Discussion Time

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MAIN TOPICS

- Feedback processes
- Reionization history
- IGM metal enrichment
- Escape fraction
- Nasty and lovely: B-fields, turbulence, cosmic-rays

Mechanical

- Gas/metal ejection efficiencies of small and large galaxies

Radiative

- Positive or negative radiative feedback in relic regions ?
- Suppression of galaxy formation below Jeans filtering mass?

Is it really a sharp boundary ? Gentle decrease of bayonic fraction ?

- Effects of global LW background: sterilization of MH ?

Chemical

- Role of dust and CMB for critical metallicity

- Can we trust reionization histories without understanding feedbacks ?
- How are star formation efficiency/photo-production affected by mechanical feedback ?
- Small scale clumping: How biased is it ? How important is it ?
- Sources: > 50% from halos < $10^9 M_\odot$ @ z>7
- Relevance of Lya background illumination/RT fluctuations for 21cm
- Reverse engineering of 21 cm Power Spectrum or Global signal

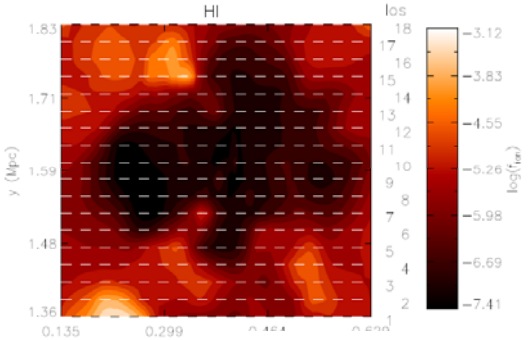
  What do we learn about reionization sources ?
- Reionization of biased regions (quasars, MW [inside vs. outside])

- Comprehensive approaches are required
- Schmidt law: does it depend on environment (and mostly: metallicity ?)
- Metallicity-dependent cooling ok, but galaxies are optically thick!
- Hot halos of galaxies: an (un)solved problem ? Cold accretion: not observed..
- Numerical convergence at high-z difficult: need for semy-analytical models ?
- Stellar ages and metallicity of high-z galaxies ? Dust ?

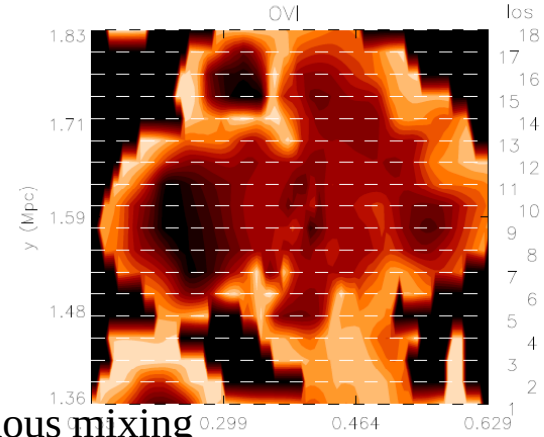
WIND BUBBLES

Fangano+2007

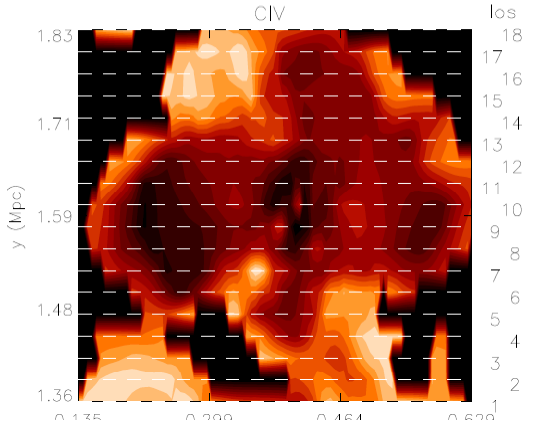
Simulated LBG-Analog @ z=3.29



HI

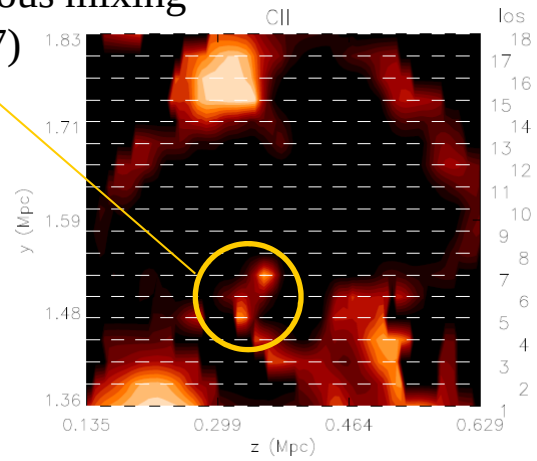


OVI



CIV

Small scale/inhomogenous mixing (Schaye+2007)



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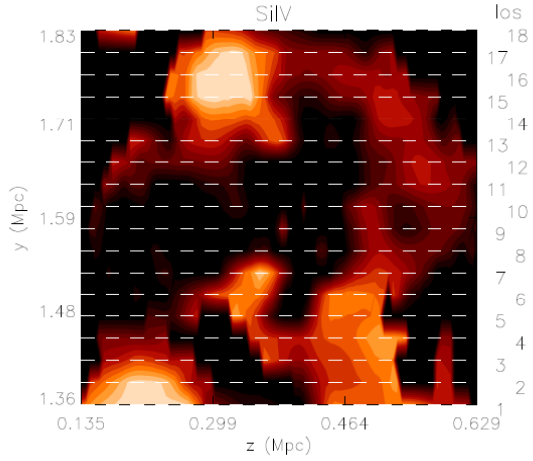
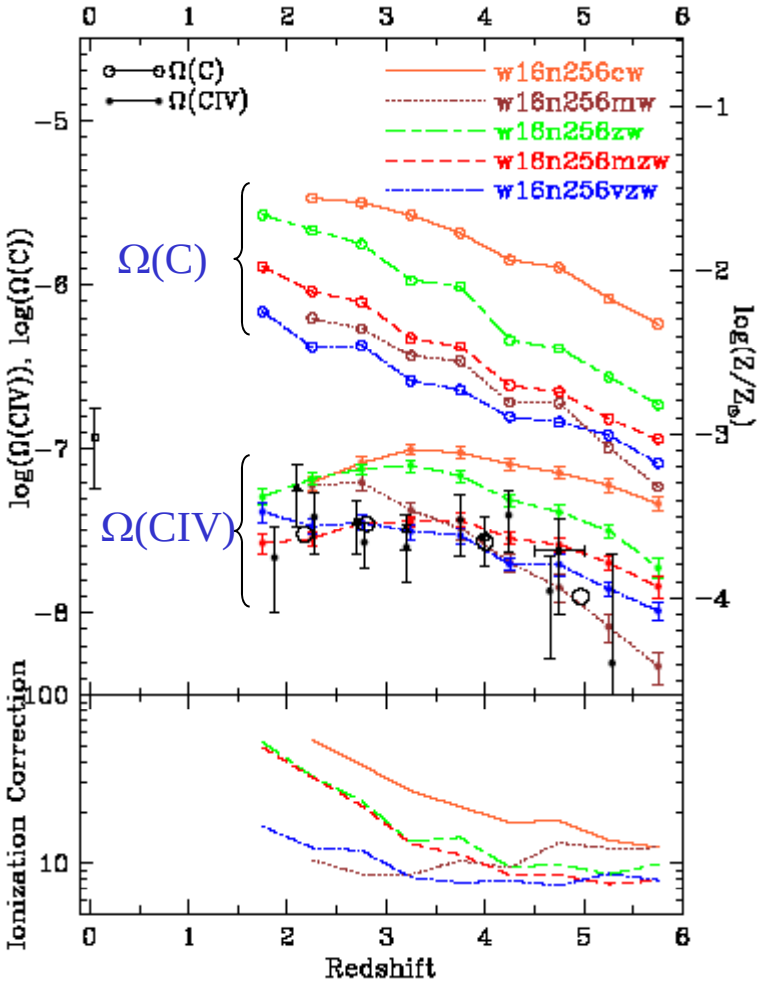


SiIV

Oppenheimer & Davè 2006..2009

IONIZATION CORRECTIONS



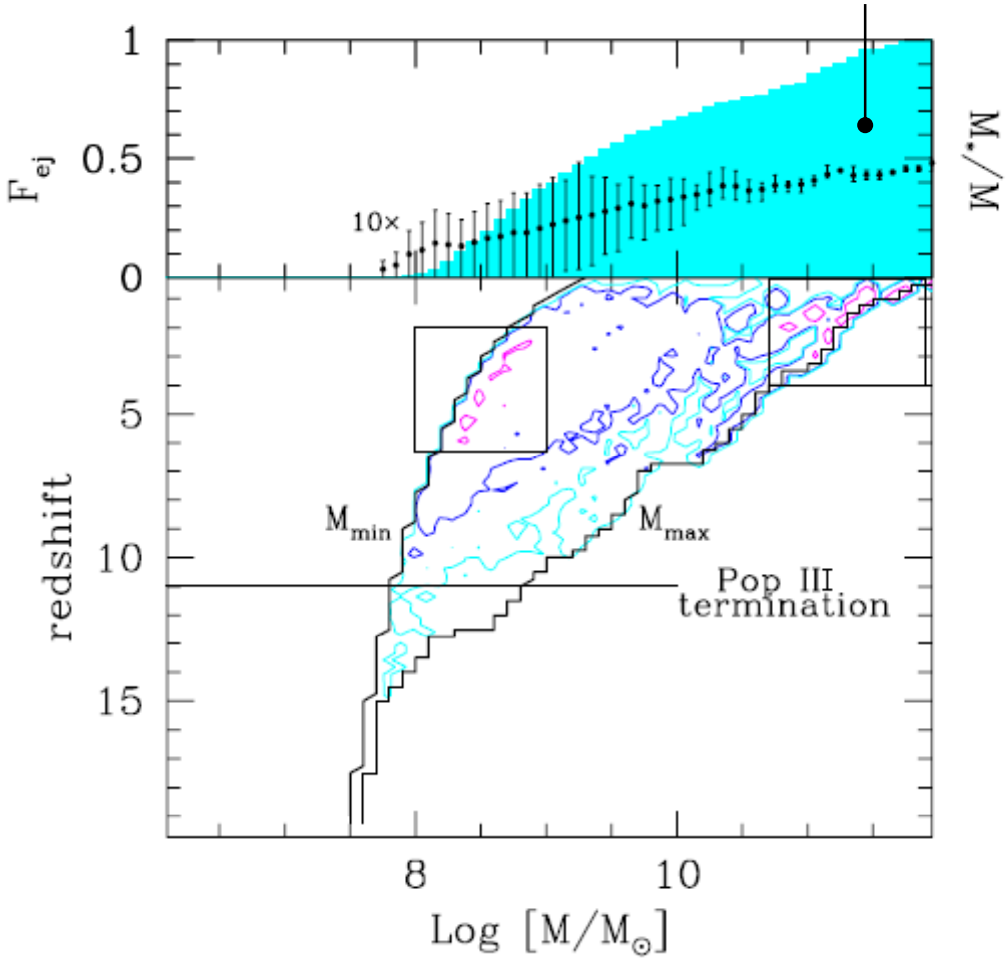
POTENTIAL DIFFICULTIES

(1) Line widths too large (hot IGM)
(2) OVI overproduction
(3) Wind velocity: fine tuning

AF+ 2000; Salvadori+ 2007

EJECTION EFFICIENCY: THEORY

Fraction of present-day IGM metals expelled
by galaxies of mass M during cosmic evolution

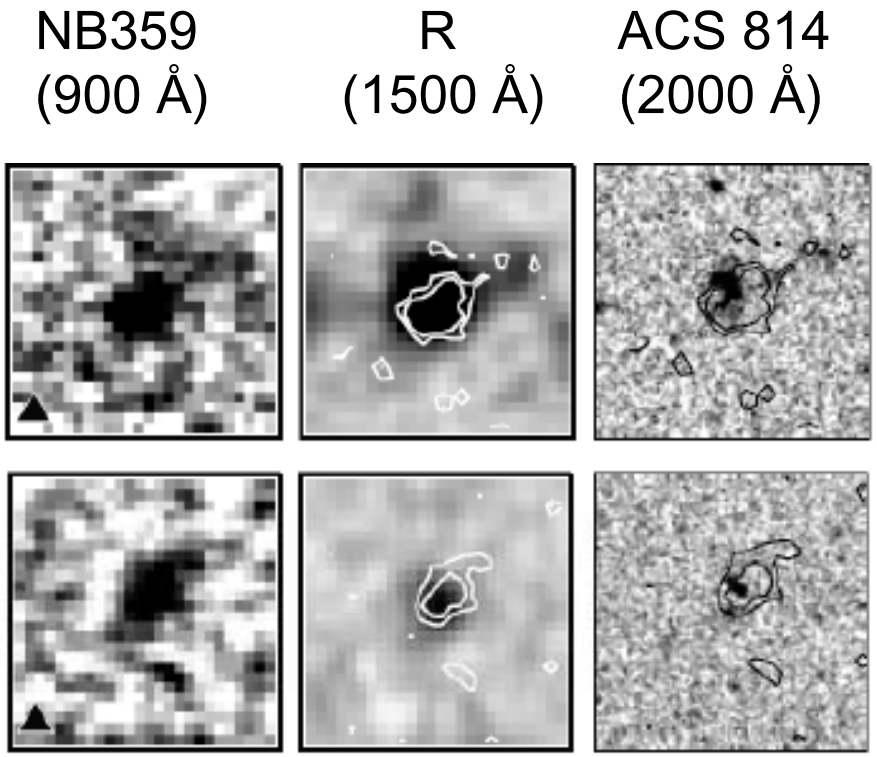


f > 80% of the metals ejected
from $M < 10^{10.5}\ M_{\odot}$ halos

- Pre-enrichment vs. Recent metal ejection
- How pervasive are metals (i.e. which overdensities are polluted ?) in *z=3-6 ?*
- Does collisional ionization correction with hot gas lead to OVI overproduction.?
- Wind velocity: fine tuning ?
- Solutions to the CIV redshift evolution puzzle ? Proximity ionization ?
- Recombination/cooling of some species (OI) ?
- Which sources produce most of the metals we see at z=0 ?
- CR-driven winds might leave the metal enriched gas cold ? Mass load larger for dwarfs galaxies. Steady-state approximation prone to instabilities ?

- Intrinsically an observational problem
- Strong dependence on small scale structure of the gas (molecular gas, turbulence carving low-density tunnels, ISM fractal structure)
- Is there a fixed relation between PopIII/PopII escape fraction ?
- Theory predicts f_{esc} decreases with z, observations show the contrary. Problem ?
- Escape through SN cavities ? But what about neutral shells bounding them ?

PERSISTING PUZZLES



$z = 3.09$

f_{esc}

- Increases from z=0 to z=3
- Increases for low mass objects
- Larger in LAEs than in LBGs
- Too many LCE for Salpeter IMF

Why?

- B-field generation: difficult to create seeds $>10^{-18}$ G from Biermann battery

Radiation drrag might get similar strengths on larger scales

- B-field strength (μG) required to drive CR-winds too large ?
- Parker instability required to "open" field lines ?
- Turbulent mixing, mixing layers and metallicity gradients

Cosmologically important to transport metals in voids ?

- Turbulence important also for amplification of B seed fields and f_{esc}
- How turbulent is the IGM ? Observational strategies ?