Probing the Hα, HI and FIR emission in low surface brightness tails of Virgo galaxies and their connection with the Virgo intra-cluster component

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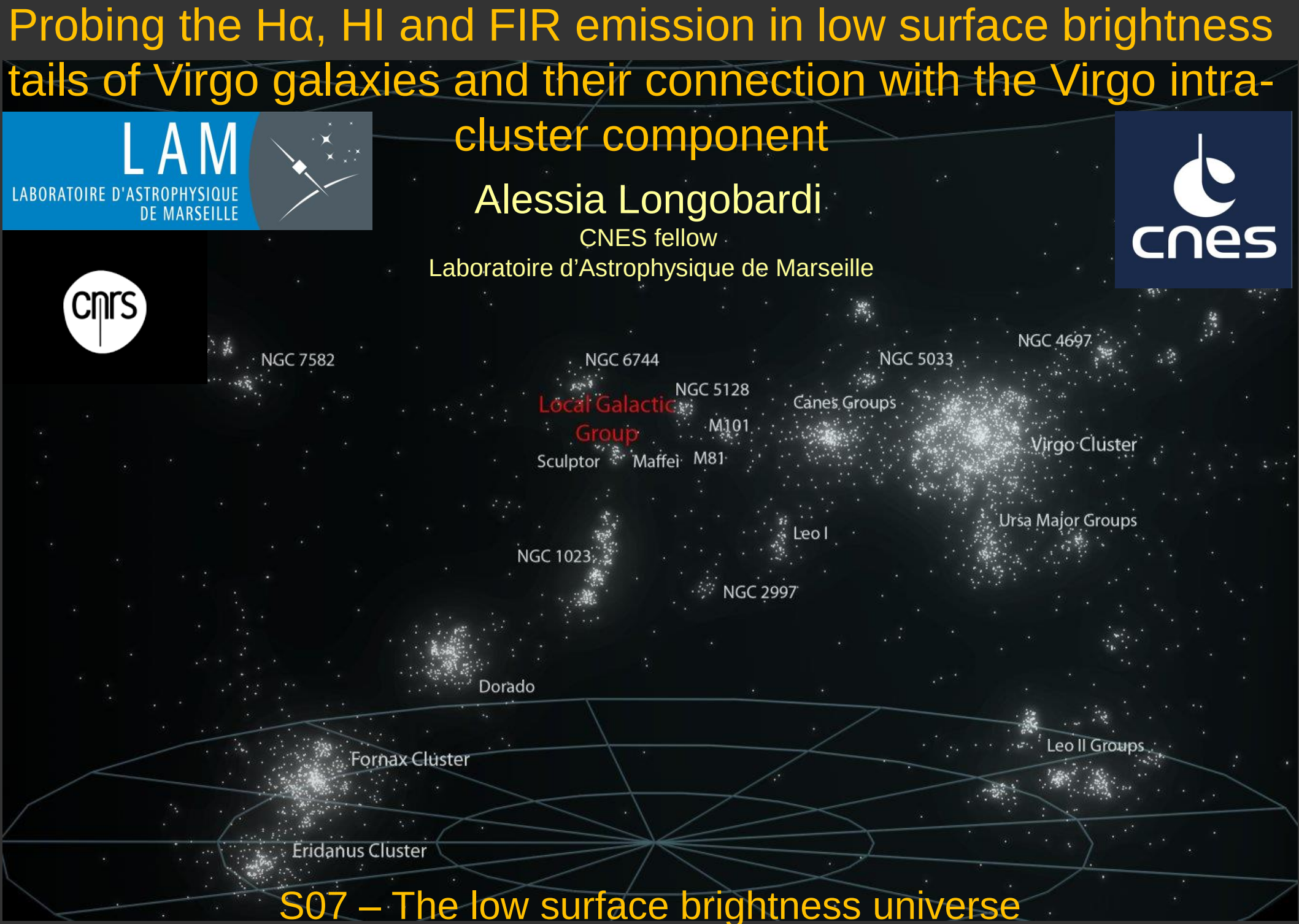


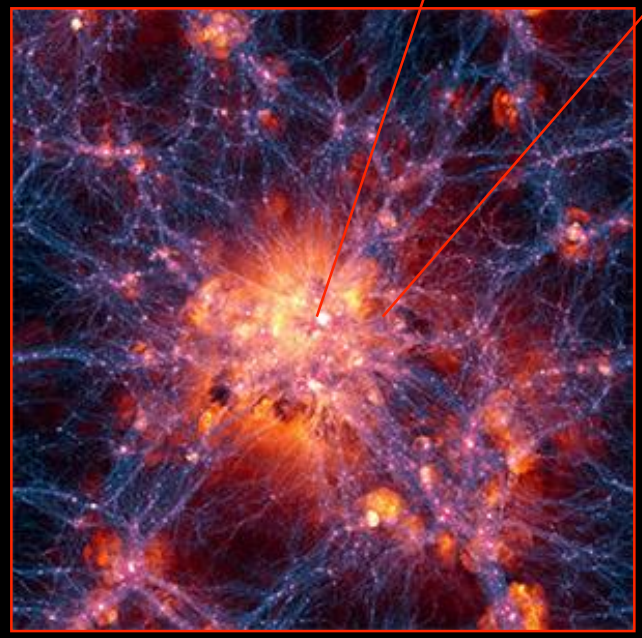
S07 – The low surface brightness universe

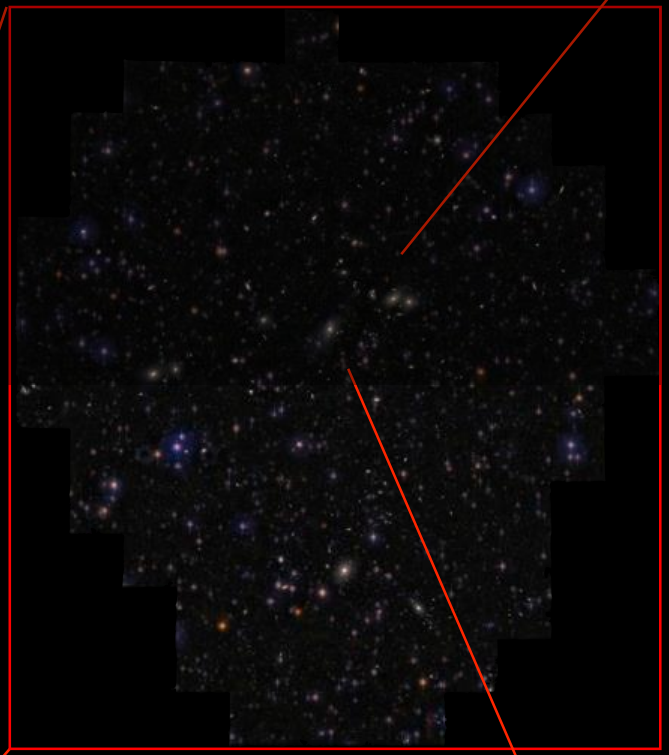
Semaine de la SF2A May 14-17 2019 – Nice, France

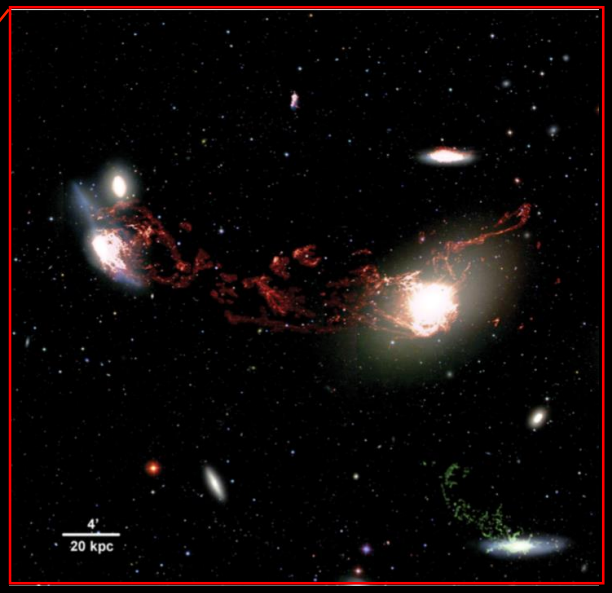
How do structures form and evolve ?

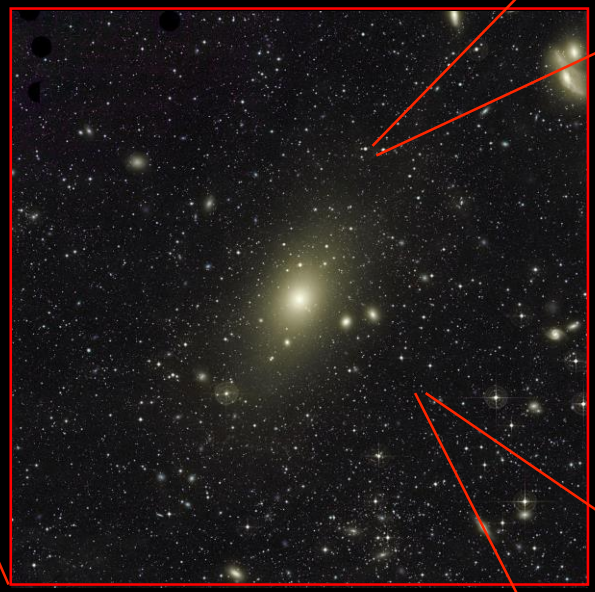
Local universe as analogue of the over-dense regions in the high-redshift universe

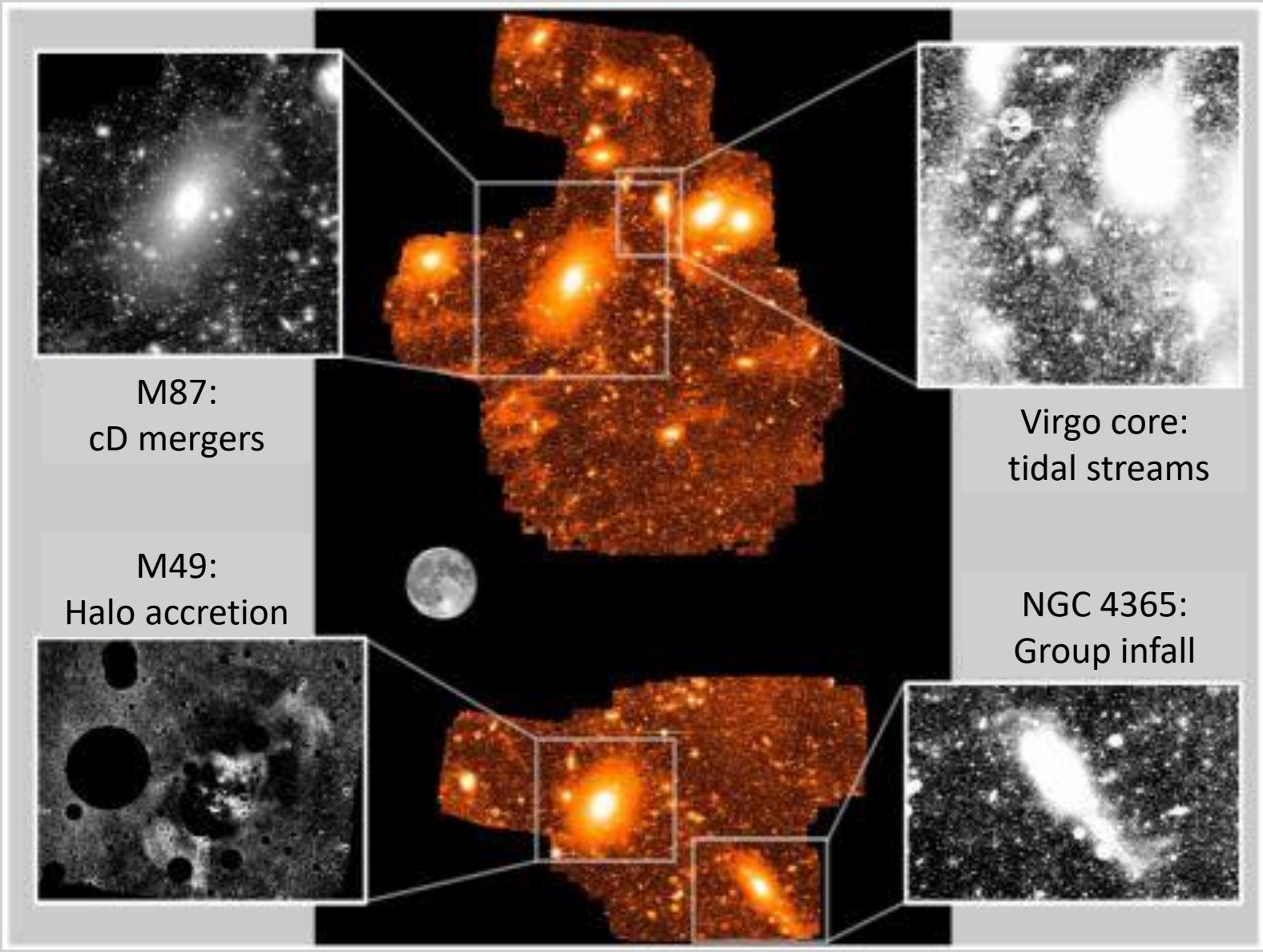
Ideal laboratories for studying (at high resolution) the perturbing mechanisms that shaped galaxy evolution.











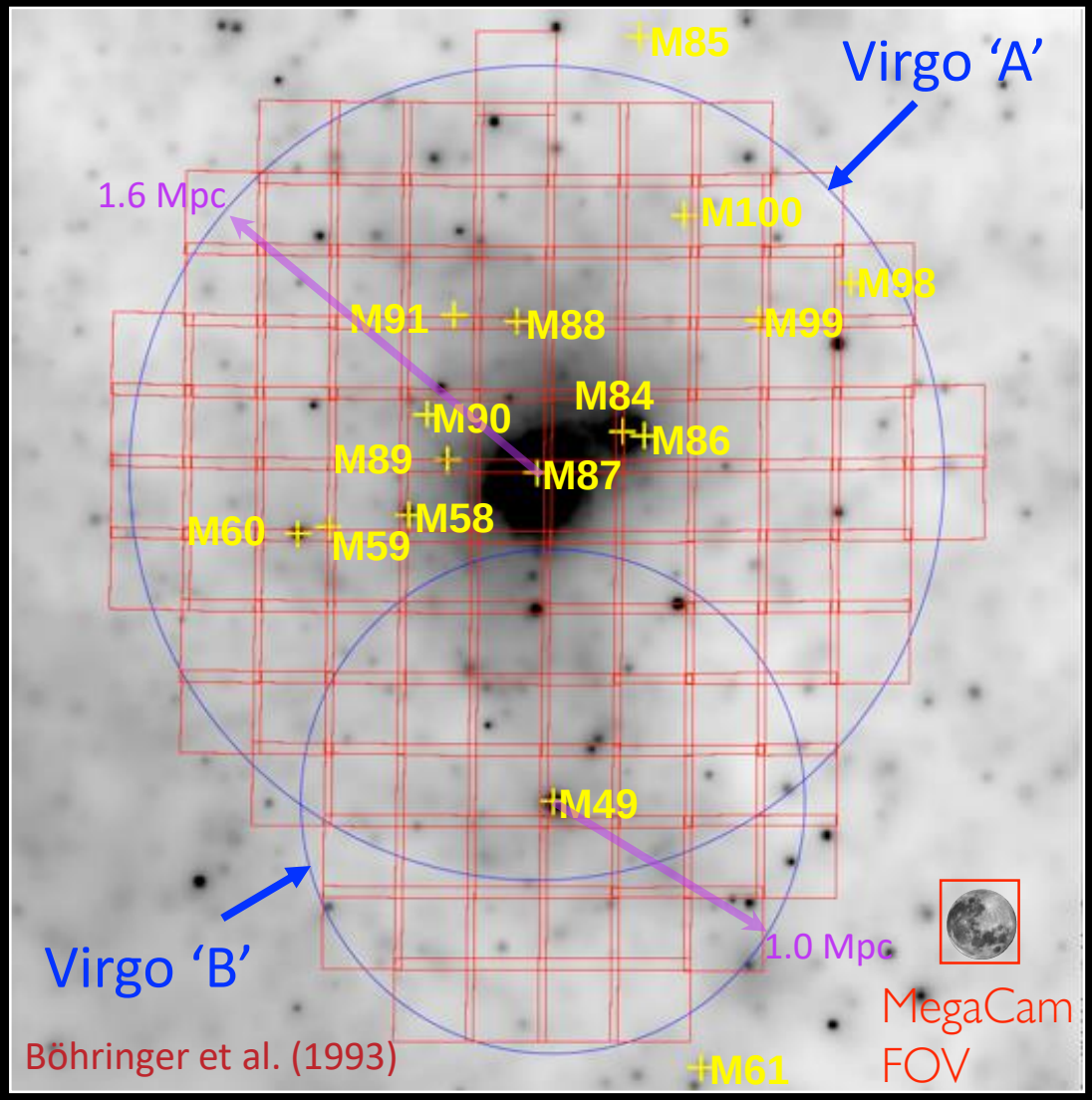
Ultra-deep wide field image of the Virgo cluster (Mihos et al. 2017)

- The richest and closest cluster of galaxies (16.5 Mpc, M_{dyn} ~ 4 x 10^{14} Mo)
- excellent angular resolution (1 arcsec = 80 pc)
- access to large elliptical, spiral and dwarf population (M_{star} ~ 10^{5} Mo) as well as the intra-cluster population

Virgo Cluster Surveys

Deep surveys map the Virgo cluster at different wavelengths.

Virgo in X-rays



X-ray: **ROSAT** (Nulsen & Bohringer, 1995)

OPTICAL : **NGVS** (Ferrarese et al. 2012)
S: ~ *g* 25.9 mag ; ~ g 29 mag arcsec^{-2}
R: < 1"

OPTICAL - Hα: **VESTIGE** (Boselli et al. 2018)
S: f(Hα) ~ 4x10^{-17} erg sec^{-1} cm^{-2} (5σ) for point sources; *Σ(Hα)* ~ 2x10^{-18} erg sec^{-1} cm^{-2} arcsec^{-2} (1σ) for ext. sources at 3" res

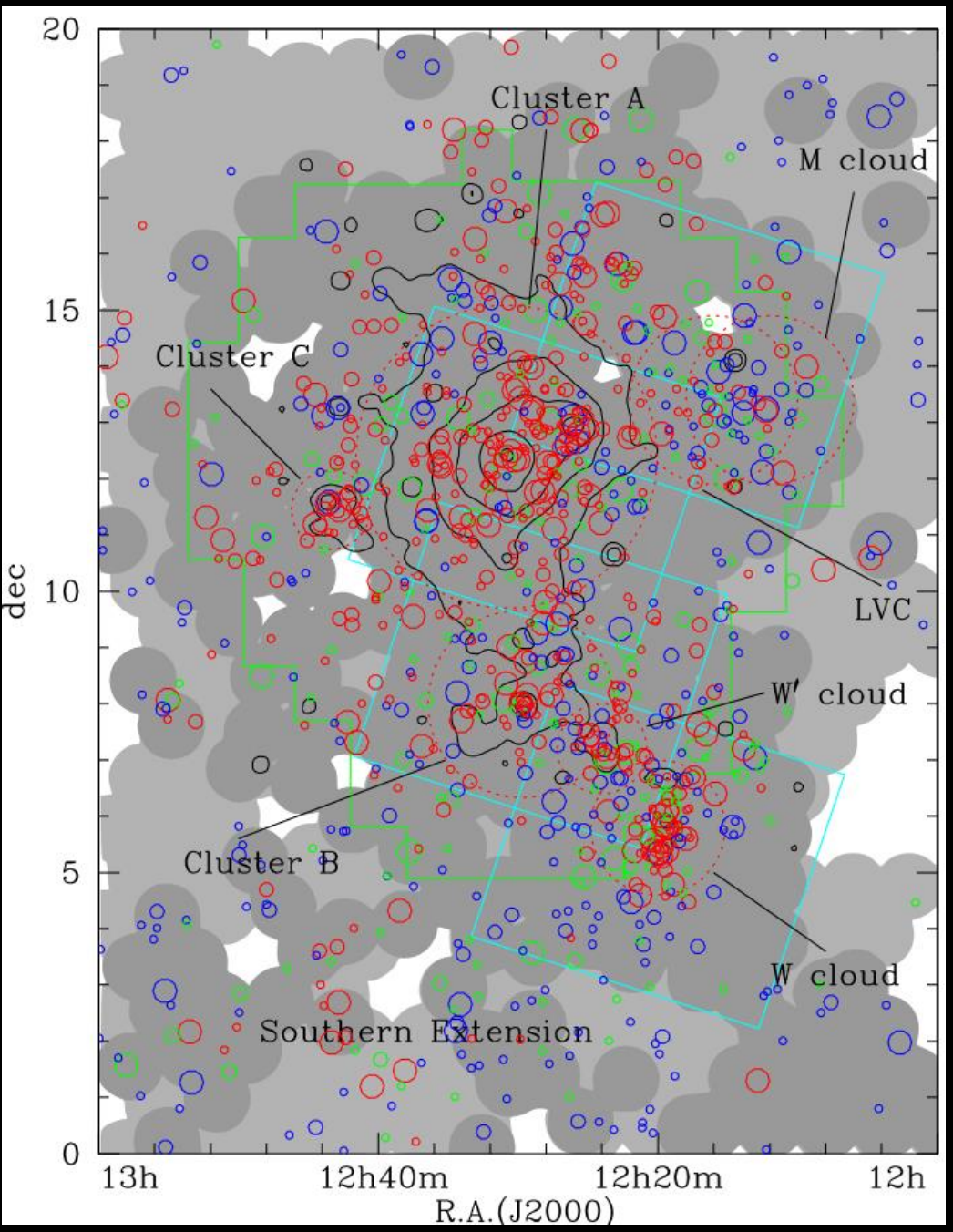
UV: **GALEX UV Virgo Cluster Survey** (GUViCS; Boselli et al. 2011)
S: ~ 21.5 mag; ~27.5 mag arcsec $^{-2}$
R:4"-5"

Near-IR: **SPITZER** (Werner et al. 2004)

Far-IR: Herschel Virgo Cluster Survey (HeViCS; Davis et al. 2010)
S: 6.8, 3.1 MJy/sr (PACS)
1.0, 0.7, 0.3 MJy/sr (SPIRE)
R: ~7"-35"

radio HI: **VIVA** (Chung et al. 2009)
S: 3-5 x 10^{19} cm^{-2} @ 10 km s^{-1}
R: 15"

Virgo Cluster Surveys

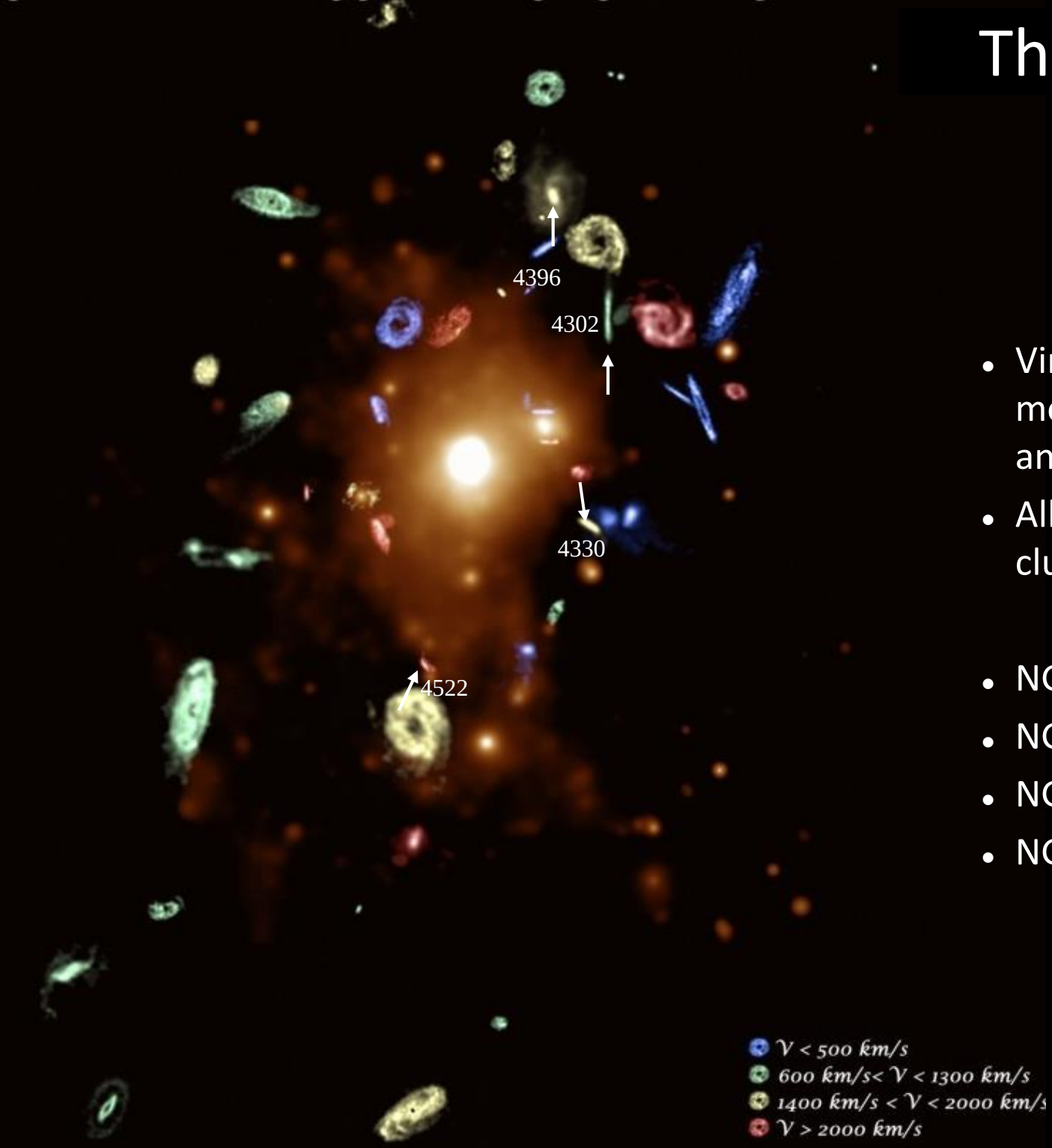


SCIENCE CASES

- The effects of the environment on galaxy evolution
- The fate of the stripped gas and dust in Virgo galaxies
- The interplay between the dust and gas in the different phases

Late-type Early-type Green valley

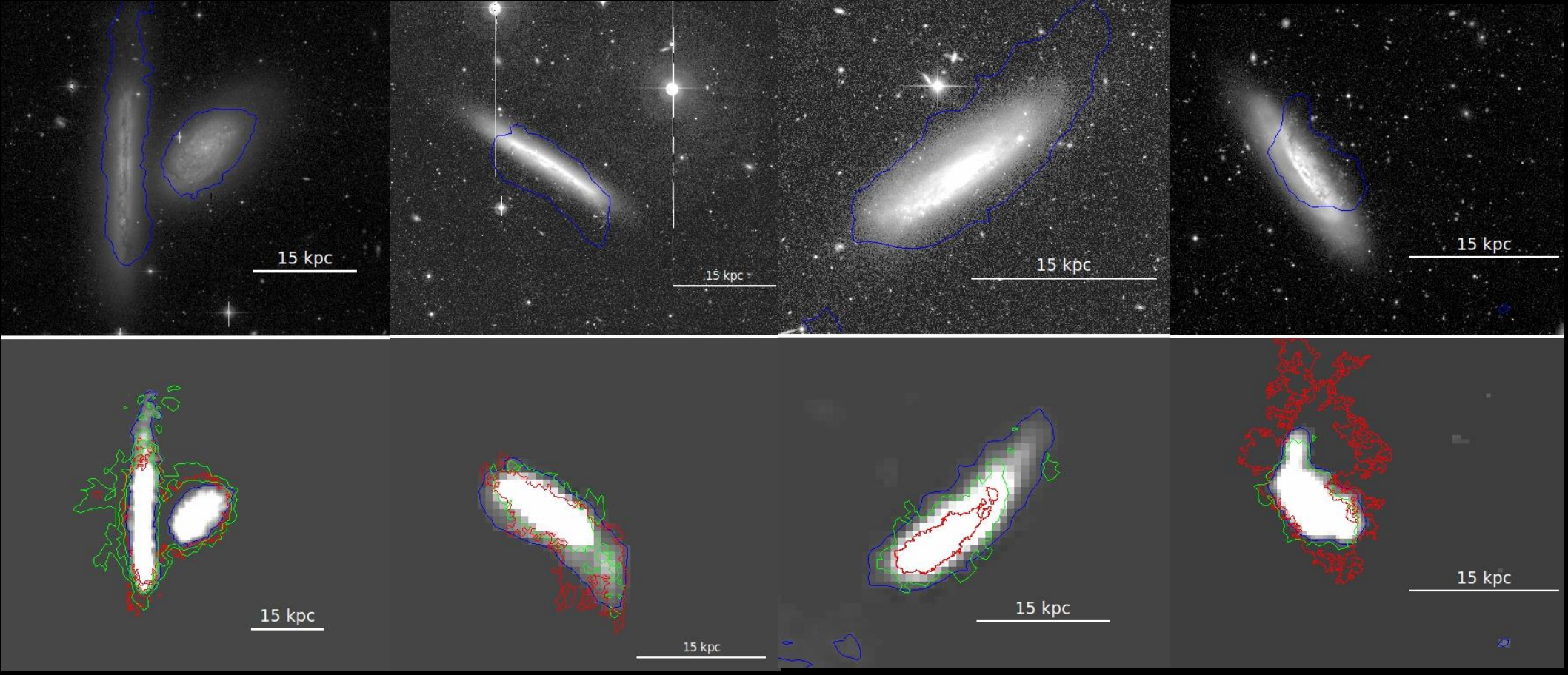
The galaxy sample



- Virgo galaxies with asymmetric morphologies in the HI, Halpha and FIR emission
- All within 4 deg from the cluster's centre

- NGC4302 (1150 km/s)
- NGC4330 (1563 km/s)
- NGC4396 (-128 km/s)
- NGC4522 (2329 km/s)

Image by A. Chung



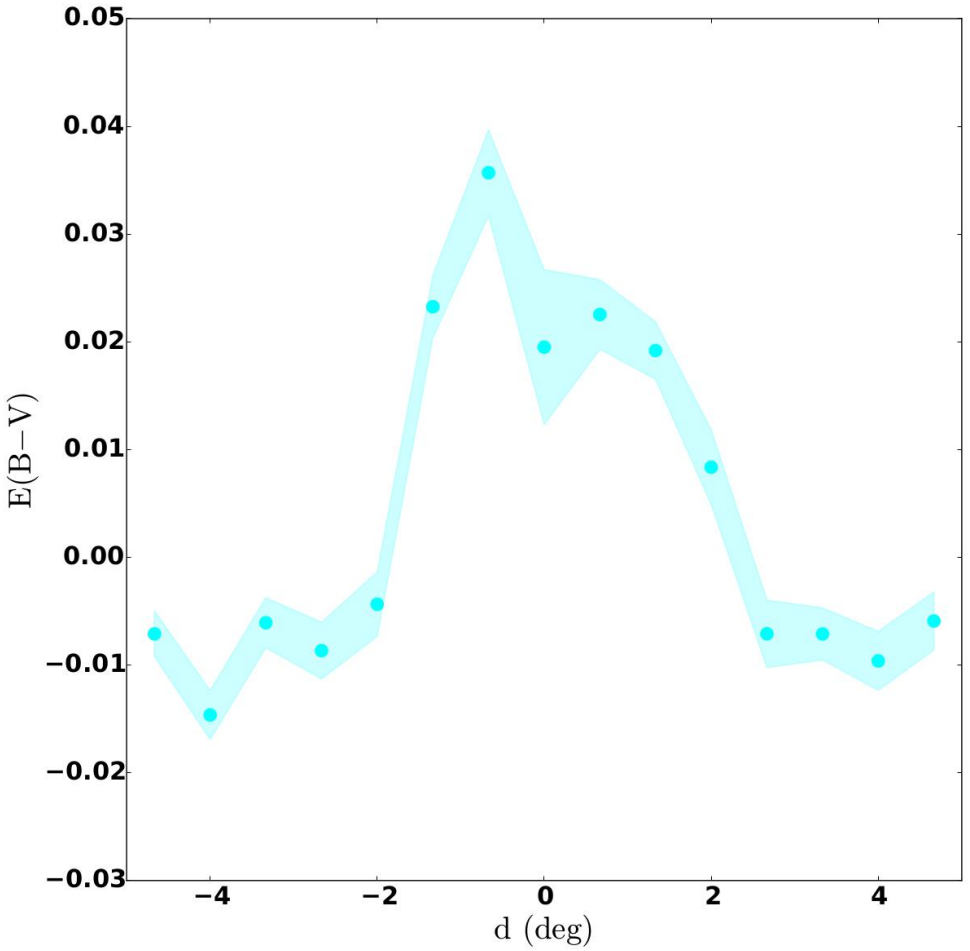
NGC4302 NGC4330 NGC4396 NGC4522

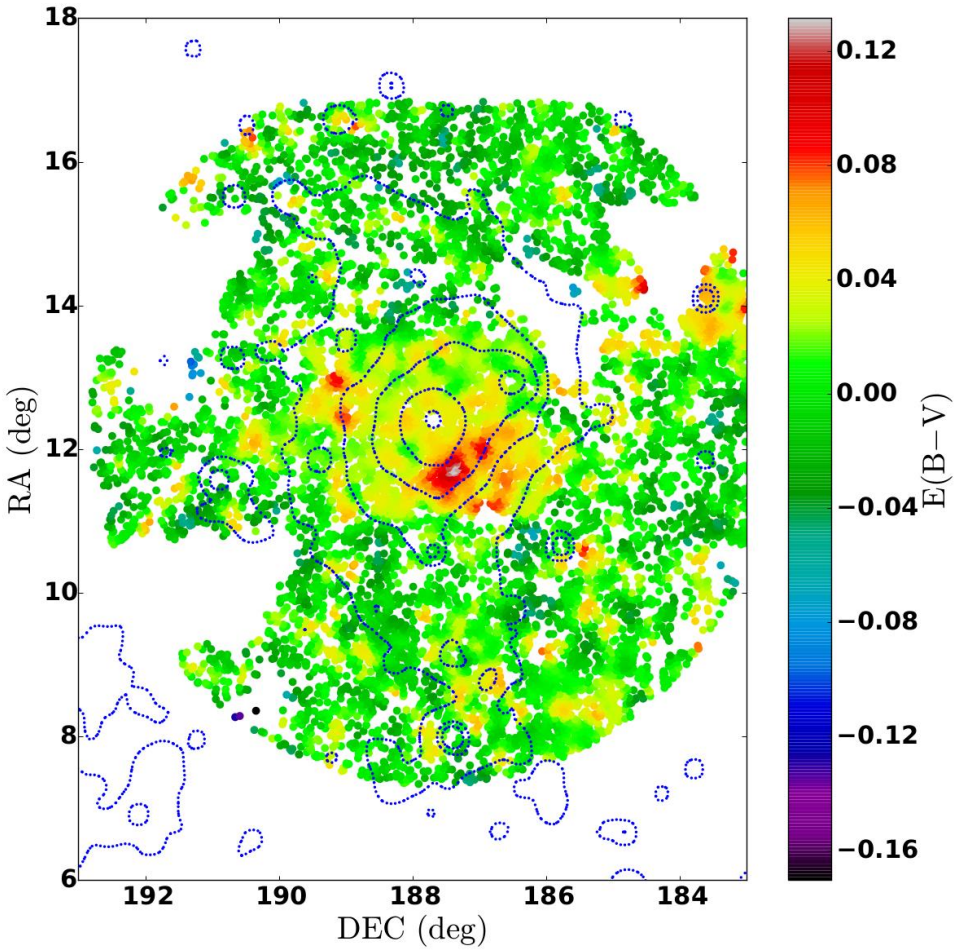
HI contours : 1-7 x 10^{19} cm^{-2}

Hα contours: 0.5 – 1.5 10^{-17} erg s^{-1} cm^{-2} $arcsec^{-2}$

FIR contours: ~ 0.1 mJy

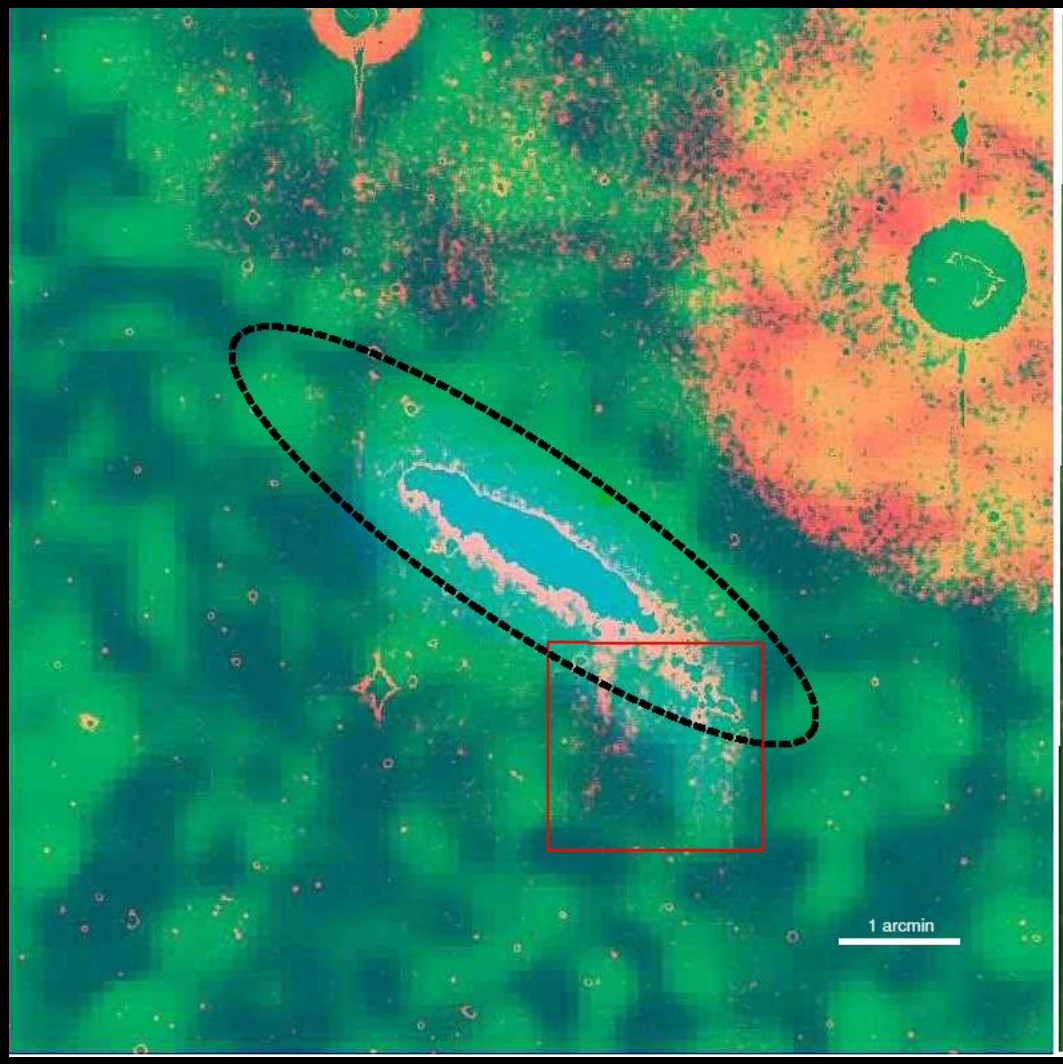
Diffuse Dust in the Virgo intra-cluster space

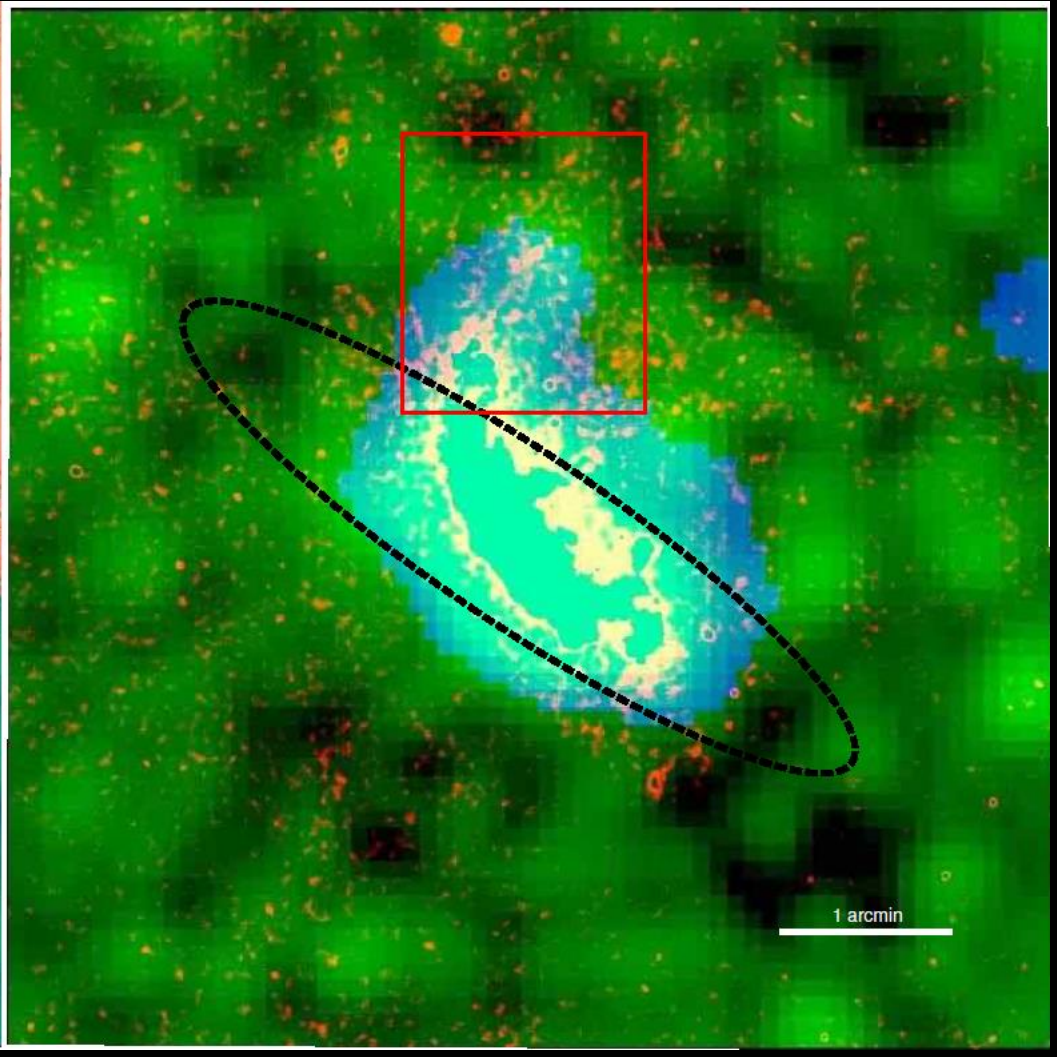




E(B-V) values are higher going closer to the cluster's center

Centrally concentrated profile as measured for the stellar component of the intra-cluster light



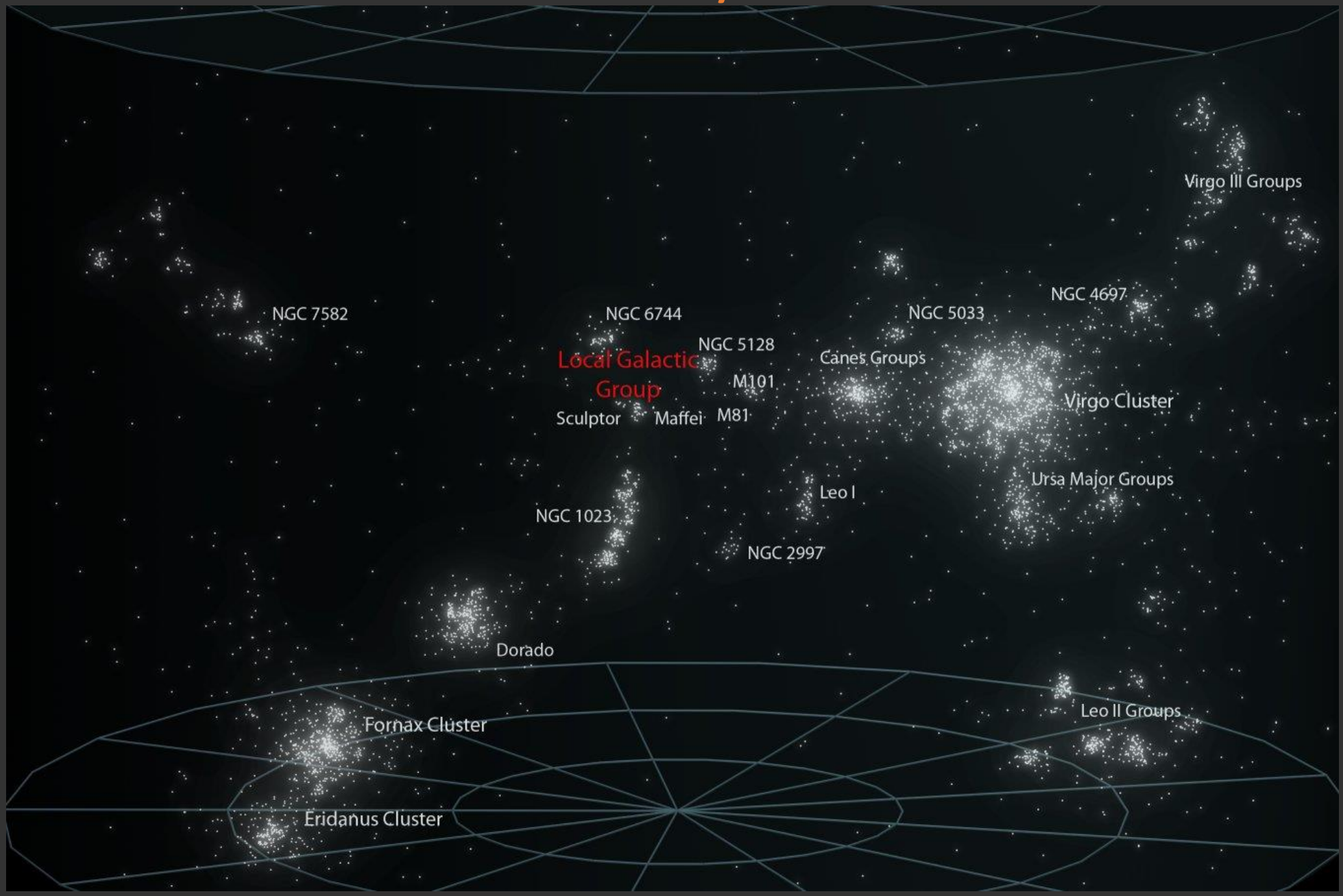


Blue HI Red Hα Green FIR

ALMA follow-up to detect the diffuse and compact dust emission (λ 1.3 μm)

- Study of the dust content of the intra-cluster component
- Measure dust-to-gas ratios in tails of stripped material
- Understand the role of tidal processing in the metal pollution of the inter galactic medium

Thank you


Virgo III Groups
NGC 7582
NGC 6744
NGC 4697
NGC 5033
NGC 5128
Local Galactic Group
Canes Groups
M101
Virgo Cluster
Sculptor
Maffei
M81
Ursa Major Groups
Leo I
NGC 1023
NGC 2997
Dorado
Leo II Groups
Fornax Cluster
Eridanus Cluster