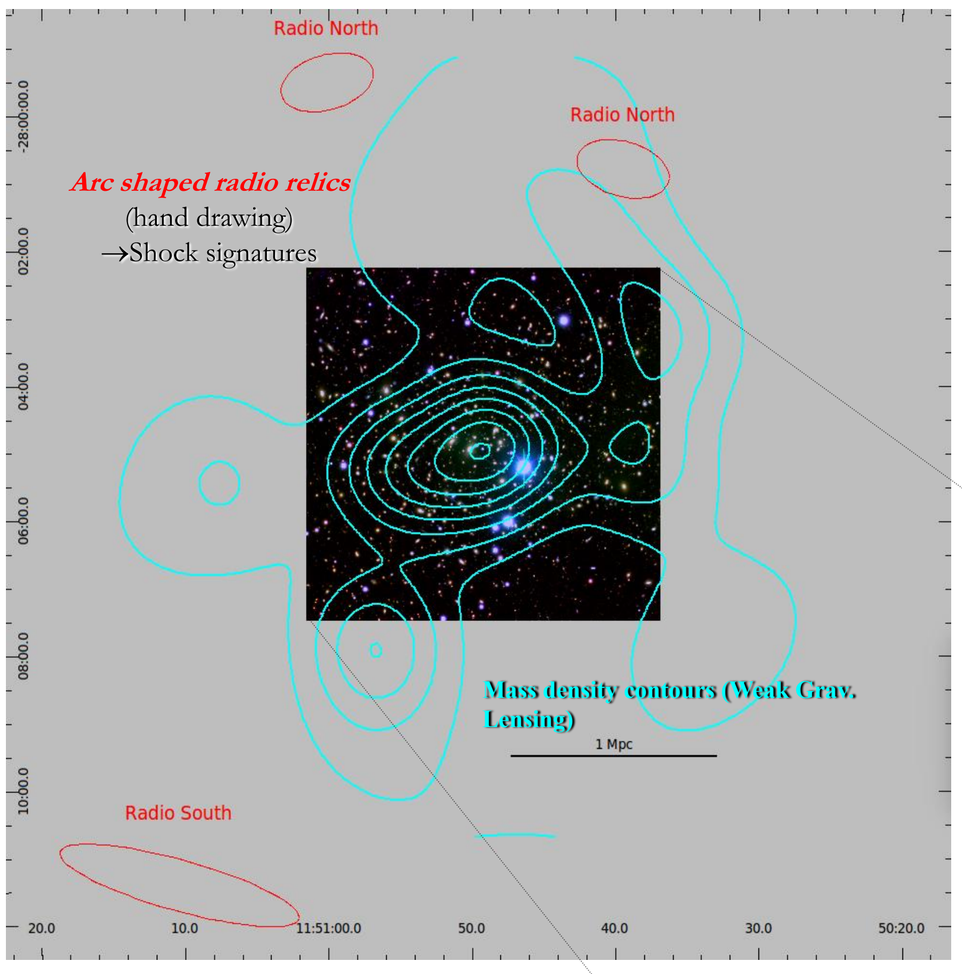
- Confirm whether or not this is one of the most massive clusters of the Universe.
- Search for evidence for recent mergers that could have produced the radio relics.

GMOS/Gemini data

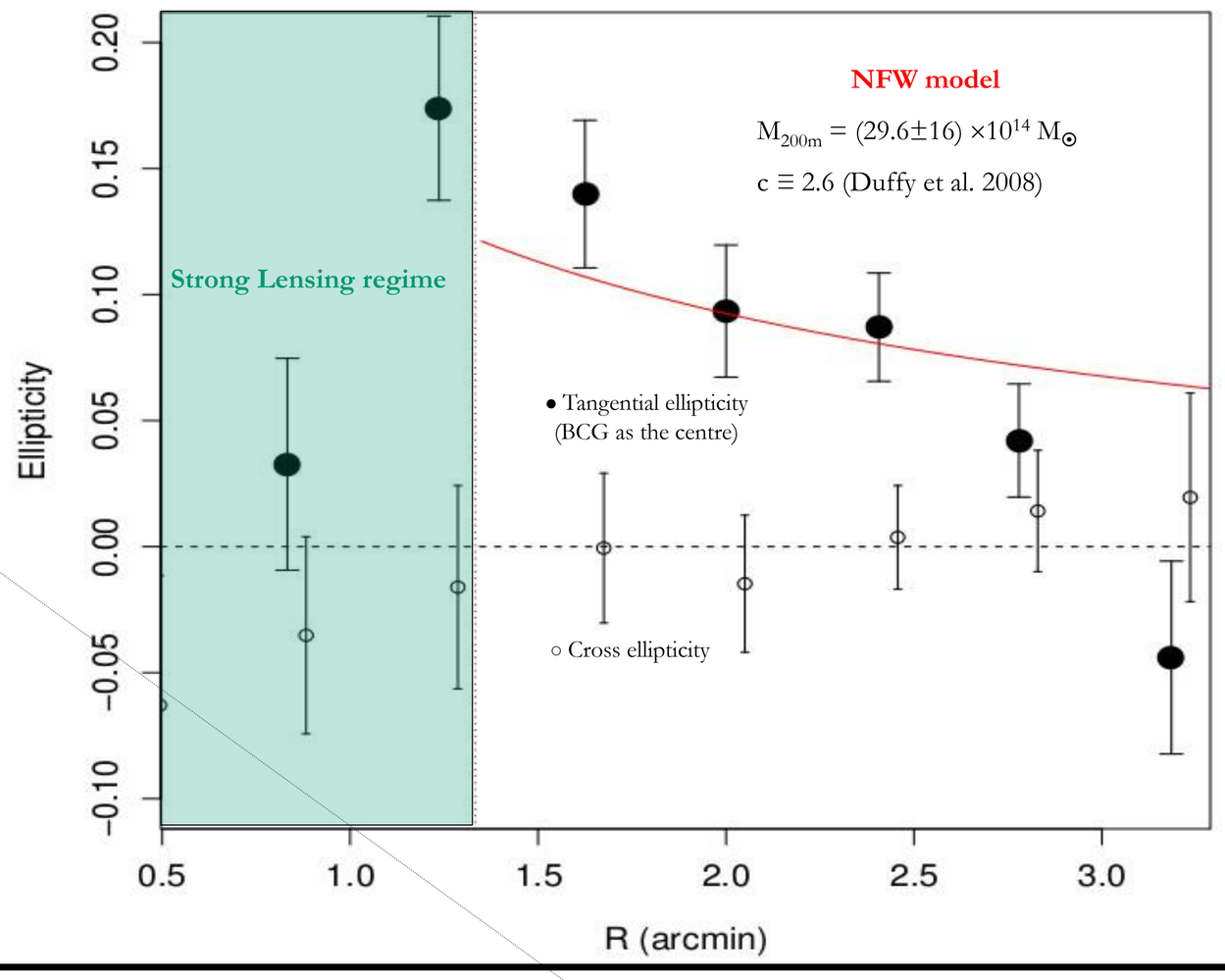
- Imaging
  - Lensing: *r*-band; Seeing 0.6"; Exposure: 1.0h
  - → background galaxy density ~38 gal. arcsec^{-2}
  - Photometry: *g*, *r* & *i*; bands Exposure: 1.3, 2.0, 0.6h
- Multi-objects spectroscopy
  - Grism: R400; Slit width: 1" → $\Delta\lambda$~8Å
  - Three slit masks; Exposures: 0.75, 1.0, 1.0h
  - Target selection from *gri* photometry – Red-sequence galaxies.
  - 100 spectra → 93 *redshifts* → 83 (pre-)members

Weak Gravitational Lensing

Weak-Lensing κ-map (via LensEnt2; Marshall et al. 2002)



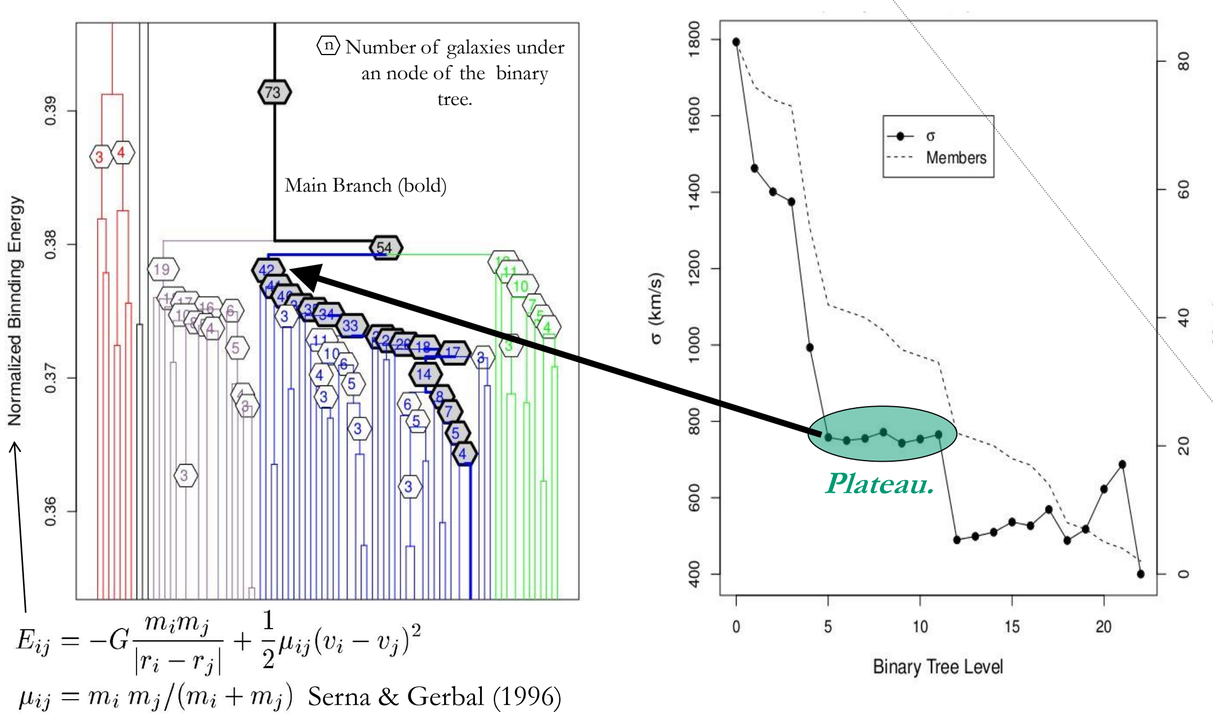
Shear Radial Profile



Dynamical Analysis

Hierarchical Clustering – Galaxy groups are connected two-by-two, following the minimum (projected) binding energy criteria between members. The process starts with single galaxy groups and ends when all galaxies are joined together..

Sub-structure Detection – The velocity dispersion is calculated for all galaxies under the nodes of the main branch (the branch with more galaxies) The main structure should form an isothermal *plateau*. The beginning of the *plateau* is where the tree should be cut (Serra & Diaferio 2013).

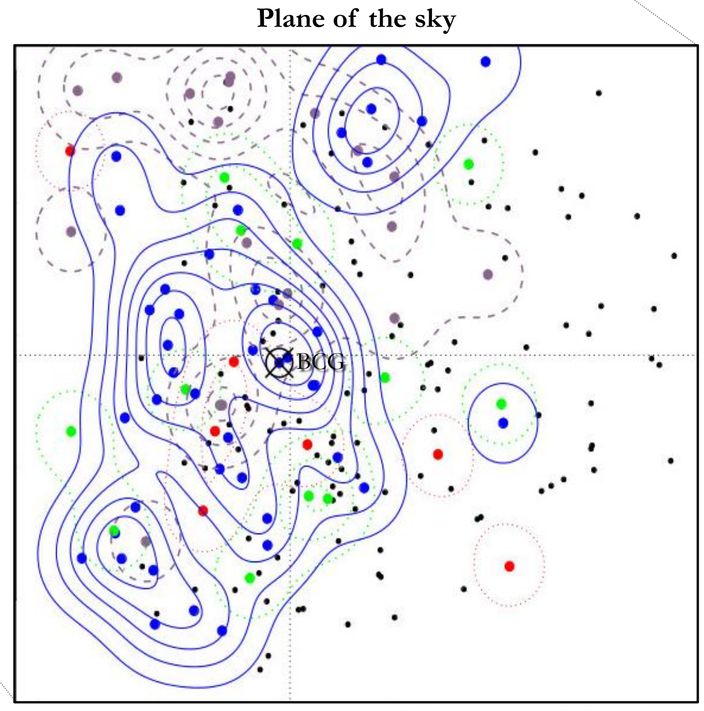


$$E_{ij} = -G\frac{m_i m_j}{|r_i - r_j|} + \frac{1}{2}\mu_{ij}(v_i - v_j)^2$$

$\mu_{ij} = m_i\, m_j/(m_i + m_j)$ Serna & Gerbal (1996)

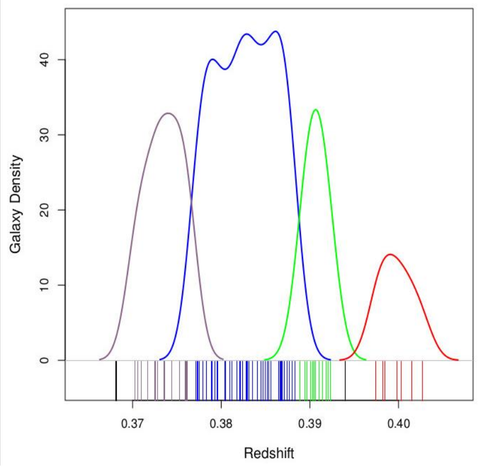
Dynamical Structures: main (blue) and sub-structures (other colours).

Plane of the sky



• Red-sequence galaxies without spectroscopic redshifts.

Velocity space



Preliminary results

- The weak-lensing mass is very high and consistent with previous results.
  - Spectroscopy of the gravitational arcs undergoing data reduction. This information plus strong lensing modeling should improve greatly the mass determination precision.
- In both mass (weak-lensing) and main galaxy density maps, there are hints of sub-structures in the SE-NW direction, which also links the arc shaped radio relics.
  - The existence of such structures reinforces the shock scenario for the formation of the relics.
  - In spite of all this complexity the BCG seems to be the actual center of mass.

References

- Bagchi et al. 2011, ApJ,736, 8
- Duffy et al. 2008, MNRAS, 390, 64
- Gruen et al. 2014, MNRAS, 442,1507
- Marshall et al. 2002, MNRAS, 335, 1037
- Planck Collaboration et al. 2011, A&A, 536, 8
- Serna & Gerbal 1996, A&A, 309, 65
- Serra & Diaferio 2013, ApJ, 768, 116

Support:

FAPESP

CNPq

Conselho Nacional de Desenvolvimento Científico e Tecnológico