Gas Infall and Metallicity Drops in Starburst Dwarf Galaxies

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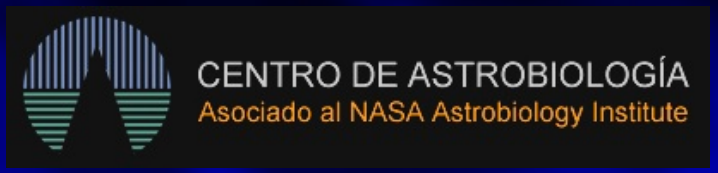

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Spineto, 2015

Evidences of recent accretion of intergalactic gas

- coming from cosmological distances
- low metallicity “pristine gas”
- fuel star formation

- gas patches with metallicity lower than surrounding ISM
- coincident with SF bursts
- Evidences of recent accretion?

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GAS
INFALL

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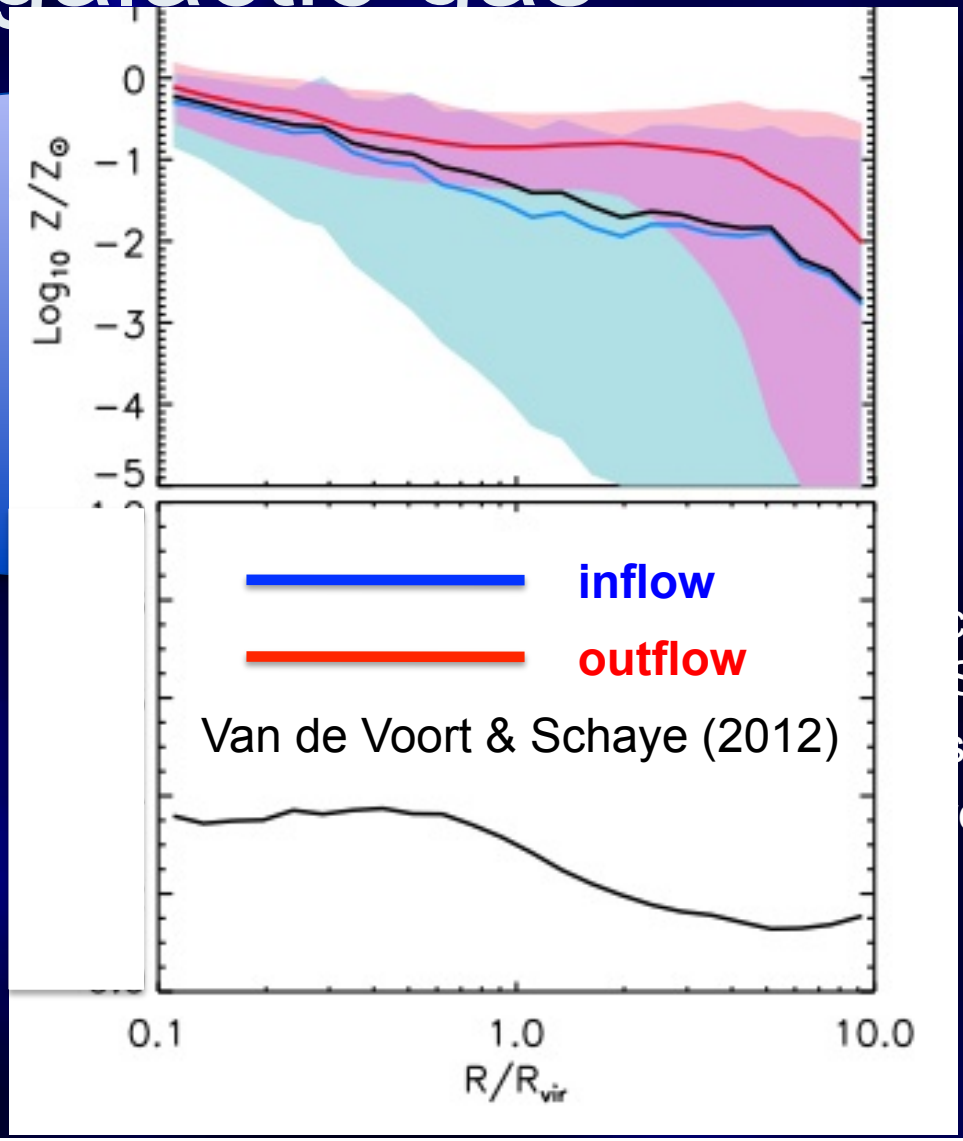

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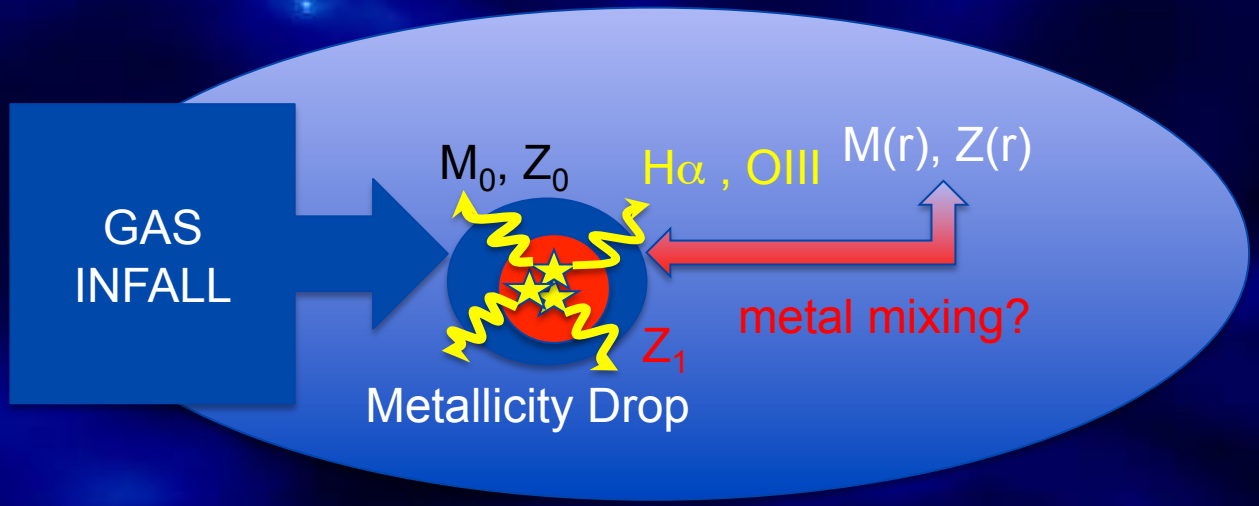
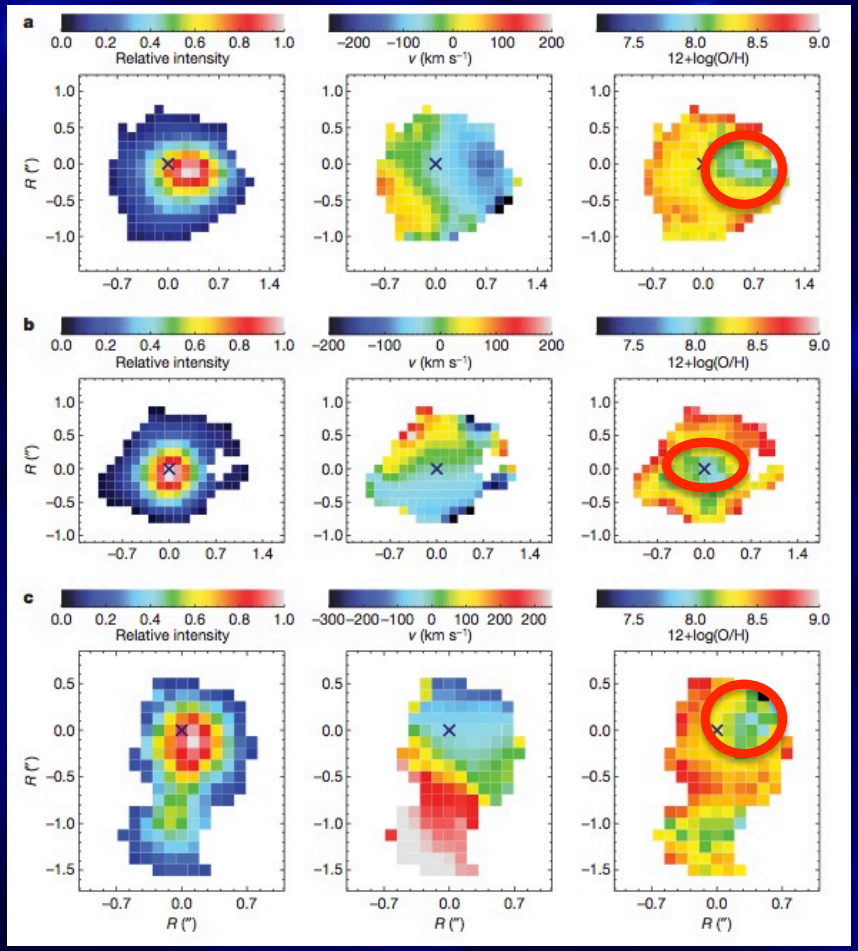
Metallicity inhomogeneities as evidences of recent gas accretion



Dwarf galaxies are the best places to look for recent gas accretion (low velocities and long time-scales)

massive infall of low metallicity gas?



Cresci et al. 2010

.1

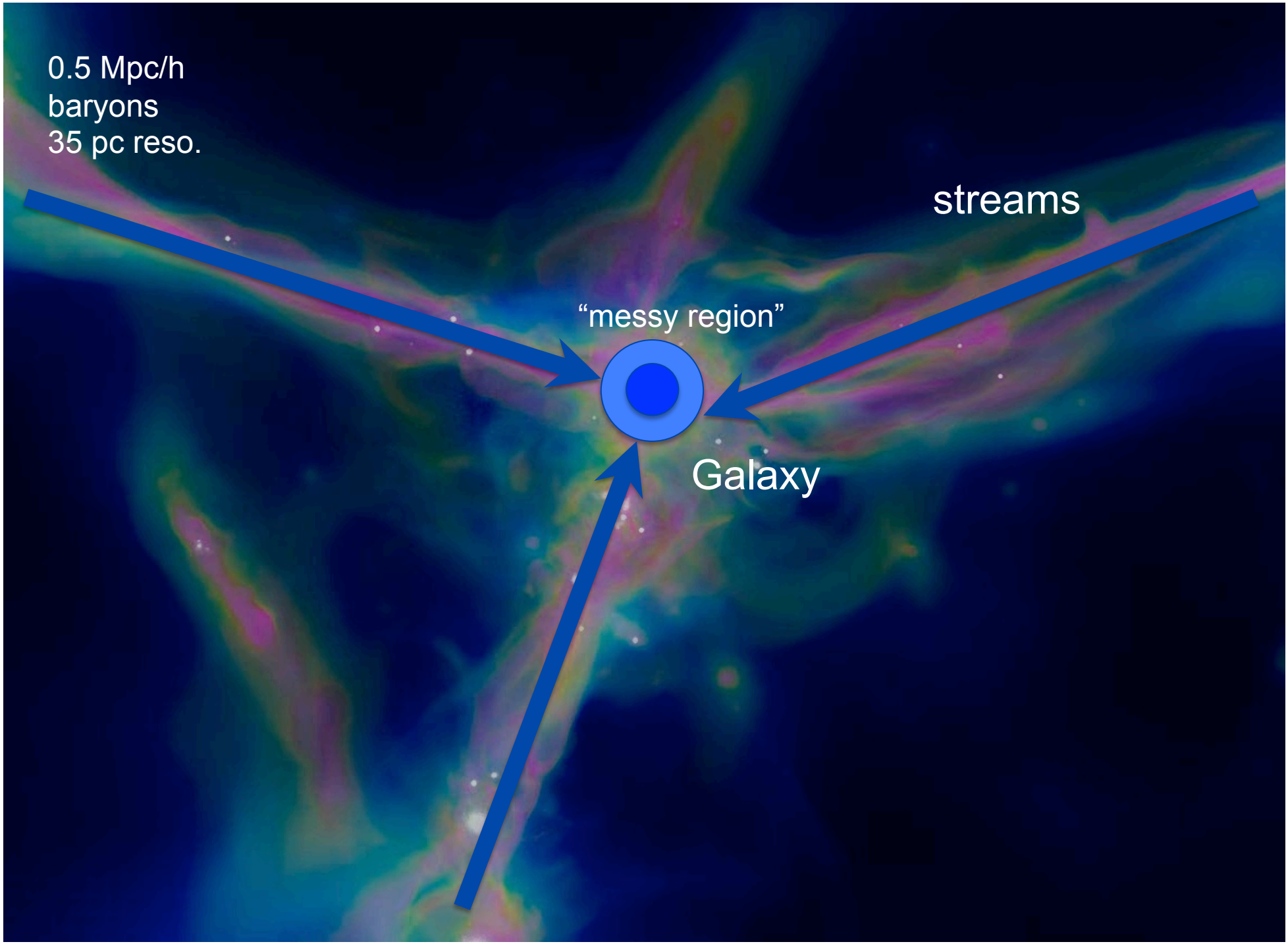
85

5

2

ensity

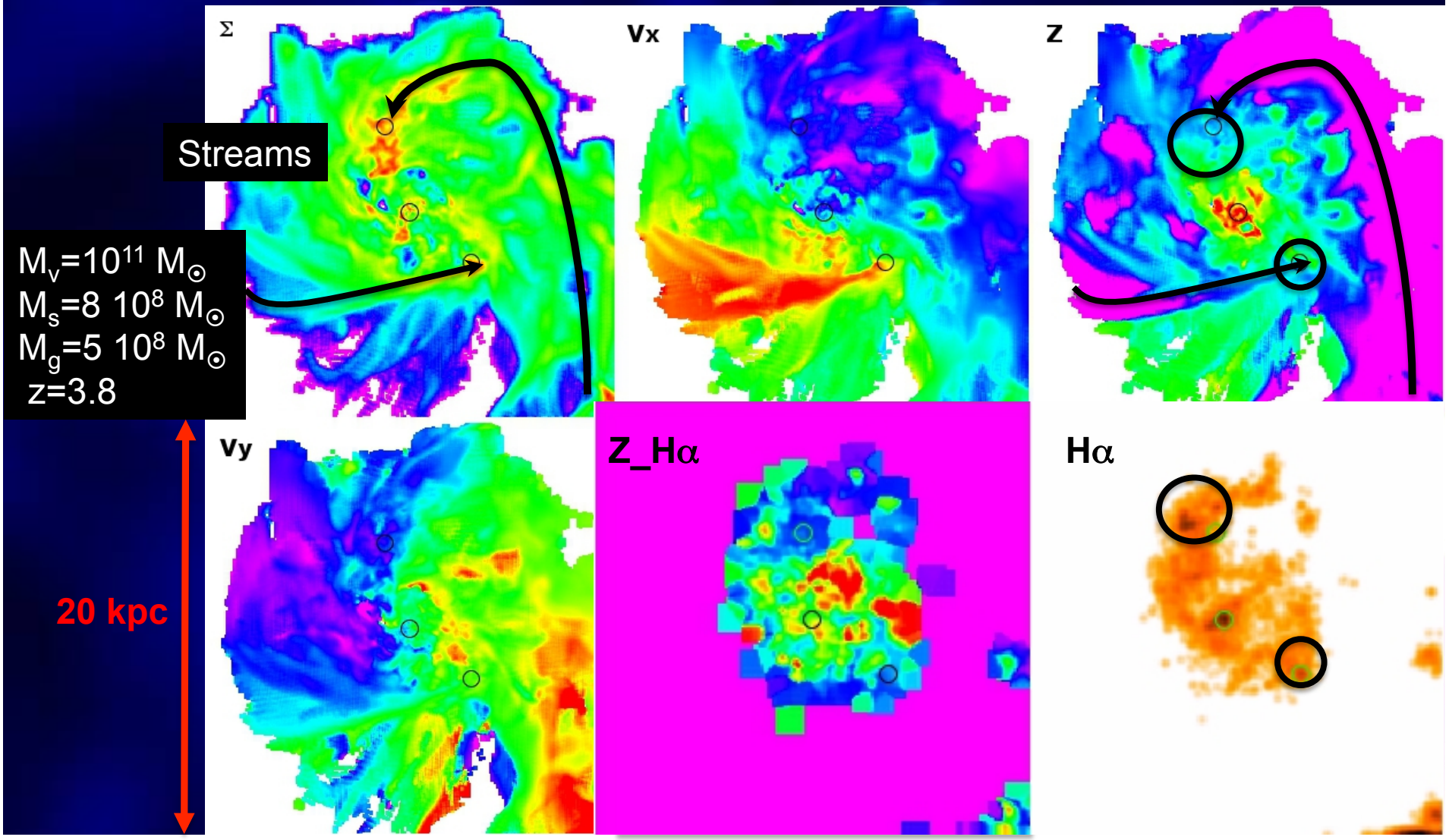
0.5 Mpc/h
baryons
35 pc reso.

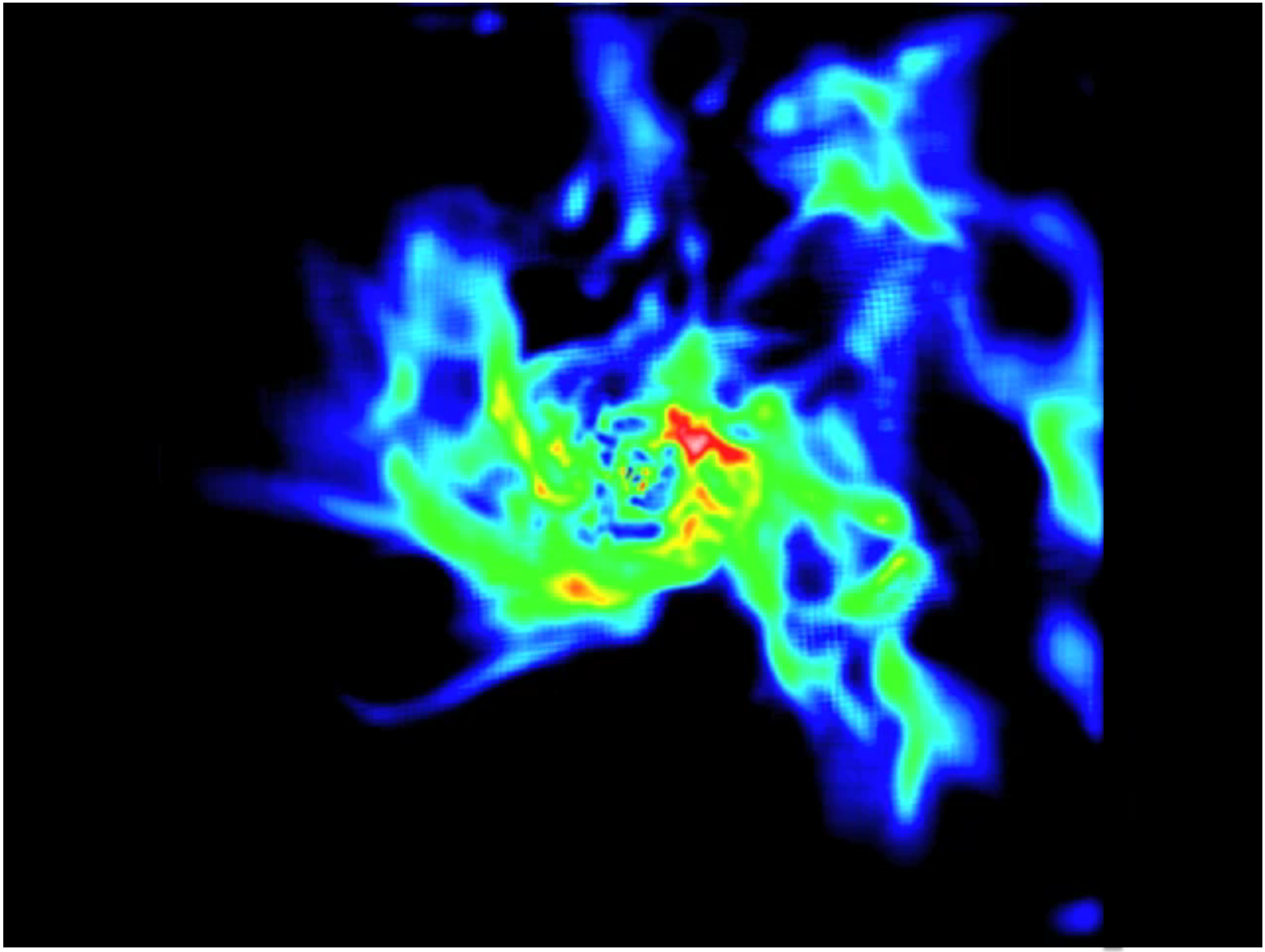

0.5 Mpc/h
baryons
35 pc reso.
streams
“messy region”
Galaxy

VELAs

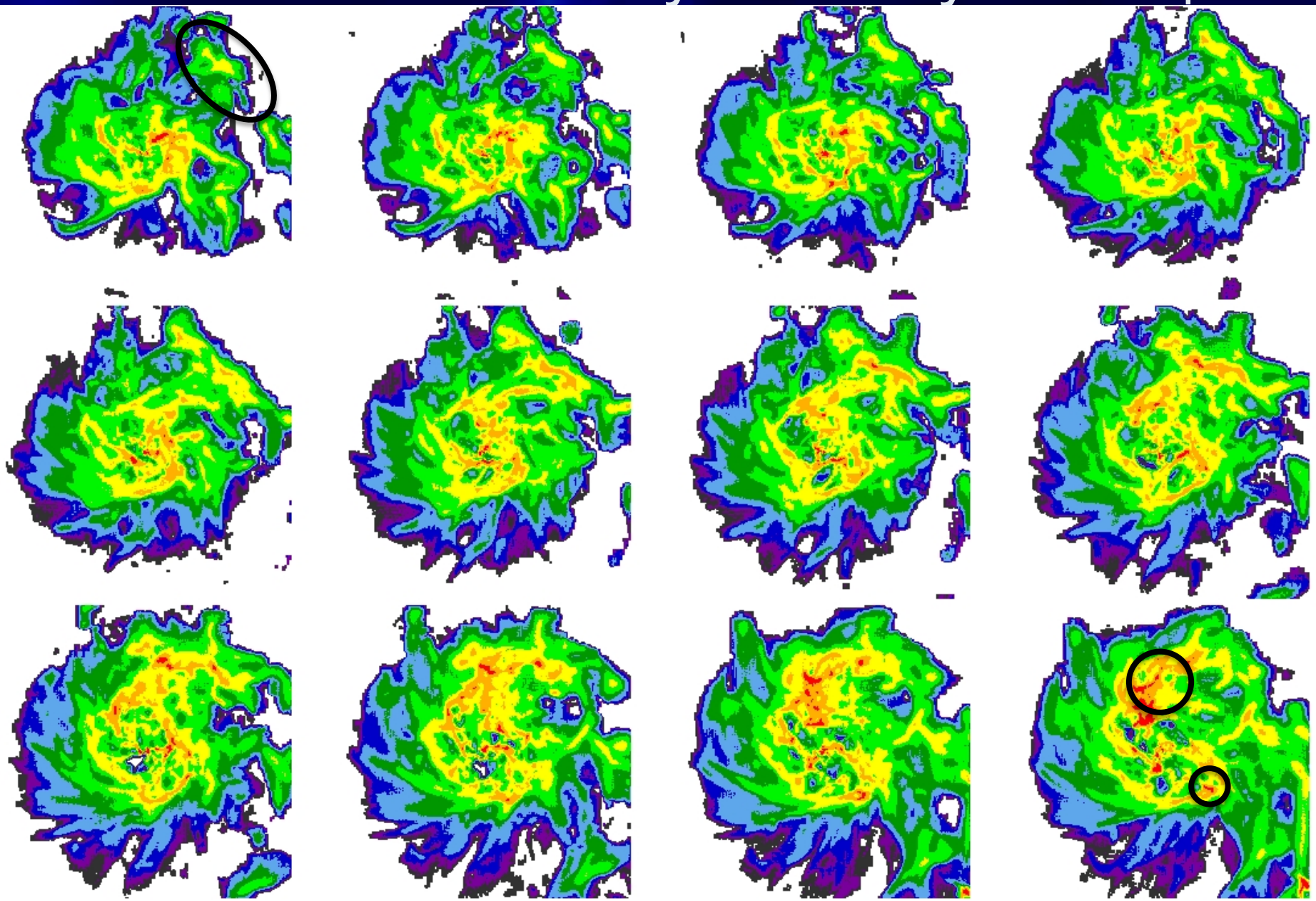
- 35 zoom-in simulations
- AMR code: ART (Kravtsov et al 1997, Kravtsov 2003)
- Gas Cooling, Star Formation, Stellar Feedback (thermal)(Ceverino & Klypin 2009; Ceverino, Dekel and Bournaud 2010)
- Radiative Feedback (Ceverino et al. 2014)
- halos with a virial mass between 10^{11} $M_\odot$ - 2 x 10^{12} $M_\odot$ at z≈1
- Maximum resolution of 15-30 pc, M_{DM}=8 10^4 $M_\odot$

Gas infall in SF dwarf galaxies

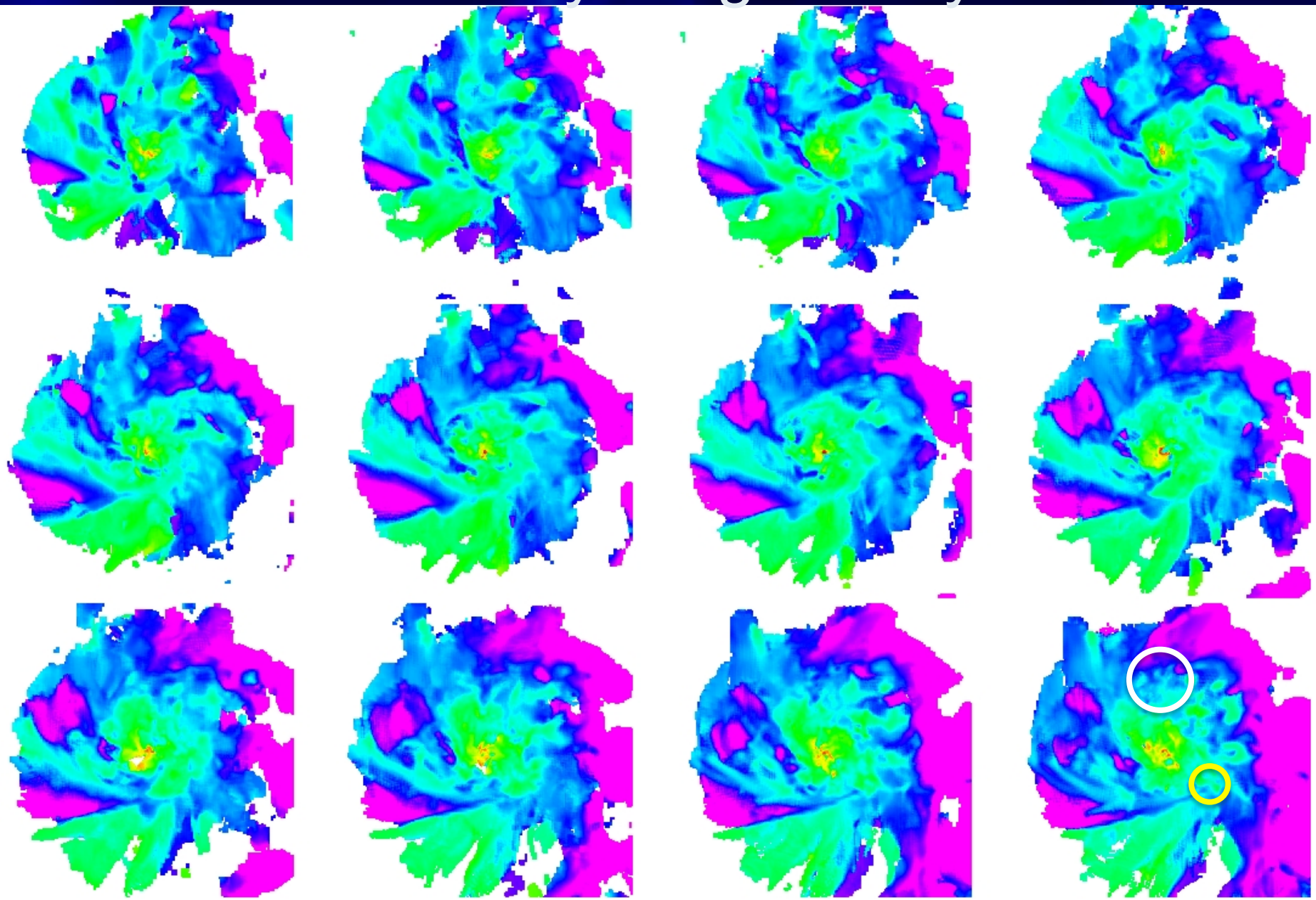




Gas Surface Density in 10 Myr timesteps

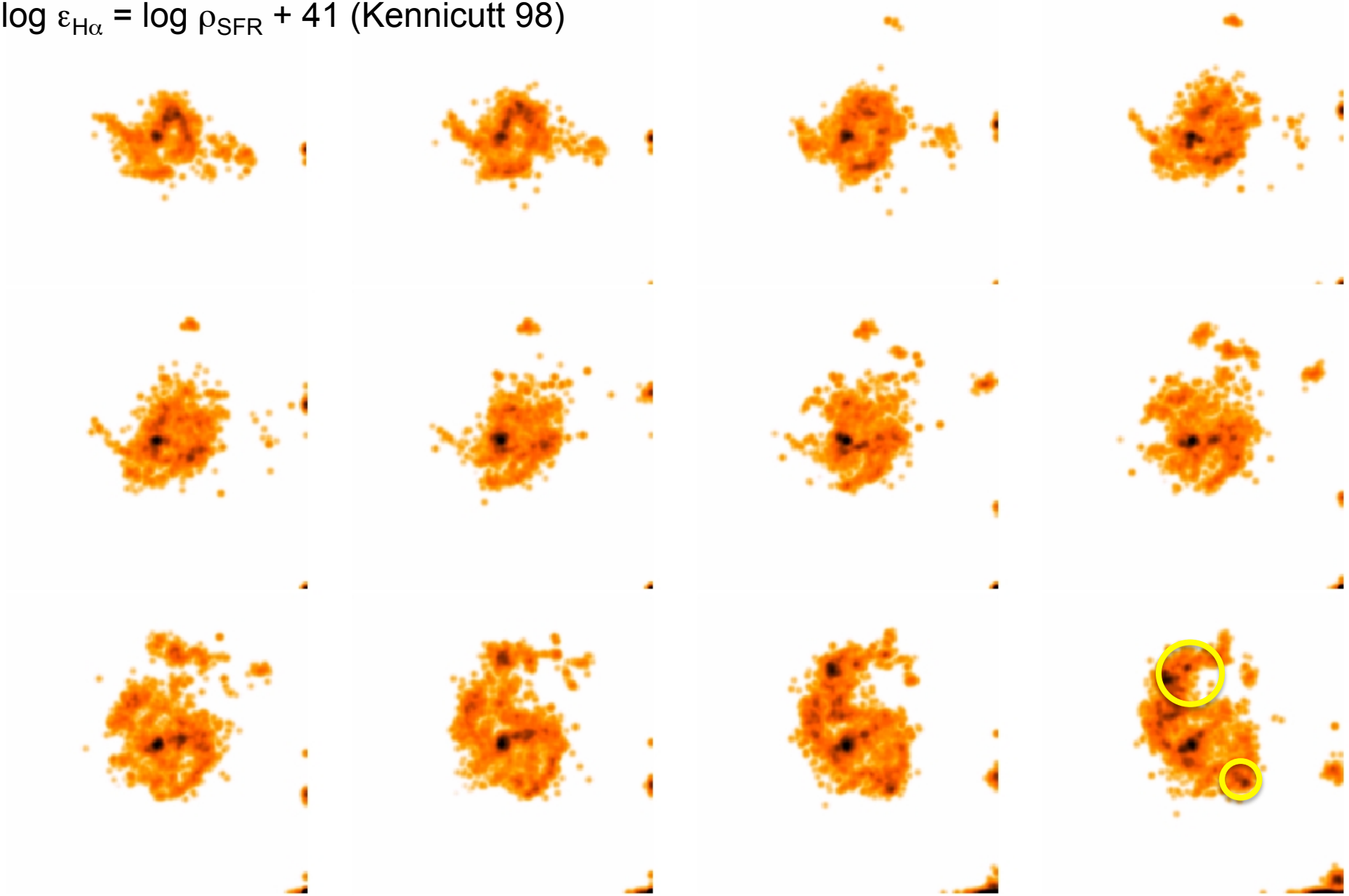


Gas metallicity weighted by mass

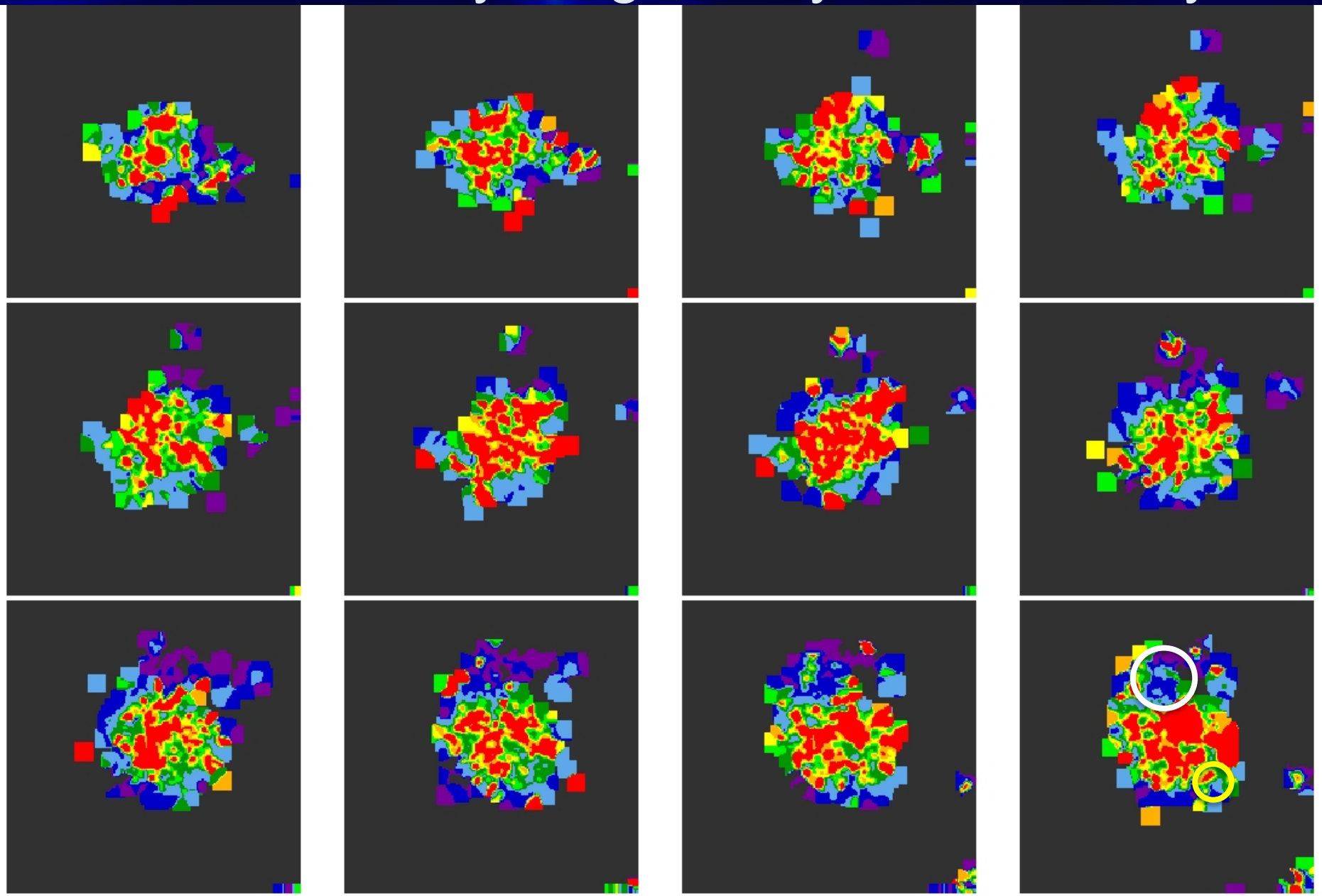


Hα Surface Brightness

log $\varepsilon_{H\alpha}$ = log ρ_{SFR} + 41 (Kennicutt 98)

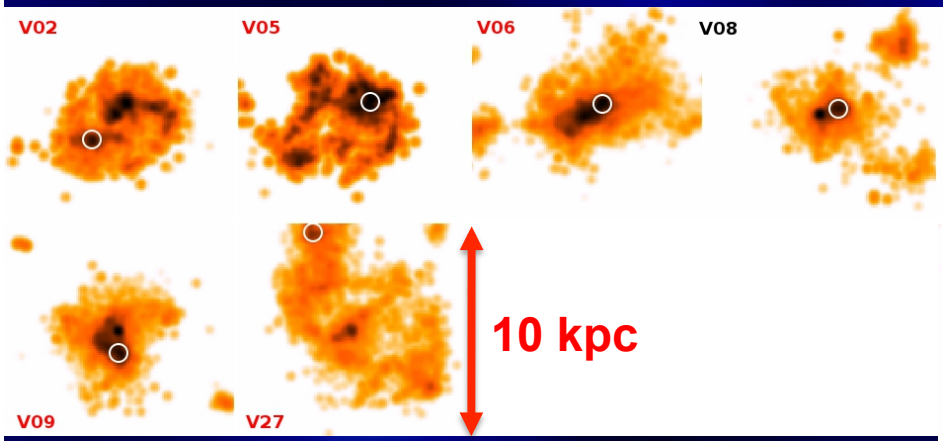


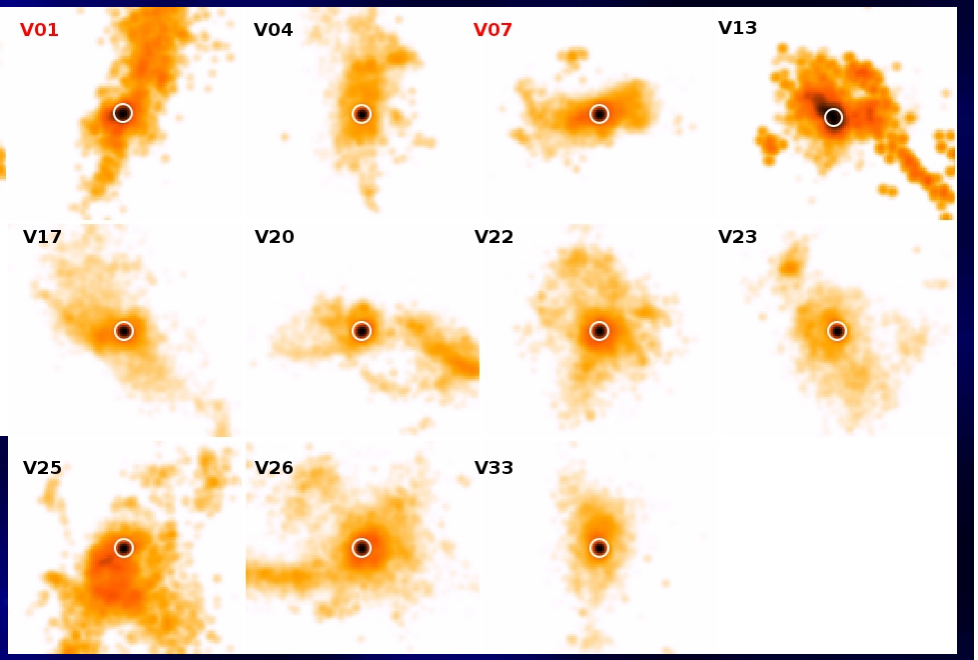
Gas metallicity weighted by Hα emissivity



Sample of Hα Images of Starburst Dwarf Galaxies z=2-6

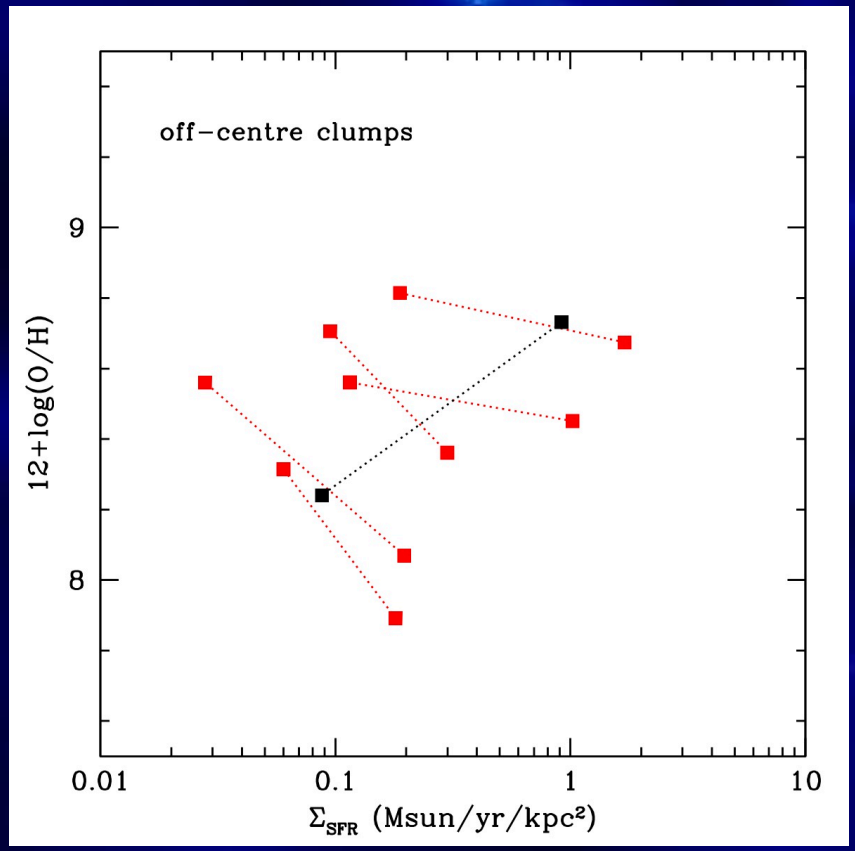
- Off-Center clumps
- Central Clumps

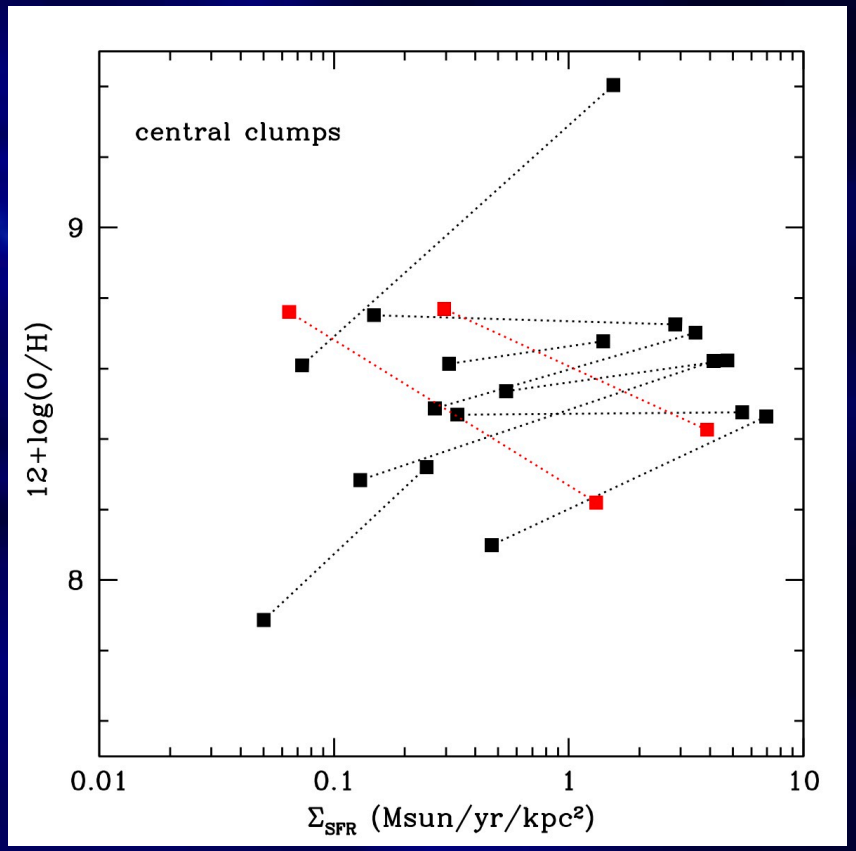




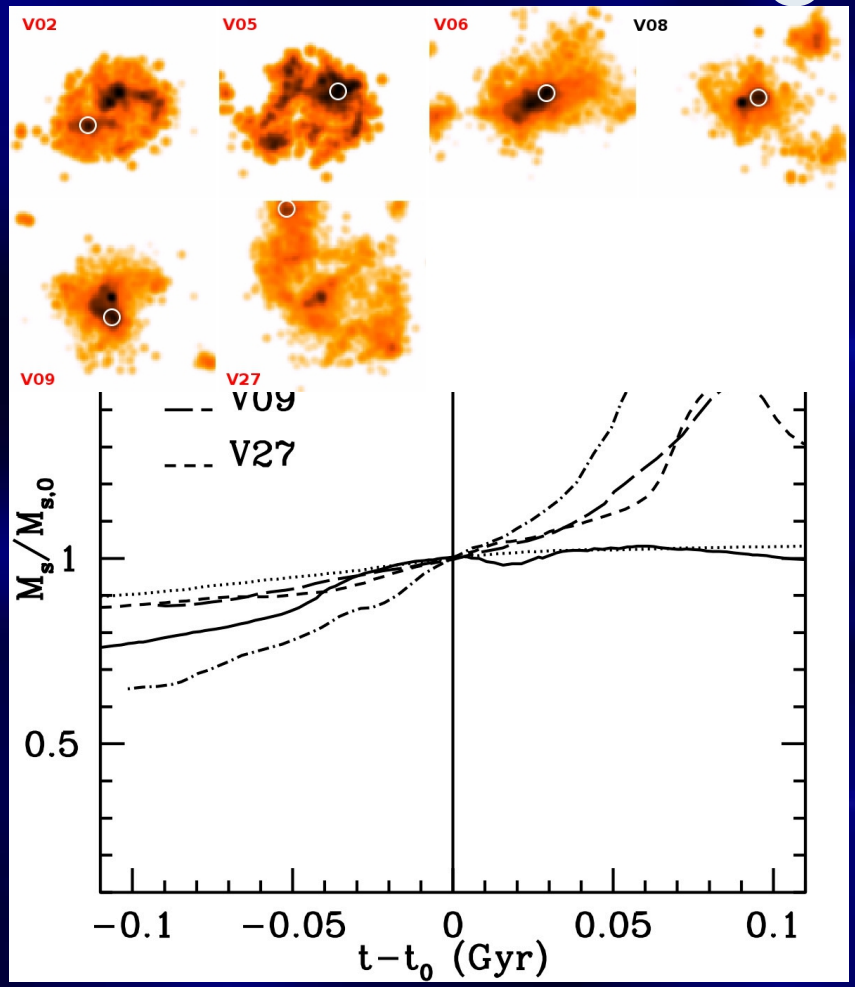
Metallicity drops in clumpy galaxies

The median drop in metallicity is 0.3 dex





Evolution of gas/stellar mass



- significant gas accretion right before the SF burst
- signs of outflows
- No signs of stellar accretion
- Gas infall not related with mergers

Gas mass doubles in 100 Myr

SUMMARY

- Metallicity drops could be evidences of recent (~100 Myr) gas accretion
- Bursts of star-formation triggered by accretion have lower metallicities than in the interstellar medium.
- Due to metal mixing, the median drop in metallicity is 0.3 dex


THE END