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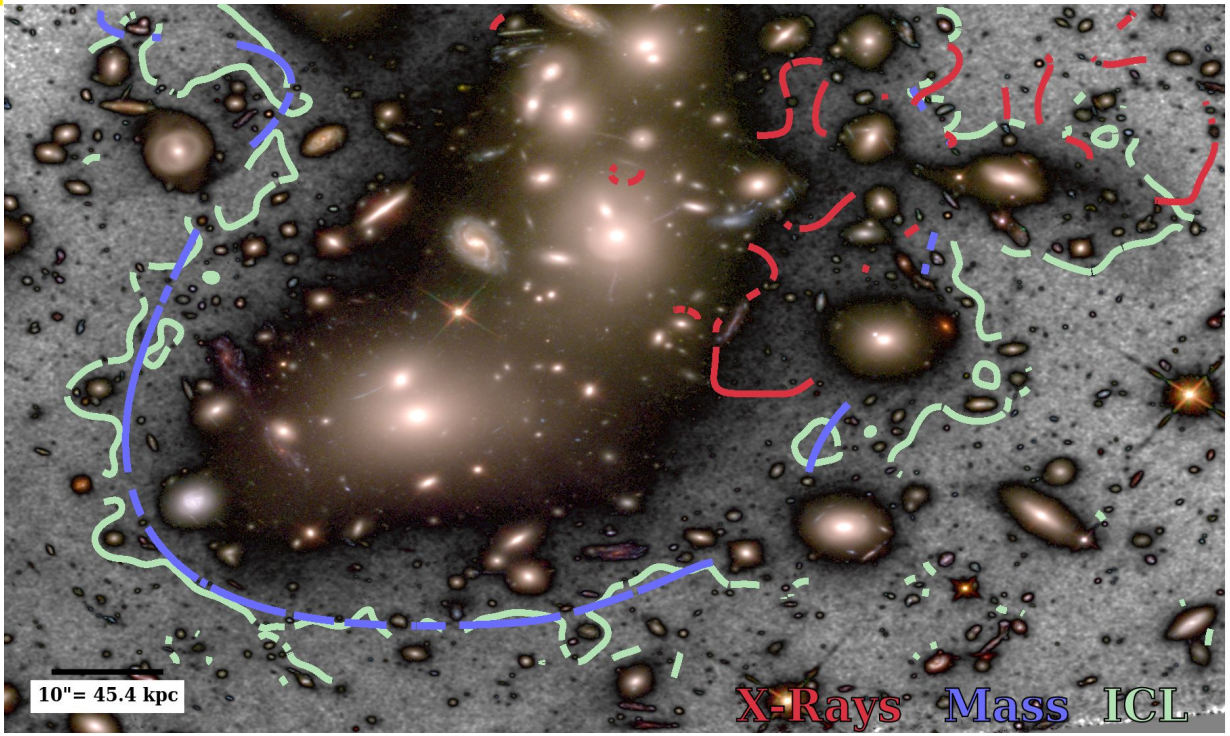
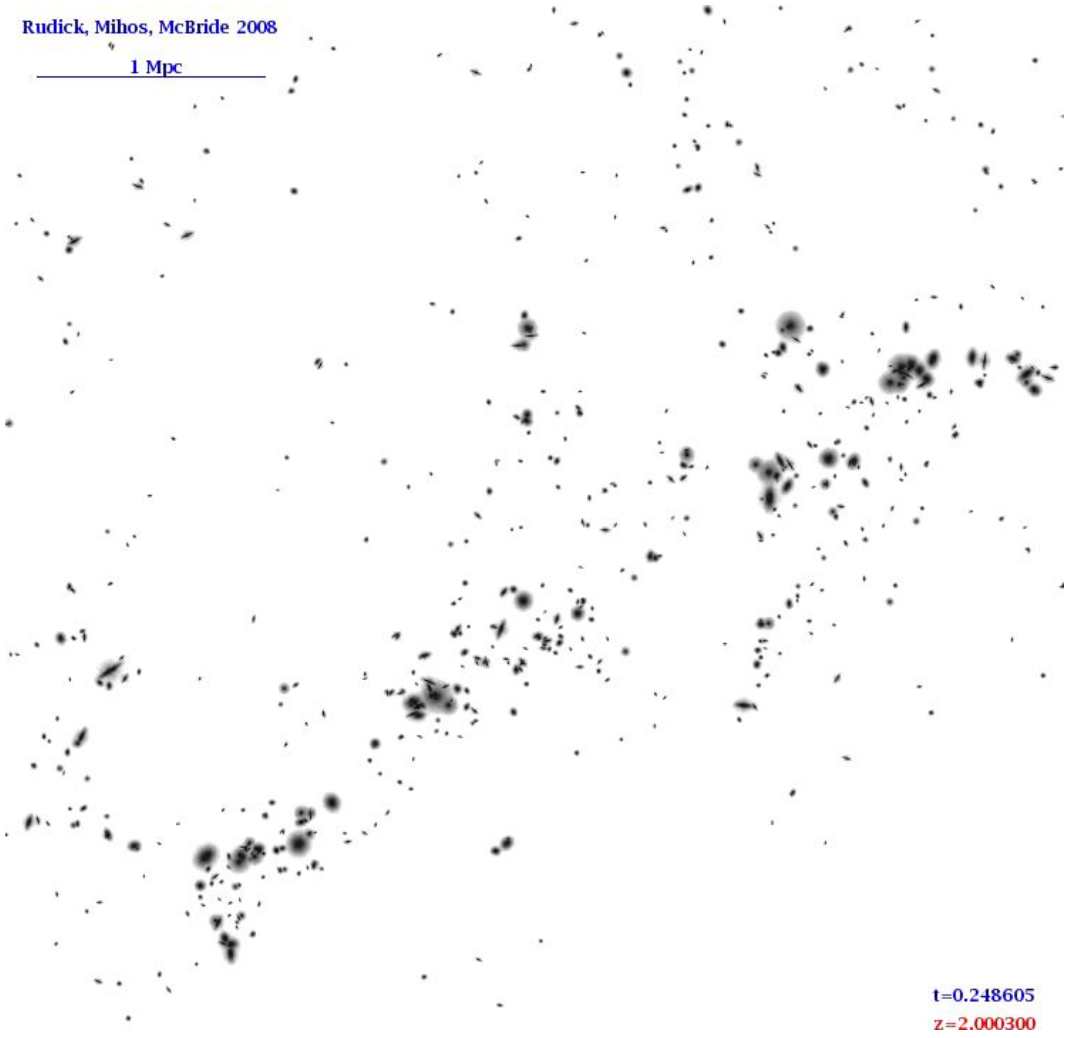
Intracluster Light (ICL) in LSST



Sarah Brough (ARC Future Fellow)
Mireia Montes

How does Intracluster Light form?



What have we observed so far?

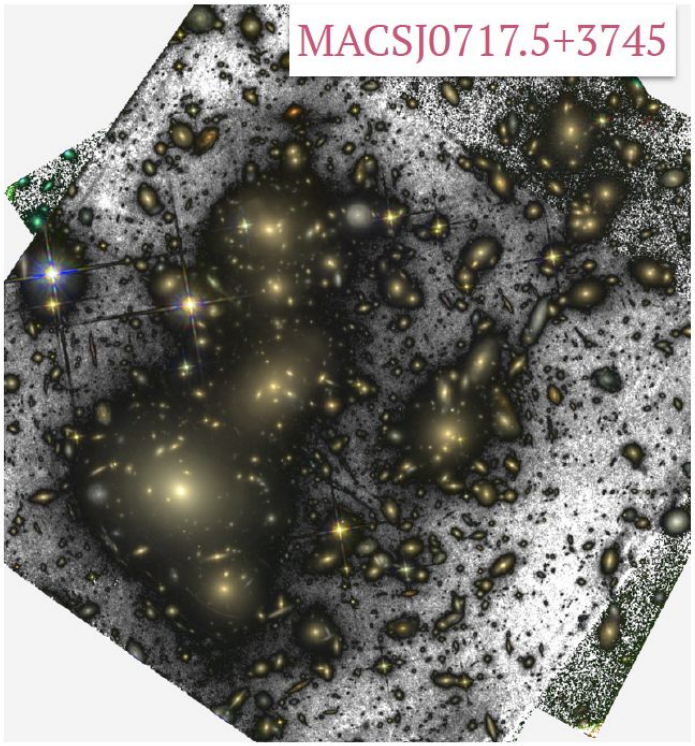
- Fraction of light: from 5 to 80% of total light (*no, really!*)
- Dramatic growth of the Intracluster Light since z = 0.5
- Correlation with cluster mass? Not clear
- Stellar populations: Not clear

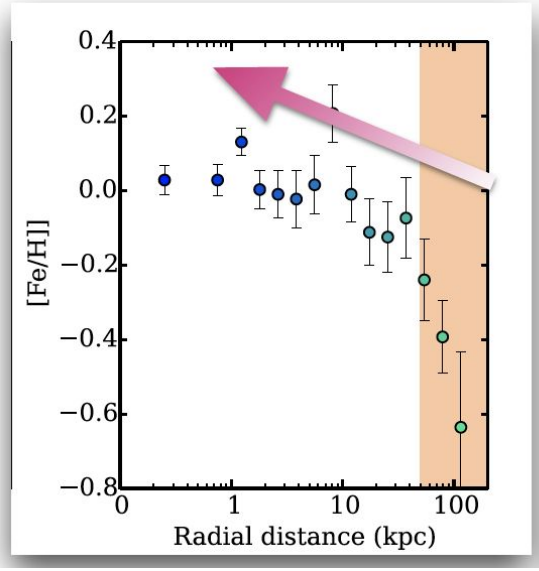
!VERY FEW SYSTEMS STUDIED TO DATE!

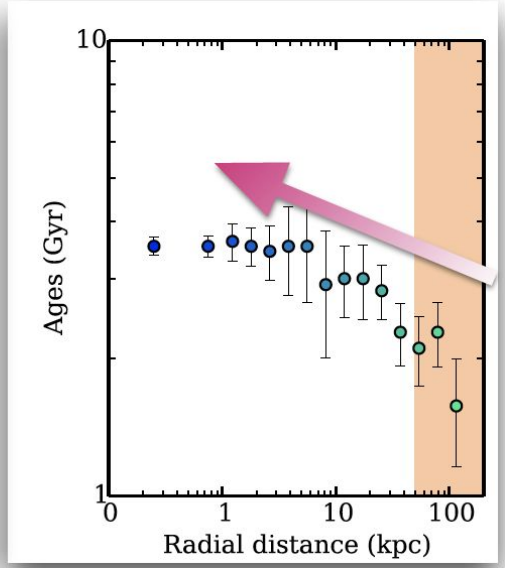
Gregg & West 1998, Feldmeier+2002, Lin & Mohr 2004, Mihos +2005, Zibetti+2005, Krick+2006, Krick & Bernstein 2007, Da Rocha+2008, Gonzalez, Zabludoff & Zaritsky 2005,2007, McGee & Balogh 2010, Toledo+2011, Adami+2012, Arnaboldi+2012, Burke +2012, Guennou+2012, Melnick+2012, Giallongo+2014, Presotto+2014, Montes & Trujillo 2014,2017, DeMaio +2015,2017, Burke+2015, Edwards+2016, Jiménez-Teja & Dupke 2016, Morishita+2017, Iodice+2017

Hubble Frontier Field (HFF) Clusters

6 clusters 0.3<z<0.7 (Montes & Trujillo 2014, 2017)







.5 to -0.3 => M = $10^{9.5}$ - 10^{10} M⊙

radient in the Intracluster Light

* 2-6 Gyr younger than the BCG(s)

* z<1

* ~2 Gyr MW-like galaxies

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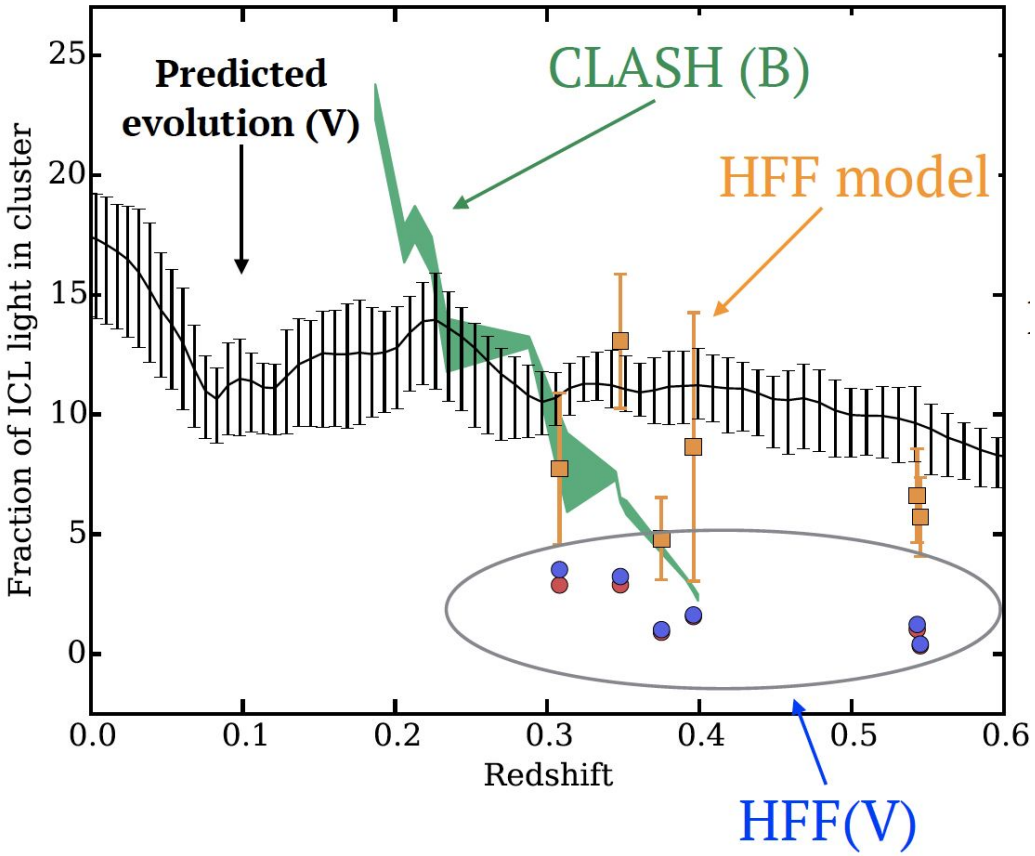
Fraction of Intracluster Light in Clusters



Burke et al 2015, Rudick et al. 2011

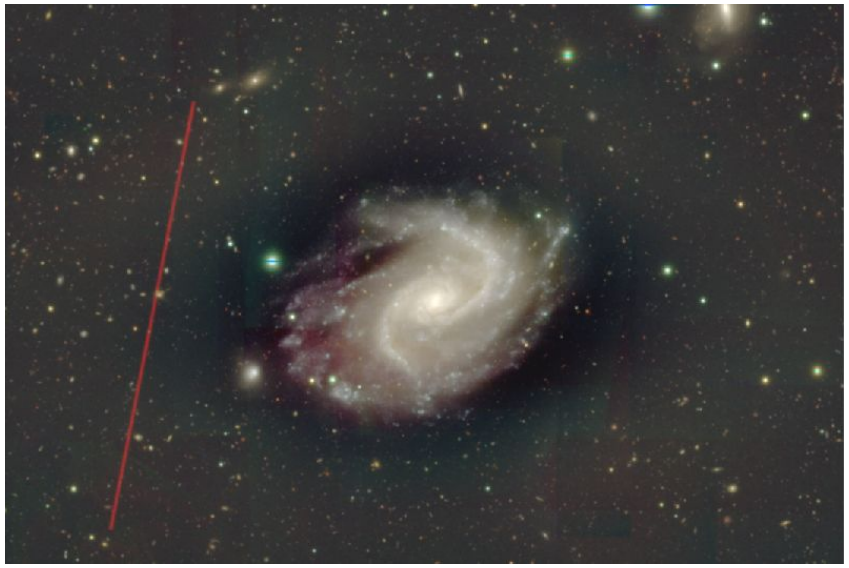
Challenges

Intracluster light is **VERY** VERY very faint (μ_v>27 mag/arcsec^2 – sky μ_v~22 mag/arcsec^2) so requires:

- Accurate flat field correction
- Accurate background subtraction including:
  - Removal of scattered light from bright stars
  - Removal of internal reflections due to telescope/dome structure
  - Sky subtraction

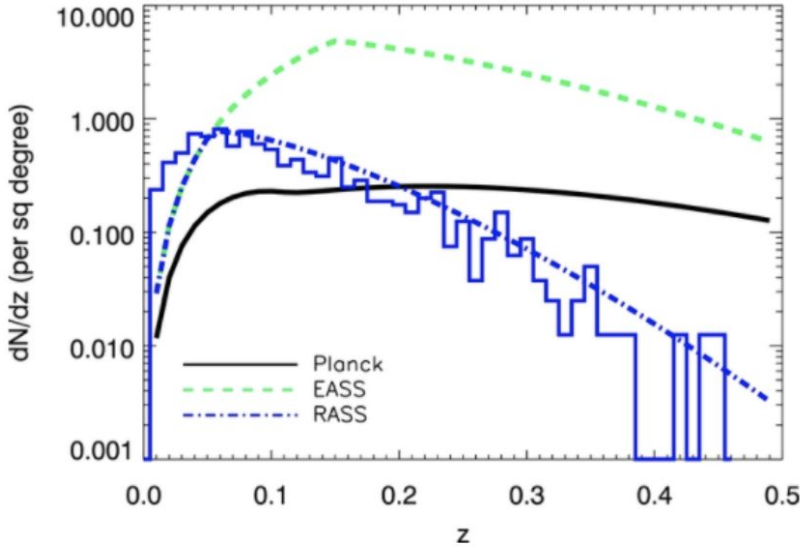
Why do we need LSST?

Wide field-of-view: Accurate Background and Statistics



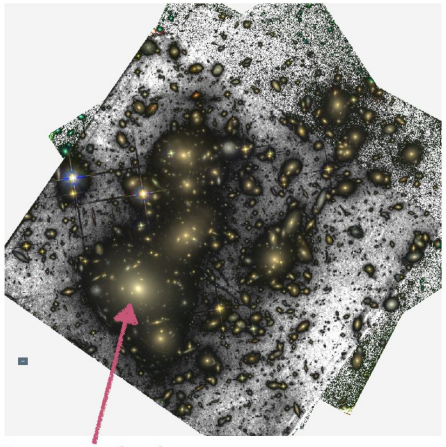
Problematic Background subtraction
(HSC; Aihara et al. 2017)

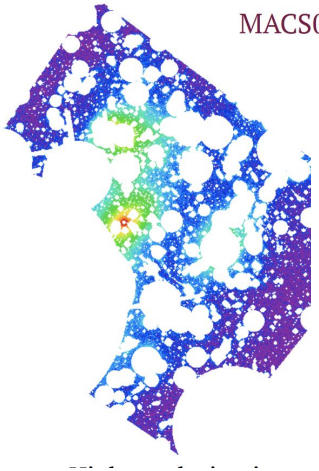
Over 10,000 deg^2 ~1000s clusters+groups

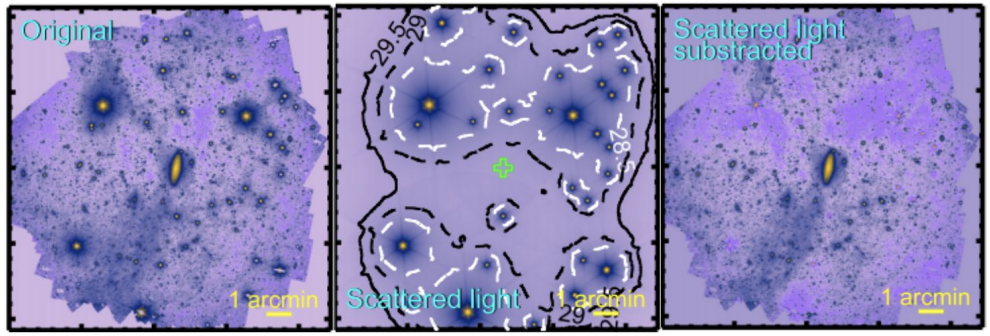


Mak et al. 2011

High Resolution: Minimises Contamination







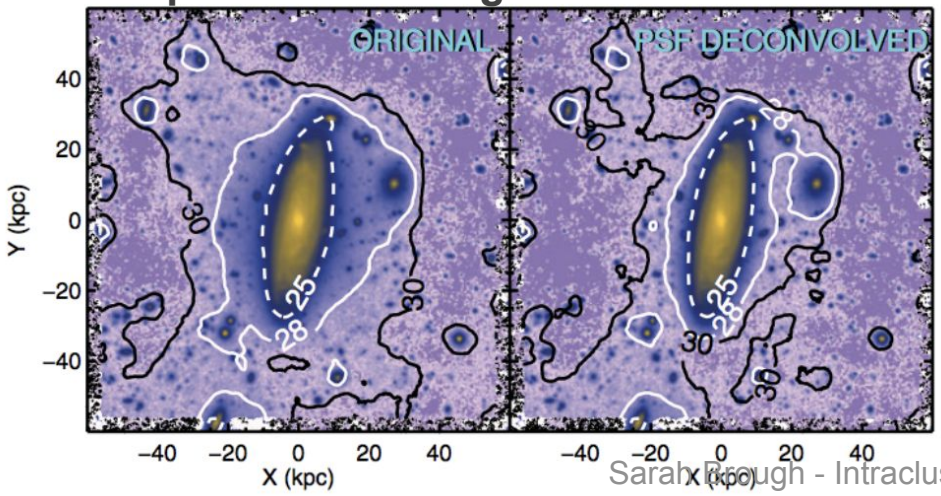
Trujillo & Fliri 2016

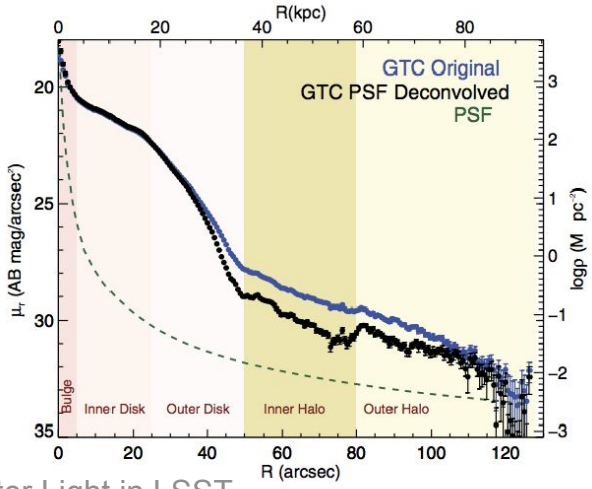
Masking

Scattered Light

Trujillo & Fliri 2016

PSF spread mimicking halo





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Conclusions

- LSST is perfect to understand intracluster light due to its: Depth, Wide Field-Of-View AND High Resolution

- We are beginning to understand the formation of the intracluster light in clusters – due to tidal stripping of MW-like galaxies, ~2 Gyr

- LSST can answer the question of dependence on cluster mass or dynamical state or redshift?