Projet Horizon - Horizon Project

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MN global reduction

Papers with MN

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<PDF_LINK>

Papers with MN

Three entries for a systematic policy + patchwork and joint (multicomponent) analysis. In principle papers. In practice, high redshift plus finite time ressources.

Strategy

What s wrong with MN	what doesn t fit
Prospective for new instruments	OWL ALMA SKA LOFAR JWST...
Niches	How special is MN compared to others
Fashion	What s hipe with cosmology
Data matching	What data sample we may fit ...
Fitting	What are the free parameters we may post process...
Savoir faire	What are the assets of Horizon in terms of processing...
Advertising	Movies, images

Observables

DM	physics of DM; closure relation
Backgrounds	IR UV CMB SED...
SZ	CMB cluster coupling
Lensing	shear maps etc
Spectra	low res, high res, 3D spectro...
X ray	temperature emisivitiy...
Optical/IR	images, morphology, chemical abundances, Zgas vs mass @ z=4
Radio	LOFAR SKA ALMA
Individual objects	jets, winds, arcs...
AGN	GRB
Photometric z	z machine
Gravitationnal waves	...
Cosmic rays	Auger

Tools

1 point statistics	counts, PDF, bias
stats of peaks: rares events	what are the special objects, large clusters, odd arcs ULIRG...

Discussion of Strategies

- What s wrong with MN : what doesn t fit Disc size, winds, lack of AGNs,

- Prospective for new instruments

— OWL, ALMA Herschel, JWST, Planck

- Niches : how special is MN compared to others

— Metals + large scales

— big cluster rare events

- Fashion : what s hipe with cosmology
- data matching : what data sample we may fit ...
- Fitting : what are the free parameters we may post process ...
- Savoir faire : what are the assets of Horizon in terms of processing ...
- Advertising.

Lyman Break Galaxies & Lyman-Alpha Emitters

involves Nicolas, Jaime, Adrianne, Chris, Jeremy Christophe

CP: c est qui Nicolas ...

longer term project devoted to detailed measurement of properties of high redshift galaxies ... this draws heavily on the luminosity function project so it also involves de facto people involved in that as well :)

- need to build light cones from MN to be able to select and count objects properly so as to compare to observations and make realistic predictions. Use all star particles and neutral gas density field including extinction for propaganda (superb images) but also WAY more realistic in terms of galaxy morphology and spectra for next generation high-angular resolution instruments ......
- physics of LAEs: (i) detailed analysis of metal distribution with respect to stars to compute Ly-alpha escape fraction as a function of geometry —> derive cosmic distribution of Ly-alpha line profiles (ii) overlap of LAEs and LBGs and capacity of LAEs to illuminate of the cosmic web in Ly-alpha ...... or do we need AGNs ...... in any case skeleton needed to define cosmic web ... (iii) predictions for MUSE —> must include velocity field info to broaden and in general compute shape of Ly-alpha line
- physics of LBGs: (i) cold flows vs. shock heated gas accretion, what is the ratio of the 2 (sharp vs. smooth transition as a function of halo mass) and what is the impact of this on galaxy SFRs (ii) dust absorption and emission —> are LBGs LIRGs or ULIRGs ...... (ii) top heavy IMF —> do we get outflows in LBGs which properties could match the observed ones ......
- correlation functions for LAEs and LBGs and halo occupation number

Metals of IGM @ z=4

involves Romain, Christophe , Pierre , Chris ....

BIBLIO in progress

CHECK: DO WE HAVE THE PROPER (observational) Zgas VS OVERDENSITY RELATION ...

- look at accretion rate of metals on galaxies vz time and mass. Is gas accretion dominated by accretion of satellites or accretion of diffuse gas ...

- compute (satellite accretion)/(diffuse gas accretion) Since accreted satellites bring their enriched gas with them, while accreted diffuse gas is mainly primordial, possible explanation of the gas metallicity vs gal. mass relation @ z=4
- Can we compute a diffuse gas / satellite accretion as a function of gal. mass and redshift ... this would be very useful to GCE modellers but we would need z
- difficulty : define properly

  for galaxies rather than haloes.
- study the effect of resolution, R_{200}

  variation, clustering of environment.
- WHIM
- metal in gas vs stellar mass (contribution from dwarf galaxies vs massive ones ......)
- filling factor of bubbles of metal/ hot gas, more on winds morphology/shape/extent ...
- More on detailed geometry of wind/IGM contamination ...
- Can a protogalaxy enrich an other nearby protogalaxy via winds and subsequent accretion ... How often does it happen ...
- More on the Zgas vs Mgal relation @z=4: Because of the limited resolution of MN, it is iexpected that the relation in MN will be shifted towards higher masses. Upgrade the Rasera & Teyssier 2006 semi-analytical model to take into account metallicity and show that this shift is understood in terms of Mass_min, i.e. the relation in MN is ok provided it is corrected for the resolution.
- look at locus of outer edge of filaments in phase space diagram

Some random questions: How does Zgas vs Mgal depend on ellipticity ... What does ellipticity trace ...

Environmental effects on the Zgas vs Mgal relation @ high z

involves Christophe, Pierre, Romain ......

At this stage it is urgent to check the Zgas vs Mstar relation and compare with observed relation from Erb 2006 and Ledoux 2006. We are very close to that from what Christophe has already done. From what Romain says (winds are inefficient at ejecting metals out of galaxies in MN) we should be close to the "no wind" regime described in Romeel 2006. Then if thats true and the relation looks really bad Im not sure what we can do about the Zgas vs Mstar relation at all. Zgas can be defined as:

- int (Zgas*Mgas_cell)/int(Mgas_cell) over Rvir or Rsomething ...
- int (Zgas*SFR_cell*Mgas_cell)/int(SFR_cell*Mgas_cell) to account for the observational bias that measured Zgas are in SF gals preferentially.
- also try plotting vs (1./0.6)*Vc instead of Mstar (see Ledoux 2006)

Is it necessary at this stage to correct for the finite resolution of the simulation ...

If we have something not too horrible then I propose a paper: "Environmental effects on the Zgas vs Mgal relation at high redshift". We have a bigger box than Romeel for instance. We should have better statistics on the most massive objects, and be able to study the influence of environment on Zgas vs Mass relation. The master plot of the paper should be: the relation in low density environments and the relation in high density environment. Of course one expects a positive correlation

Then: What drives this effect ... investigate 4 mechanisms using MN:

- stronger pre-enrichment in proto-clusters due to proximity ... so gals start with more metals
- stronger ram pressure in proto-clusters -» winds are even less efficient at ejecting metals.
- can you think of a possible 3rd mechanism ... maybe the fraction (accreted diffuse gas) / (accreted

satellite gas) is negatively correlated with environment and can drive the dependence.

- at fixed Mstar, compare ages of gals in proto-clusters and in low-density environments: are things happening earlier in proto-clusters ... This explanation alone should not be sufficient, since it is expected that gals evolve ALONG the relation rather than perpendicular to it. This last commetn is bunk. Damien s plots in Savaglio 2005 show its not true.

It should be easy to show that high z Z measurement sare biased towards high density environements

some random questions probably out of scope of this paper:

- How does Zgas vs Mgal depend on ellipticity ... What does ellipticity trace ... some degree of "disturbance" ... then it fits into the environment paper.
- Just for fun plot Zstar vs Mgal, Zgas vs Mgal, compare with Gallazzi et al. 2005 (SDSS data @z=0) and Tremonti et al. 2004. Is the offset between these 2 relations the same @z=0 and @z=4 ...

ULIRGs: gas in galaxies @ z=4

involves Julien et al. ....

somehow linked to project on LBGs:

- Rare events ... galaxies without gas : speak to Omont.
- Madao raw and corrected for absorption ... Paint dust via recipes
- Look at ULIRG in MN —> rare events, but we should get a fistful of them anyways
- morphology of objects (multiple mergers) do stats on how many of them would be blended by SCUBA ...

Morphology analysis of massive galaxies @ z=4

involves Christophe Damien

- classification using networks 2D/3D
- Gini Asymmetry Concentration widding
- beyond red versus blue
- fraction of interacting galaxies
- spectro vz morpho type
- Fraction of Spirals
- Mass estimate of disks; spectral mass;
-

Skeleton of filaments

involves Thierry Christophe Stephane . ...

- evolution of section
- comparison of different skeletons
- true skeleton
- colour and morphology of galaxies as a function of distance to filaments.
- true skeleton in clusters: radial profile of physical fields along filaments; relationship to velocity field.

Light cones up to z=15

involves Jeremy, Charlot etc.. ....

- evolution of light cone as a function of z w.r.t. NIRSPEC

high-z HOD

involves Jeremy, Romain Christophe

- what is the halo occupation distribution at high z (as function of every possible galaxy property)
- how does it evolve down to z=3 (galaxy/halo merger rates etc)
- HOD interpretation of clustering (cf. above project with LBGs)

Galaxy bimodality and accretion

Topo intro

Until now accretion physics in a cosmological context has been studied only with lagrangian codes (Keres, Dekel). Although the particule view has advantages, for instance being able to follow the history of particles. However, AMR codes offer a better treatment of shocks in the gas, which is a desirable advantage since we want to separate between the 2 major accretion modes, cold stream and hot shocks. Hence, using an AMR code for such a study has been suggested (Keres or Dekel...) The other advantage of using RAMSES is that it allows for the treatment of chemical enrichment. We can thus investigate how the metals are distributed between the 2 major accretion modes. This is of particular importance since metallicity governs the cooling efficiency. Hence, metallic gas hot shocks might be able to cool fast and still form stars, while cold streams might be able to remain focussed and connected to the core of the galaxy and continue feeding it with cold gas even when a hot gas halo has laready developed. It has been shown by.... that the specific redshift at which the 2 regimes begin to separate (or the redshift at which hot shocks become significant and start building up the red sequence) is around z=4. This we also see in MN.

I) Accreted gas temperature bimodality

or mass fraction (or volume fraction ...) entering the virial sphere or smaller (0.1 Rvir according to Dekel, Keres) as a function of T. Do we see bimodality ...

II) Bimodality and metallicity

then, same as a function of (T,Z): 2d map. Still bimodality ... Are cold flows metal-rich/poor ... and shocks ... Implications for the cooling.

III) Connectivity issues

Along the range of masses of galaxies, are the ones with hot shocks still fed with fresh gas ... i.e. Are the cold streams still connected to the core ... this would be the place for Christophe s filling factor stuff ...

would be nice also to show Area_cold_flow/4piR^2 vs R/Rvir should show if the the fresh infalling gas still reaches the core of the galaxy or if the infalling gas filament becomes disconnected from the center.

Average this plot over many galaxies with similar mass. then show how this varies with galaxy mass. Concusions for star formation ...

Pb: how do u define area_cold_flow ... lets say its area(v.r
IV) Critical mass

How to define a critical mass separating the 2 regimes ... if we plot mass fraction (T>Tvir) vs mass. Maybe we can define the critical mass as the inflexion point of this curve ...

IV) Critical mass @ z=4,5,6 seems to be enough already there for a letter ...... compare with others: Dekel and Keres say its constant wirh z. Bundy gives a law: quenching mass MQ (1+z)^3.5. But definition is quite different. What do we get ...

V) use both spherical infall measurements

VI) On a discute l idee consistant a utiliser les lignes de champ de vitesse pour sonder le halo en volume plutot qu a la sphere du viriel et reduire la dependance de l analyse vis=a=vis du rayon de la sphere consideree. Bricolage/wrappage d un integrateur qui donne les lignes de champ pour un champ de vitesses donne.

- Choisir les points de depart des lignes de champ sur une sphere; faire la pdf de la valeur des champs (temperature, metallicite) le long de la ligne de champs en fonction de l absisse curviligne.

Autres idees:
- PDF des profils radiaux
- Squelette de T @ r - Branchement des filaments @ R200/i ...
- Cartes d acccretion comme celles au on avait deja mais a R200/i
- Nombre de filaments vs M ... Surface occupee a R200 vs M ...

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