

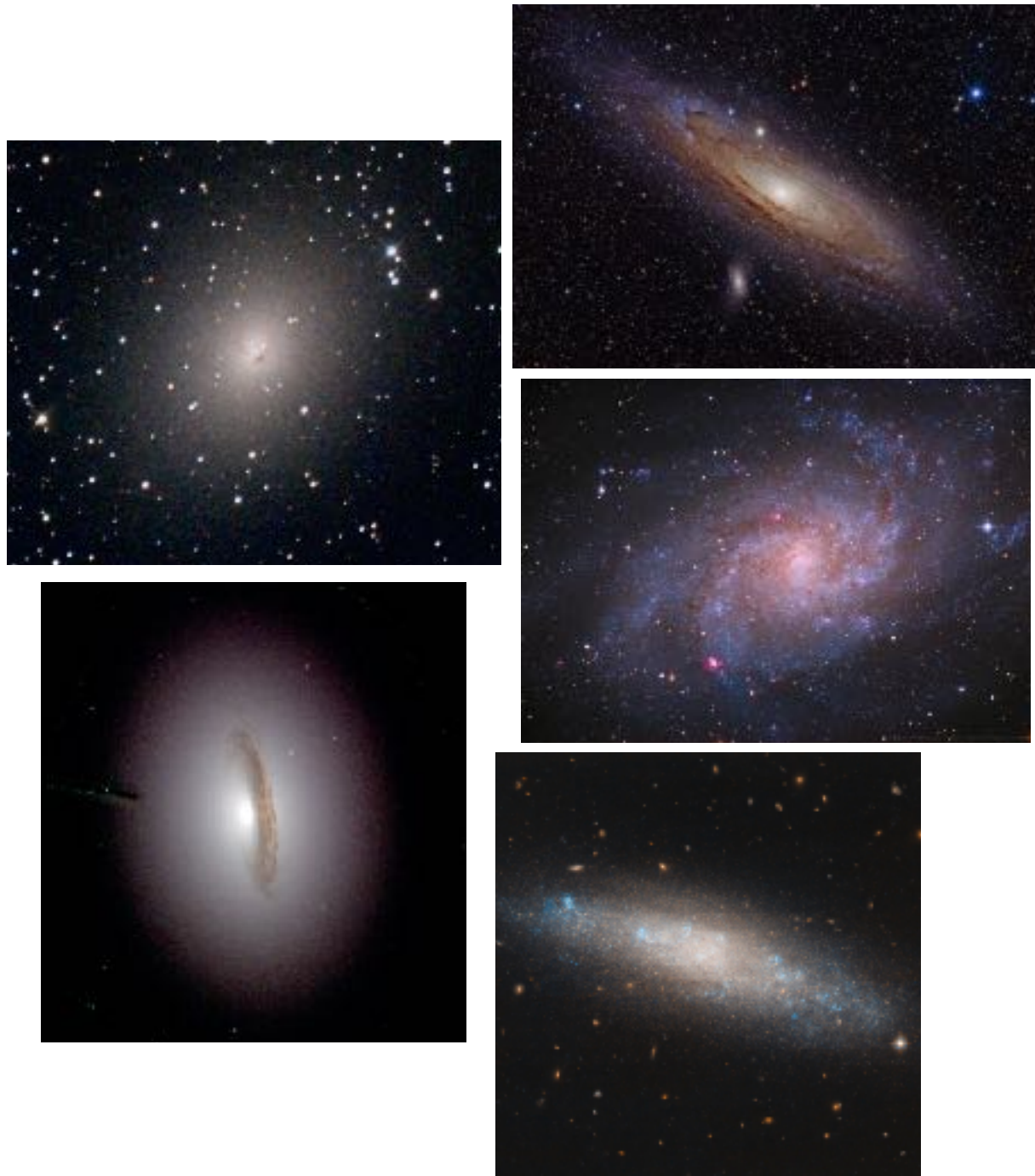
Disentangling the role of halo mass, density and cosmic web filaments in shaping galaxy growth at high redshift

Hyunmi Song (Yonsei), Clotilde Laigle (IAP),
Ho Seong Hwang (KASI), Christophe Pichon (IAP), Yohan Dubois (IAP),
and collaborators

Survey Science Group Workshop 2020
10~12 February 2020 @ high-I resort

What shapes the diversity of galaxies?

Halo mass, local density, ...



... large-scale environment: clusters, anisotropic structures, ...

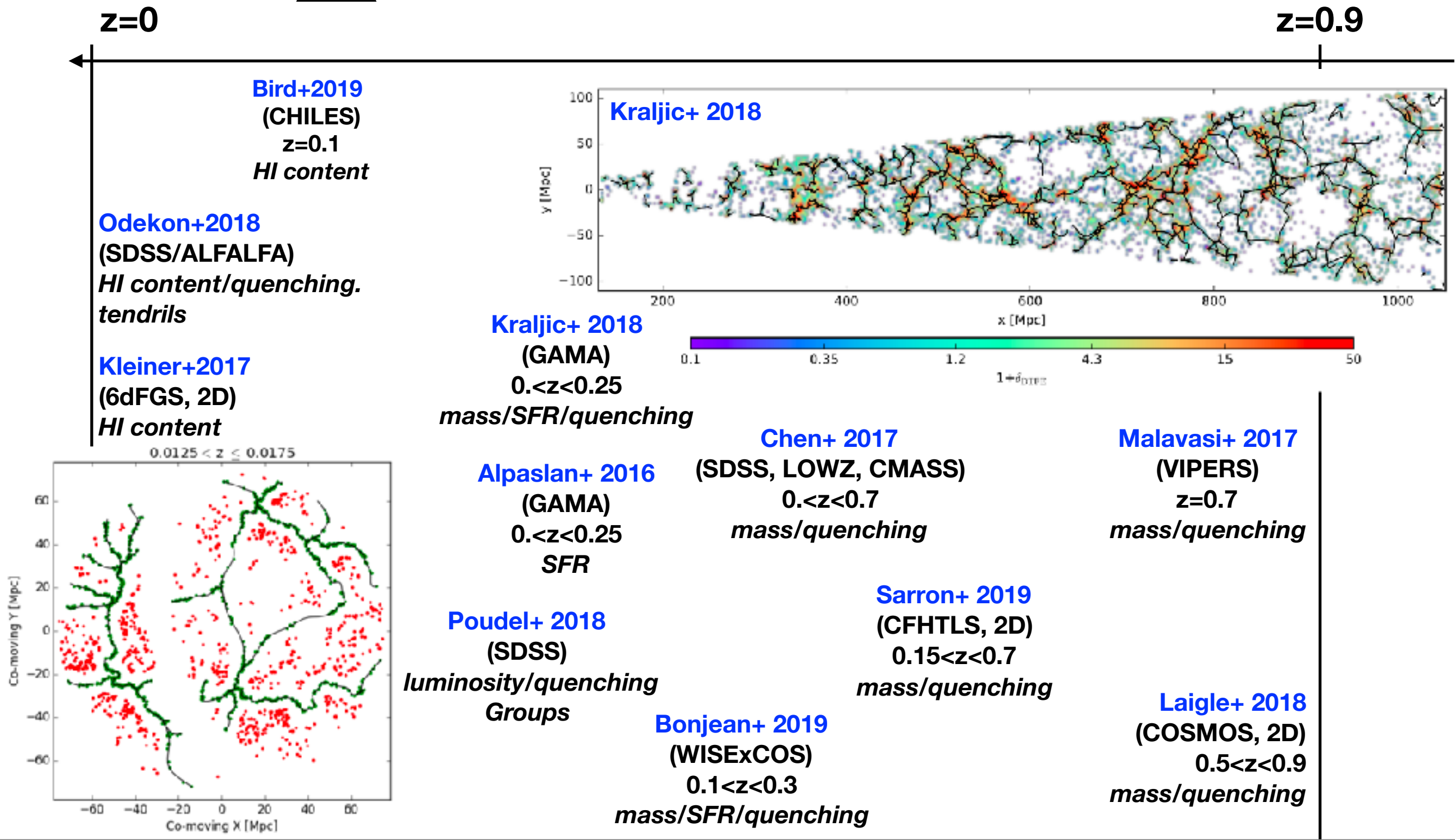
Properties of galaxies in cosmic filaments from $z=0$ to $z=1$

A review

(c) C. Laigle



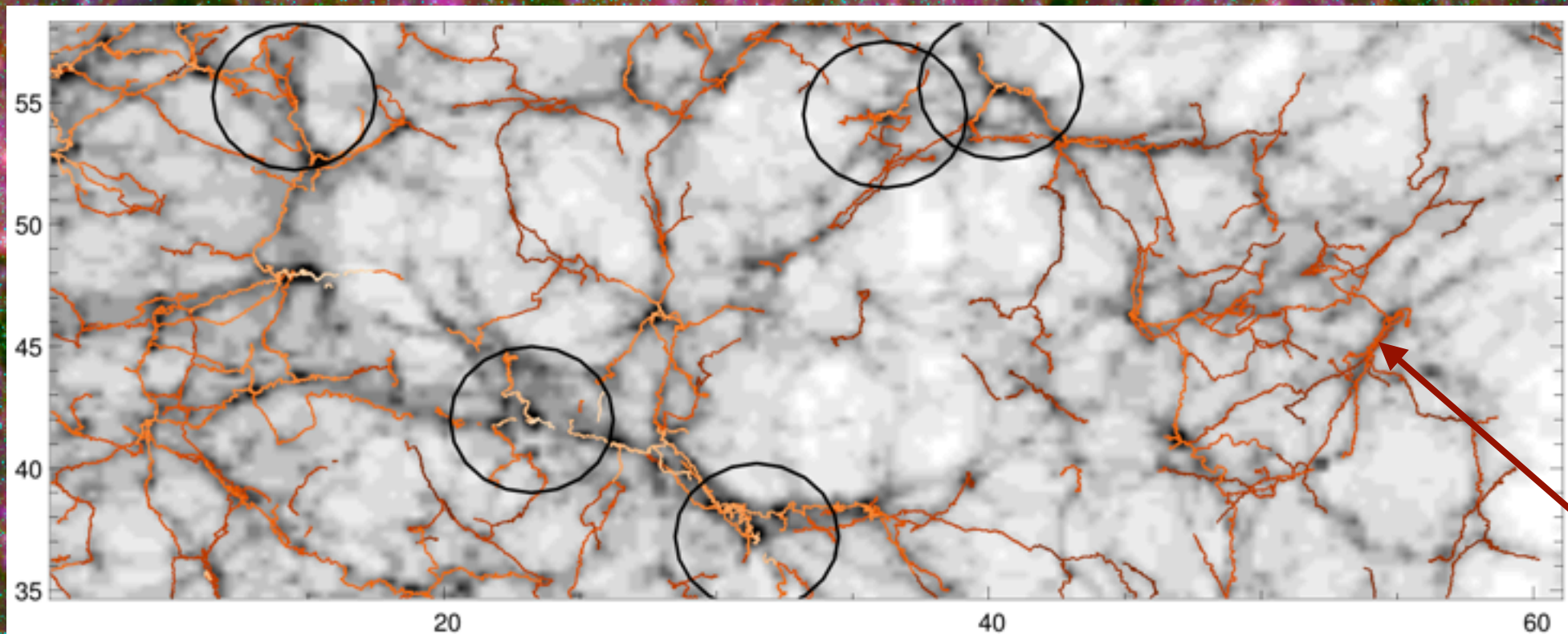
Different scales/filaments extractors/mass ranges ...



Horizon-AGN

Redshift 2 ~ cosmic noon

100 Mpc/h

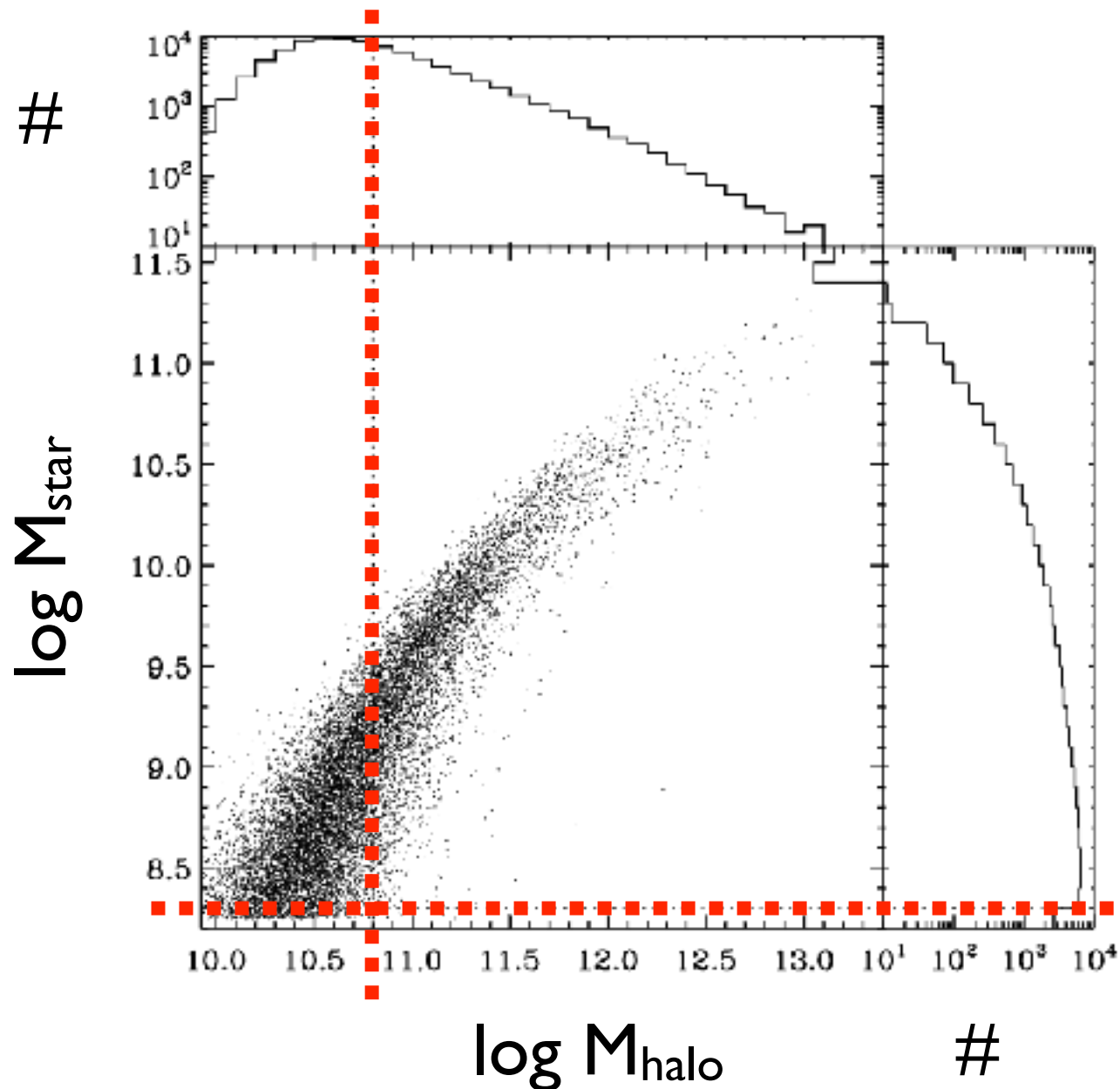


Dubois et al. (2014)

Filaments
extracted
using
Disperse
(Soubie
2011)

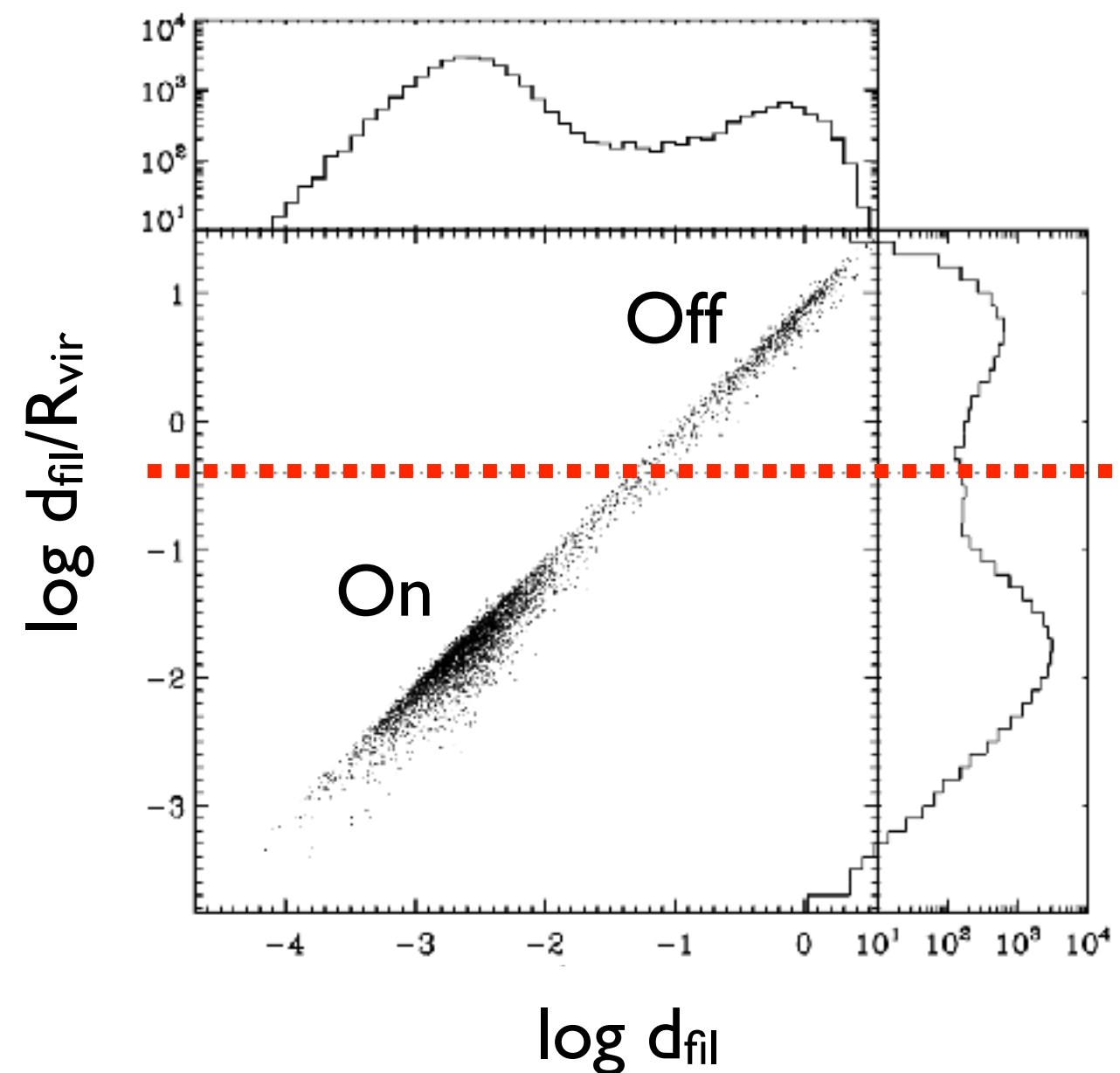
Data

Mass-complete sample
of central galaxies



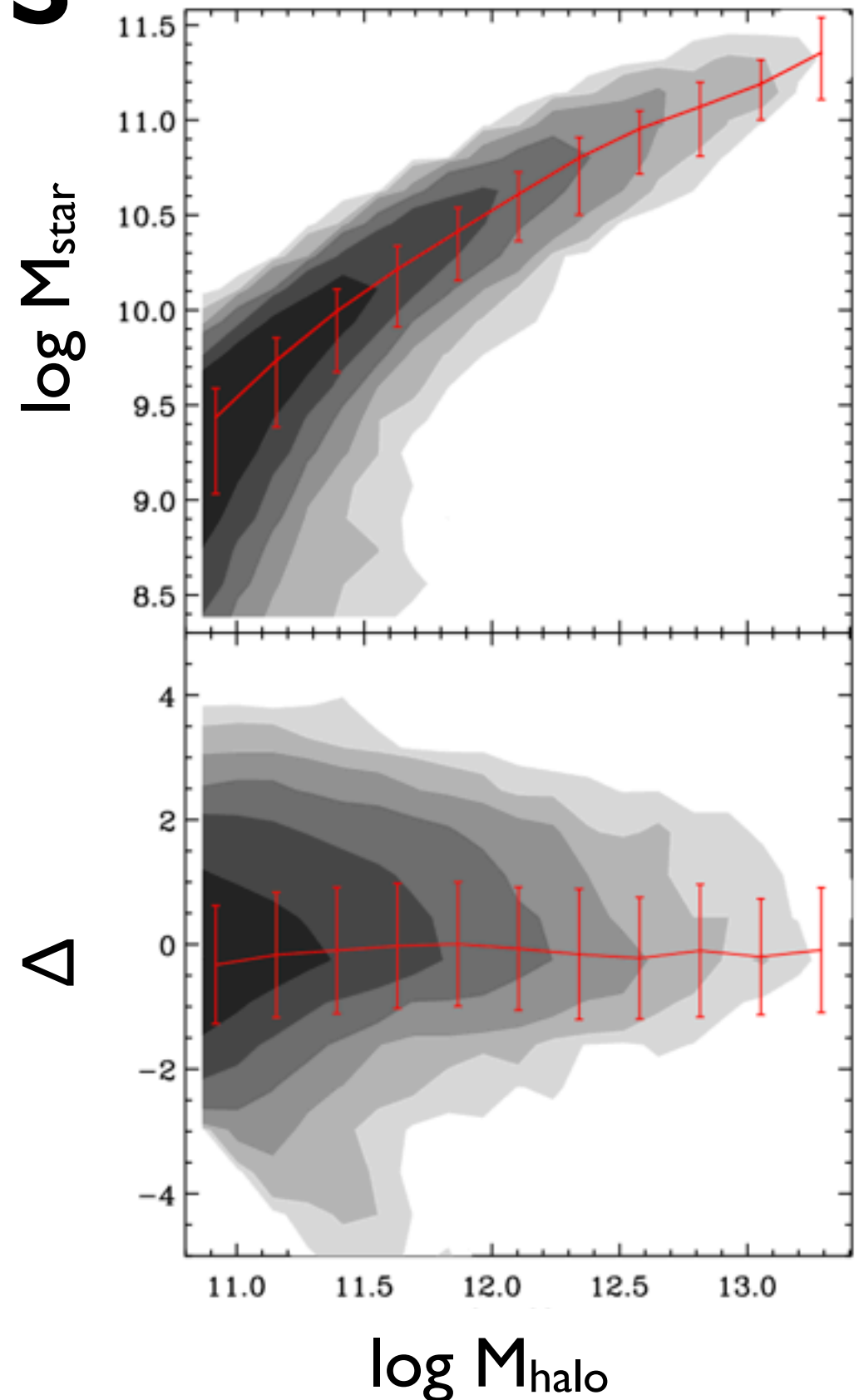
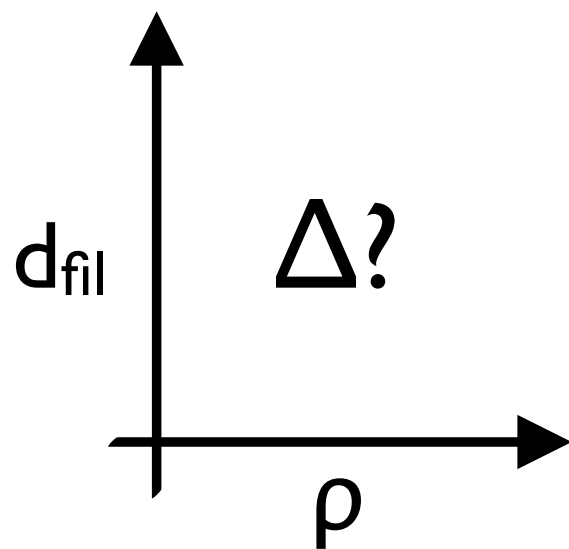
**cluster galaxies excluded*

On- & off-filament
subsamples



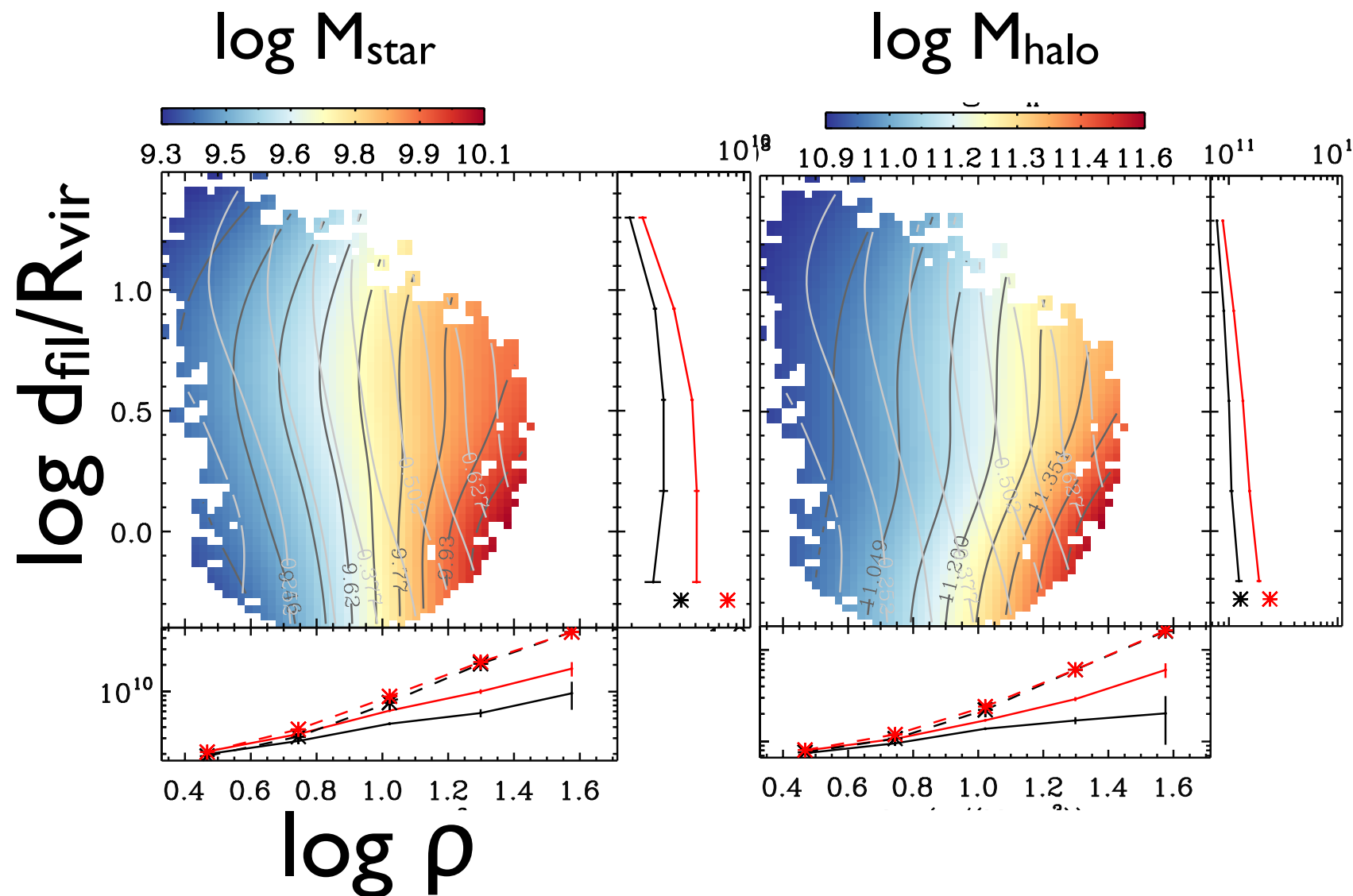
Analysis

- Galaxy property
= $f(M_{\text{halo}}, \rho, d_{\text{fil}})$
- Residual (Δ)
= offset from the mean trend
at a given halo mass
/scatter in the halo mass bin



Preliminary results (Song, Laigle+ in prep.)

What is the role of filaments in shaping galaxy growth?



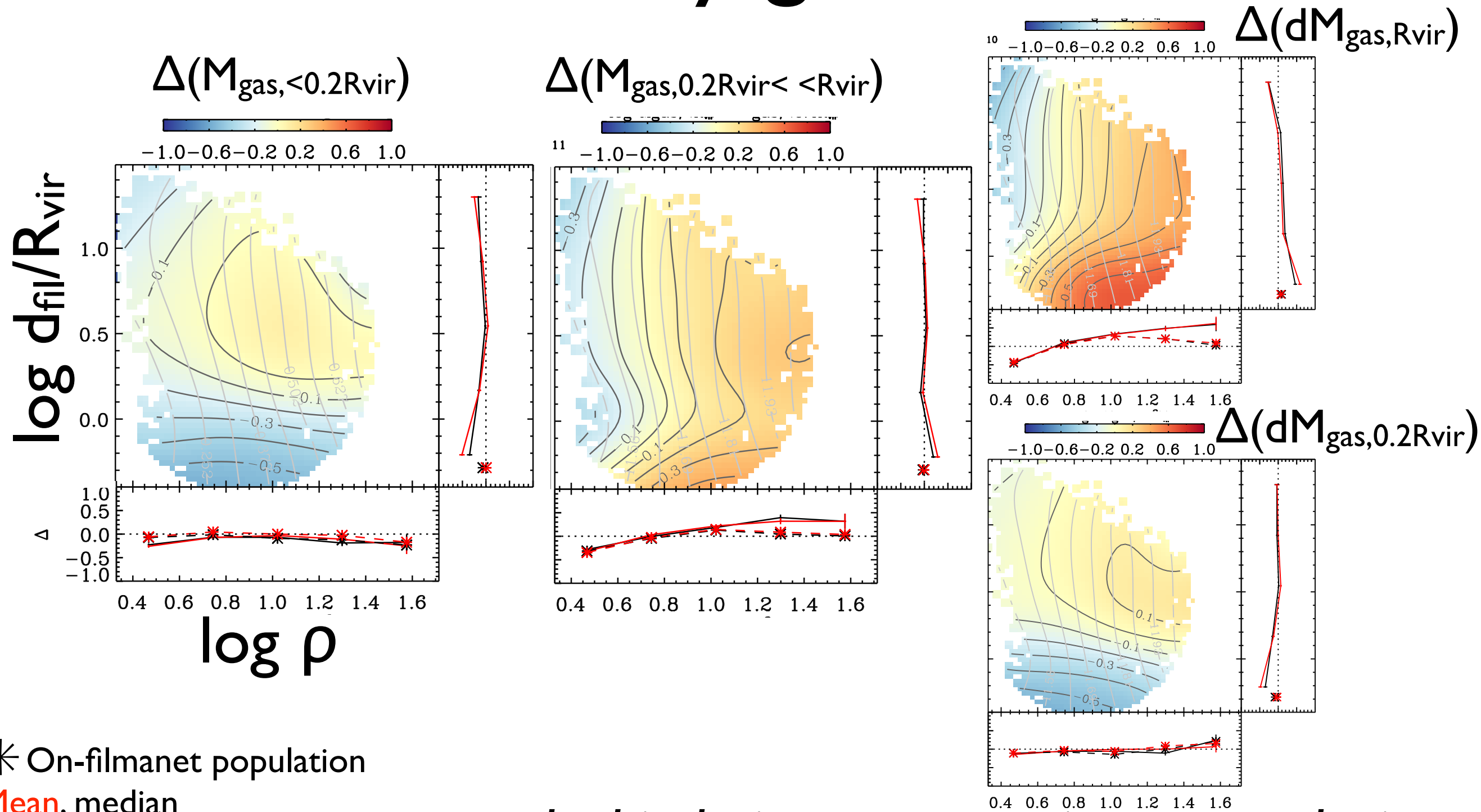
... Proximity to filaments enhances SF up to a certain distance, but suppresses SF until galaxies enter filaments.

* On-filament population

Mean, median

Preliminary results (Song, Laigle+ in prep.)

Filaments suppress star formation of nearby galaxies



... by hindering gas accretion onto galaxies.

Summary

Gas density



Halo



Velocity field lines
color-coded by vorticity



“Off-filament” halos far from filaments:

Star-forming cold gas efficiently injected into galaxies via laminar “tendrils”

“Off-filament” halos close to filaments:

Although gas is on overall denser, accretion onto the galaxy is truncated (increasing anisotropic shear/flow redirection/gas shock heating)

“On-filament” halos:

They sit at the bottom of gravitational potential well. Cold gas might be more easily funneled again through galaxies.



(c) C. Laigle