DESC-CL activities @ LSST-France

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Welcome: Marina Ricci, Cécile Renault

Reminder : cluster cosmology with cluster counts

- Halo mass function = number density of haloes (clusters) as a function of mass and redshift d$n(M,z)/dM$

- *dn(M,z)/dM* depends on cosmology
  - ➤ Expansion history
  - ➤ Growth of structures

Cluster counts are at the core of cluster cosmology

Borgani (2001)

z

$\Omega_\Lambda = 0.7$ L03
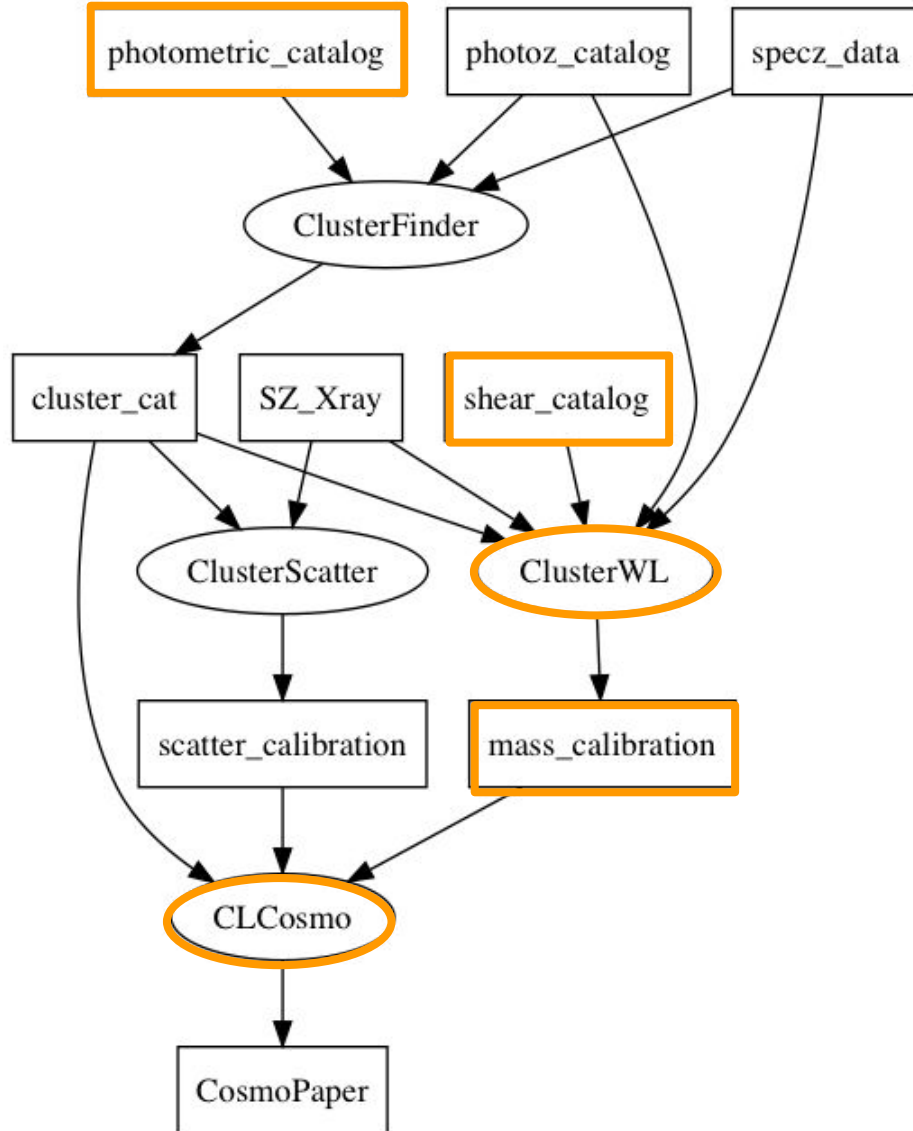
z=1.4   EdS   z=0.6   z=0

$\Omega_m = 1$
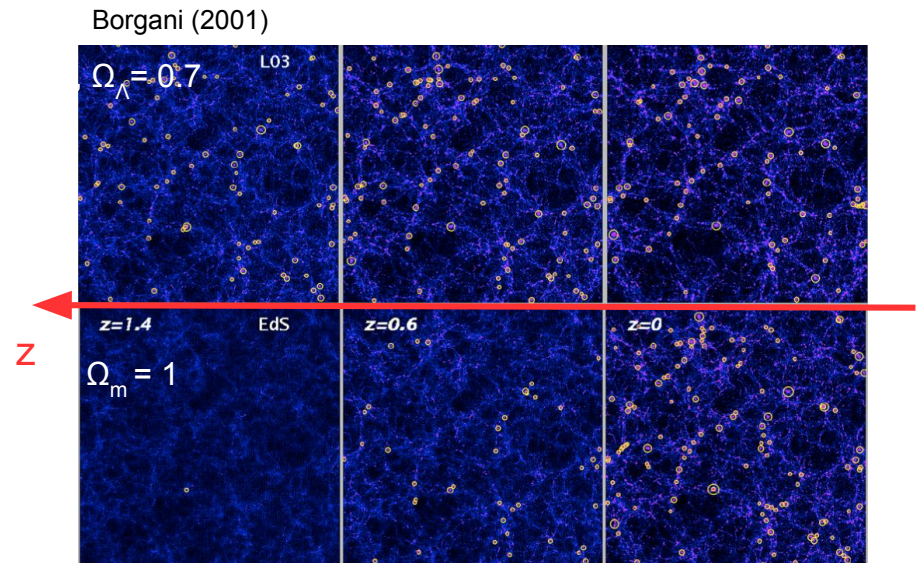
In mass bin *a* and redshift bin *i*

$$N(M_a, z_i) = \frac{\Delta\Omega}{4\pi} \int_{z_i}^{z_{i+1}} dz \frac{dV}{dz} \int_{M_a}^{M_{a+1}} dM \ n(M,z)$$

Problem: relation between the observable (richness for LSST) and the actual cluster mass?

→ Use weak lensing for absolute mass calibration
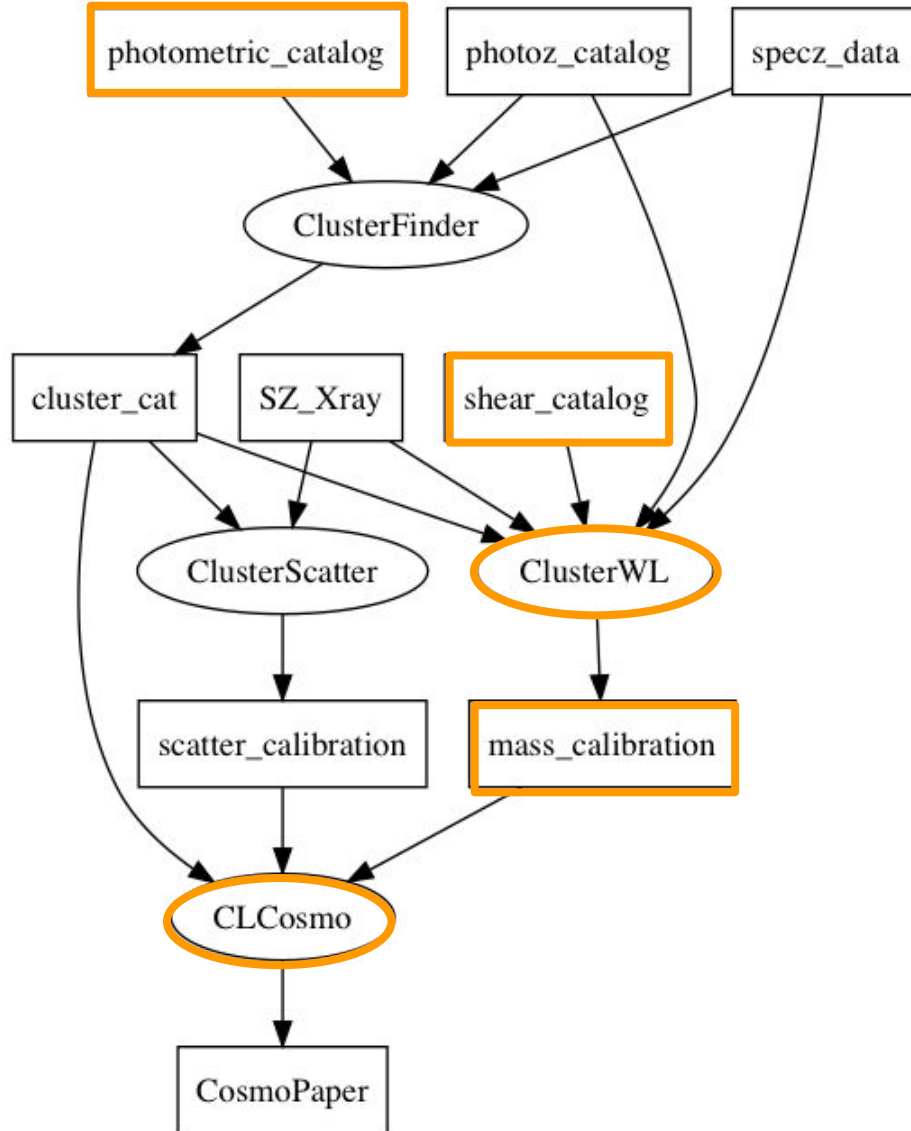
Global picture - January 2018

DESC-CL pipeline as proposed by S. Bocquet following über-pipeline discussions

Where we (DESC-CL@IN2P3) contribute / wish to contribute

DESC-CL@IN2P3 - Talk on January 2018

1. From images to catalogs with DM stack

2. Catalog checks / validation

3. From catalogs to WL mass

4. Towards cluster cosmology

Global picture - Today

DESC-CL pipeline as proposed by S. Bocquet following über-pipeline discussions

Where we (DESC-CL@IN2P3) contribute / wish to contribute

DESC-CL@IN2P3 - This talk

1. ~~From images to catalogs with DM stack~~

2. ~~Catalog checks / validation~~

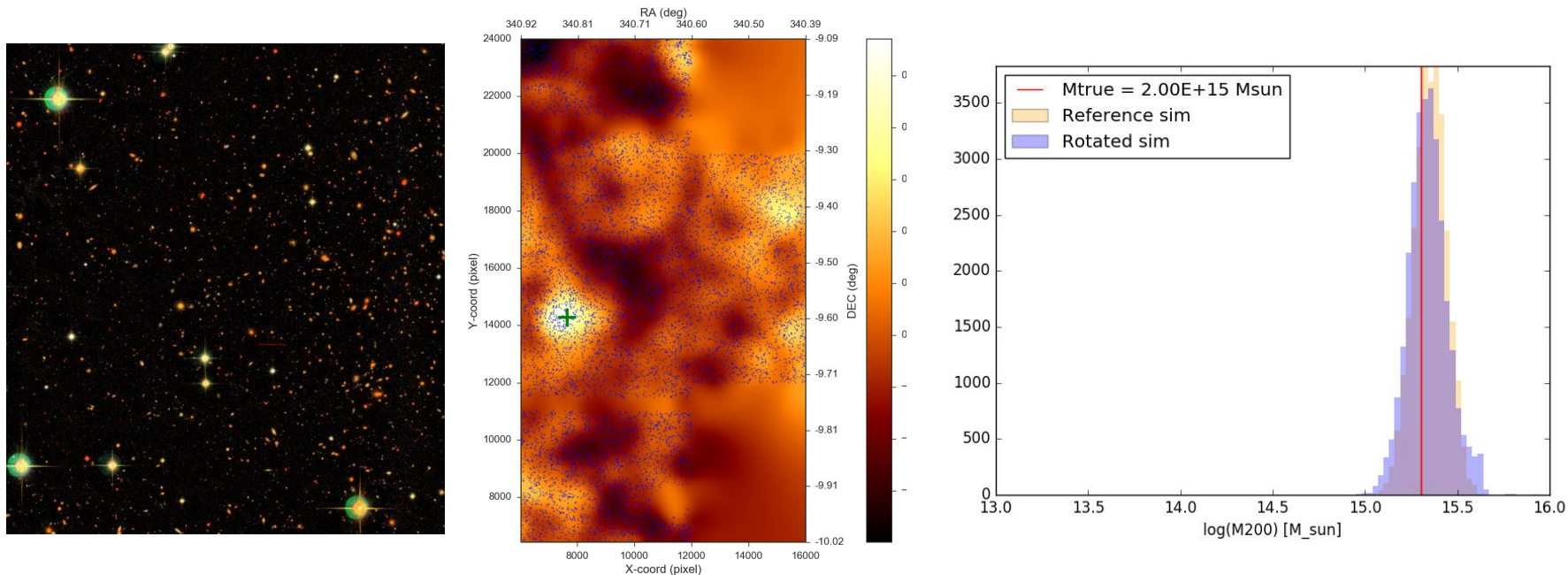3. From catalogs to WL mass

4. Towards cluster cosmology

Less progress in 2018 compared to 2017:
- Dominique → + DC2
- Céline → + CCOB
- Nicolas left :-(
- Mariana → Brazil, + teaching duties

Clusters pipeline (≠cosmo pipeline): from DM-stack catalog to mass

Precursor DM stack based cluster analysis pipeline

Mass part of the code used by Binyang "Robert" Liu for his paper → undergoing DESC review

Cluster Lensing Shear Calibration with Simulations of LSST

Binyang Liu,[1][*] Ian Dell'Antonio,[1][†] Daniel Parker,[2] Nicolas Chotard[3], Céline Combet[4] & Douglas Clowe[5]

[CLShear in SRM]

CLMassMod (lead: D. Applegate → C. Avestruz, A. Malz)

Effort to provide DESC with a galaxy cluster weak-lensing mass modeling and verification code
[CLMassMod (SRM) → CLMM https://github.com/LSSTDESC/clmm]

- Aimed at checking various effects:
    - Miscentering
    - Halo triaxiality
    - Choice of underlying DM profile (NFW, Diemer-Krastov, etc.)

- Should include various mass reconstruction methods / likelihoods (non-stack analysis)
    - Binned shear profile
    - Unbinned data (e.g., pzmassfitter)
    - Bayesian hierarchical modeling (e.g., Lieu et al. (2017))

- Relies on existing cosmology/cluster software: CCL (DESC), colossus, Dallas group software

Involvement:
→ CLMassMod 5-day retreat: profile from DC2 catalog, mock data generator
→ Remote participation at the hack week in Edinburgh
→ Plan to get NumCosmo included

CLShear: follow-up on B. Liu's project/paper

- Objective: Shear calibration from methods implemented in DM-stack and impact on mass reconstruction
- Approach: generate CL-tailored simulated images, feed them to DM-stack
  - Ray-tracing using projected mass map of cosmo-DC2 clusters instead of idealised NFW halo
  - Add cluster galaxies
  - Add foreground galaxies
  - Add redshift distribution?
- How to best contribute?

B. Liu, N. Li, S. Fu, I. Dell'Antonio

CLMassMod, cluster mass calibration:

- Objective: Test the CLMassMod code using DC2 data
- To be better defined once the CLMM code is more advanced

Future plans

- CFHT / HSC reprocessing of existing cluster data - Need to restart this effort, no one else is doing it and expertise is here.

- Possible collaboration with Marguerite Pierre (X-rays)

- Contact with Garching (J. Comparat) → cluster finding algorithms (at the moment RedMapper is the only cluster finder discussed in the WG)

- Contact with UniGe (J. Coupon + G. Desprez)
    → HSC data processing
    → Image / catalog combination from different surveys (COSMOS / Ultravista - SXDS / UKIRT) - CFHT/D2 - extended - ELAIS (Infrared Space Observatory)

- Sujets stages / thèses
    - LAPP (Yves) : "Evolution des grandes structures de l'univers et comptage d'amas de galaxies avec LSST" - Stage M2 suivi d'une thèse
    - LPSC (Céline) : Réflexion en cours….