

Stelle, popolazioni stellari e mezzo interstellare @ INAF-OAS Bologna

Stelle, popolazioni stellari e mezzo interstellare @ INAF-OAS Bologna



Stelle, popolazioni stellari e mezzo interstellare @ INAF-OAS Bologna

- L'Istituto Nazionale di Astrofisica (INAF) è il principale ente di ricerca pubblico italiano per l'astronomia e l'astrofisica, con sedi in diverse città italiane
- L'Osservatorio di Astrofisica e Scienza dello Spazio (OAS) di Bologna è una di queste



Stellar astrophysics... on the cutting edge!



Francesca Annibali (dwarf galaxies, streams)



Michele Bellazzini (dwarf galaxies, streams, Gaia)



Angela Bragaglia (star clusters, spectroscopy, Gaia)



Francesco Calura (chemo-dynamical models)



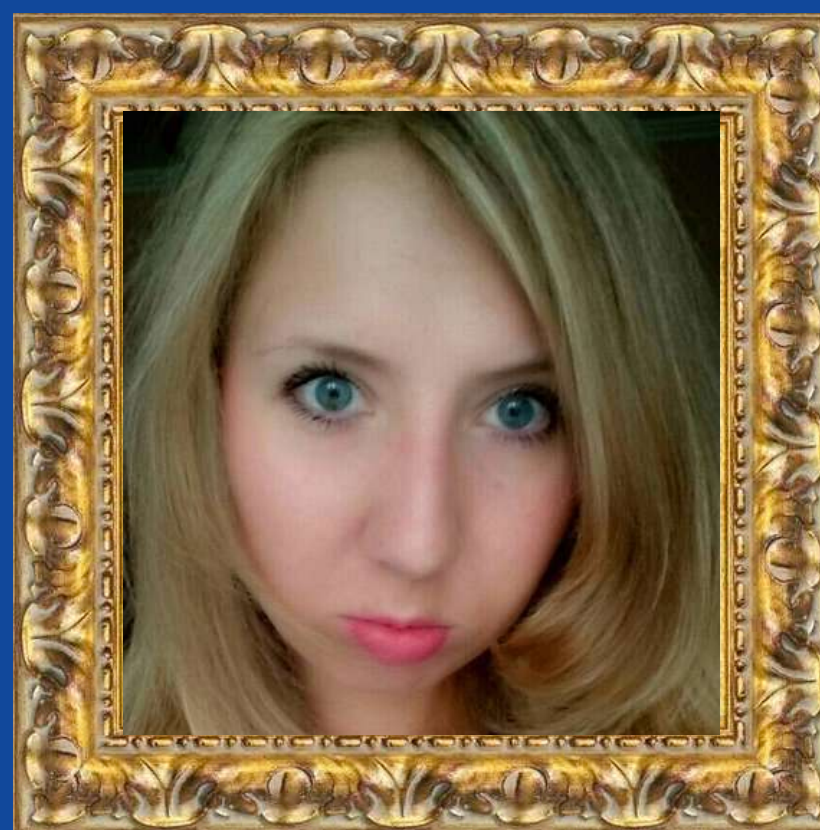
Ricardo Carrera (star clusters, spectroscopy)



Eugenio Carretta (star clusters, spectroscopy)



Felice Cusano (dwarf galaxies)



Tatiana Muraveva (variable stars, distance scale, Gaia)



Emanuele Dalessandro (star clusters, UV)



Davide Massari (star clusters and dwarf galaxies, streams, astrometry, Gaia)



Livia Origlia (star clusters, spectroscopy, IR, instrumentation)



Donatella Romano (chemical evolution models)

Stellar astrophysics... on the cutting edge!



Alessia Garofalo (variable stars, dwarf galaxies, Gaia)

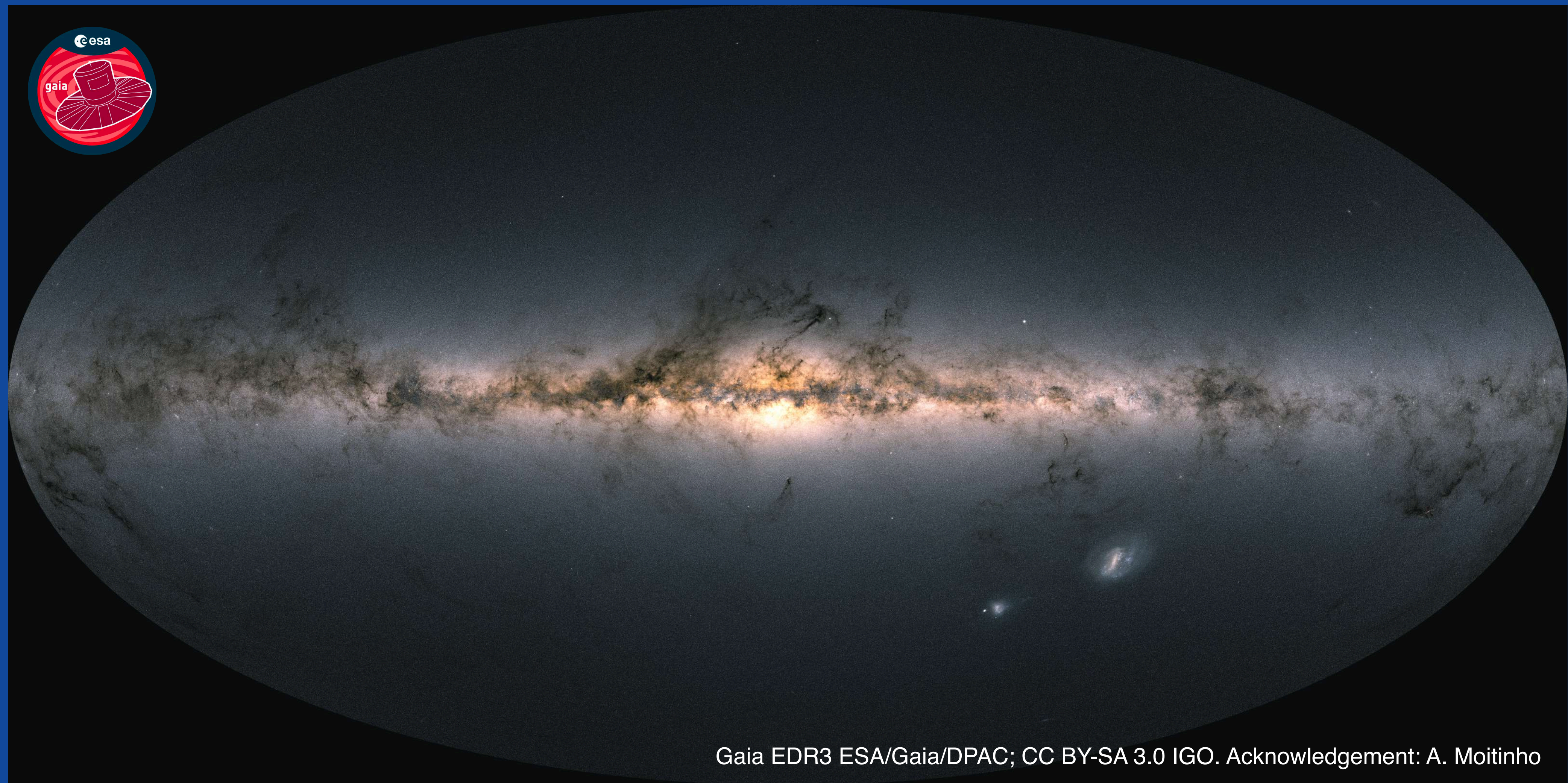


Raffaele Pascale (dynamics of stellar systems, hydrodynamical simulations)

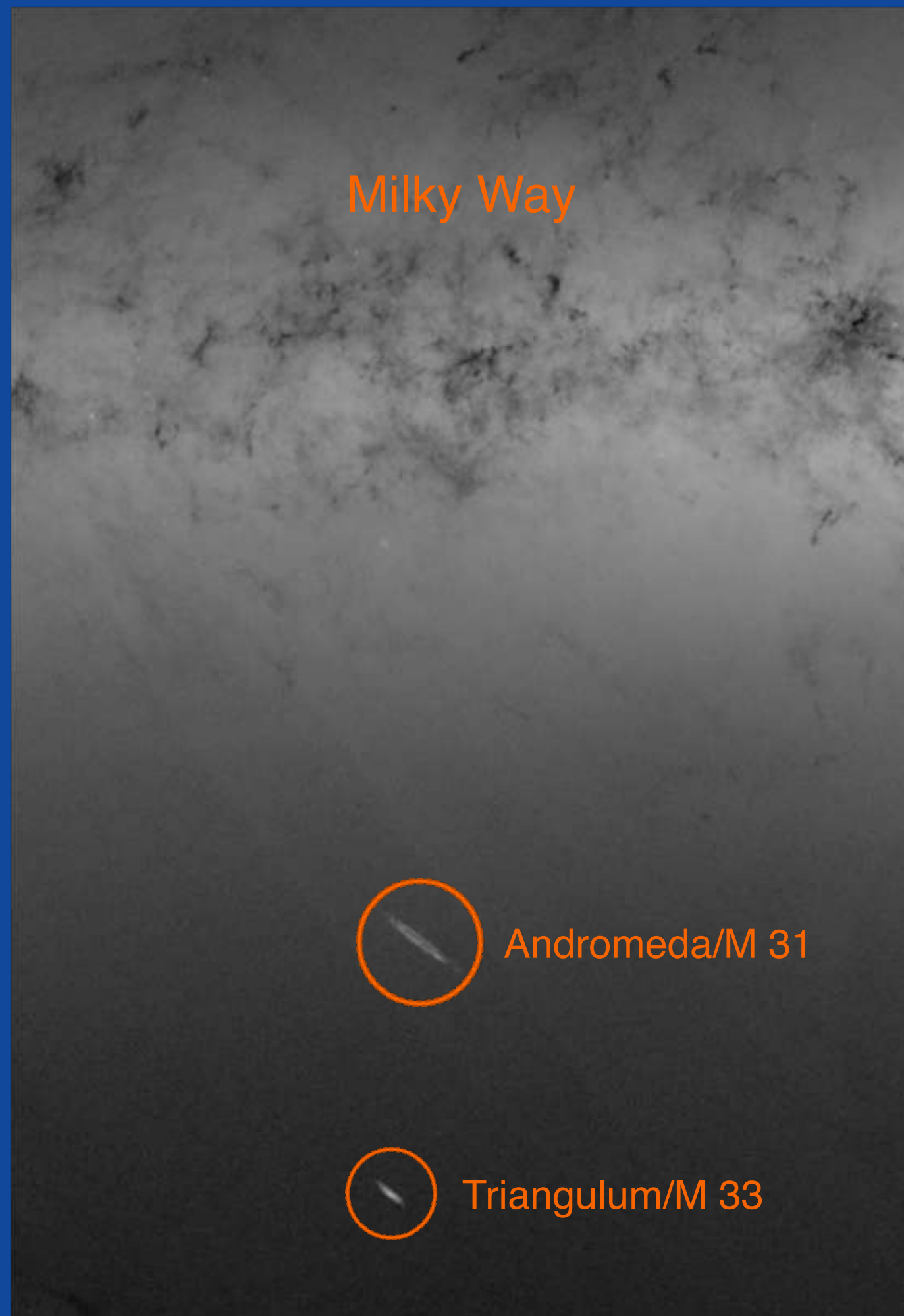


Al terzo piano della Stecca

This is our playground



It is made of gas, dust, stars and stellar systems

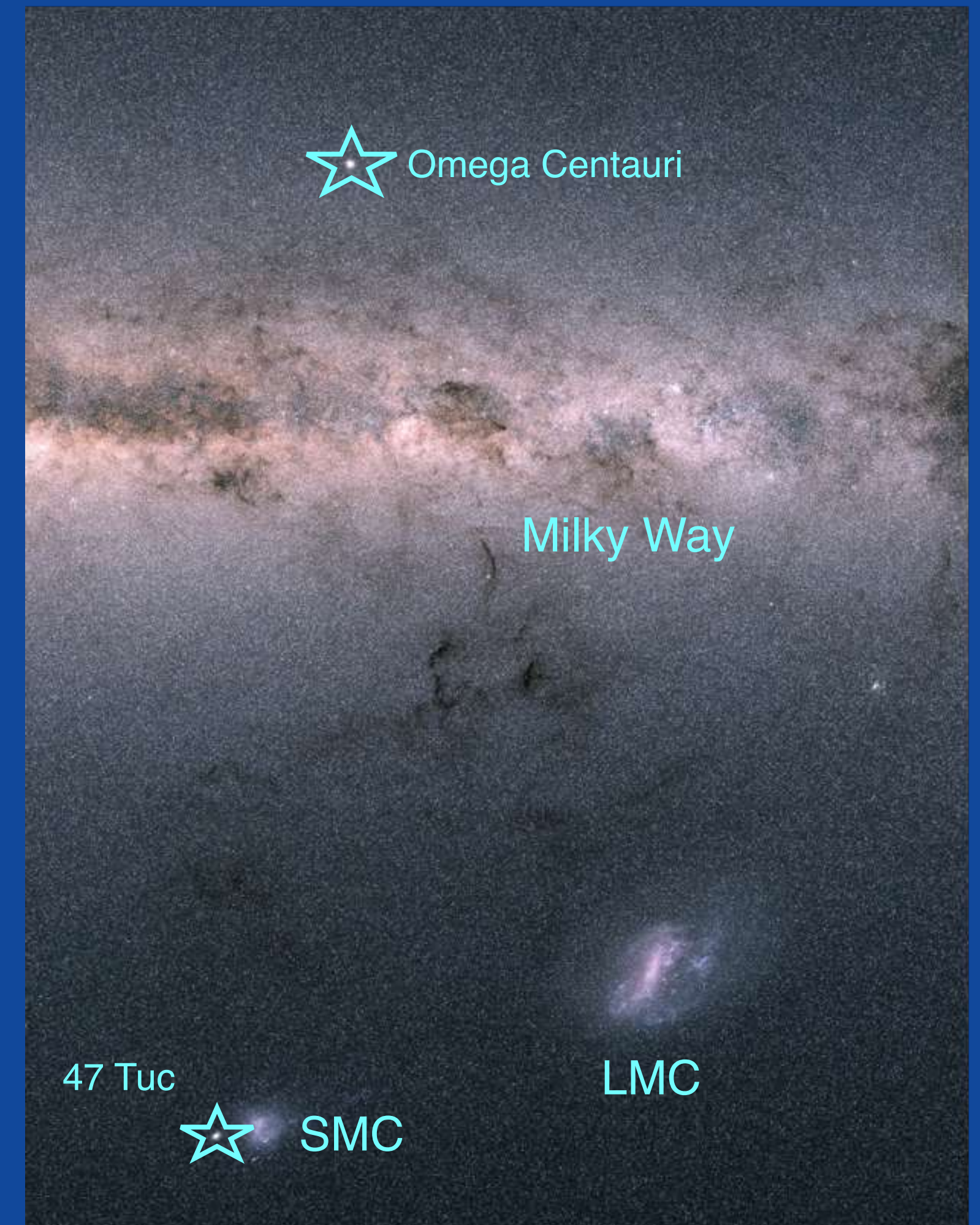


Our own galaxy

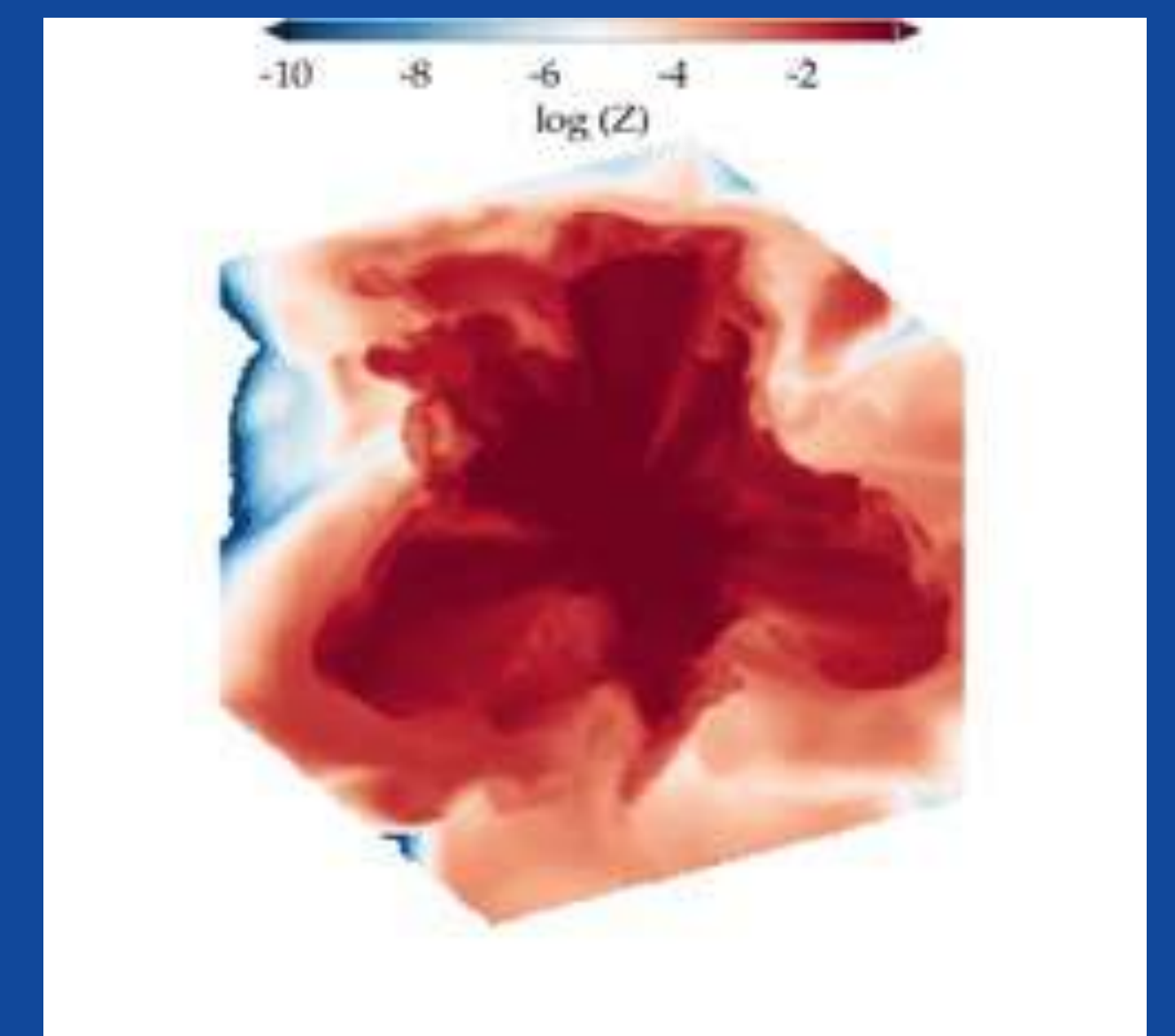
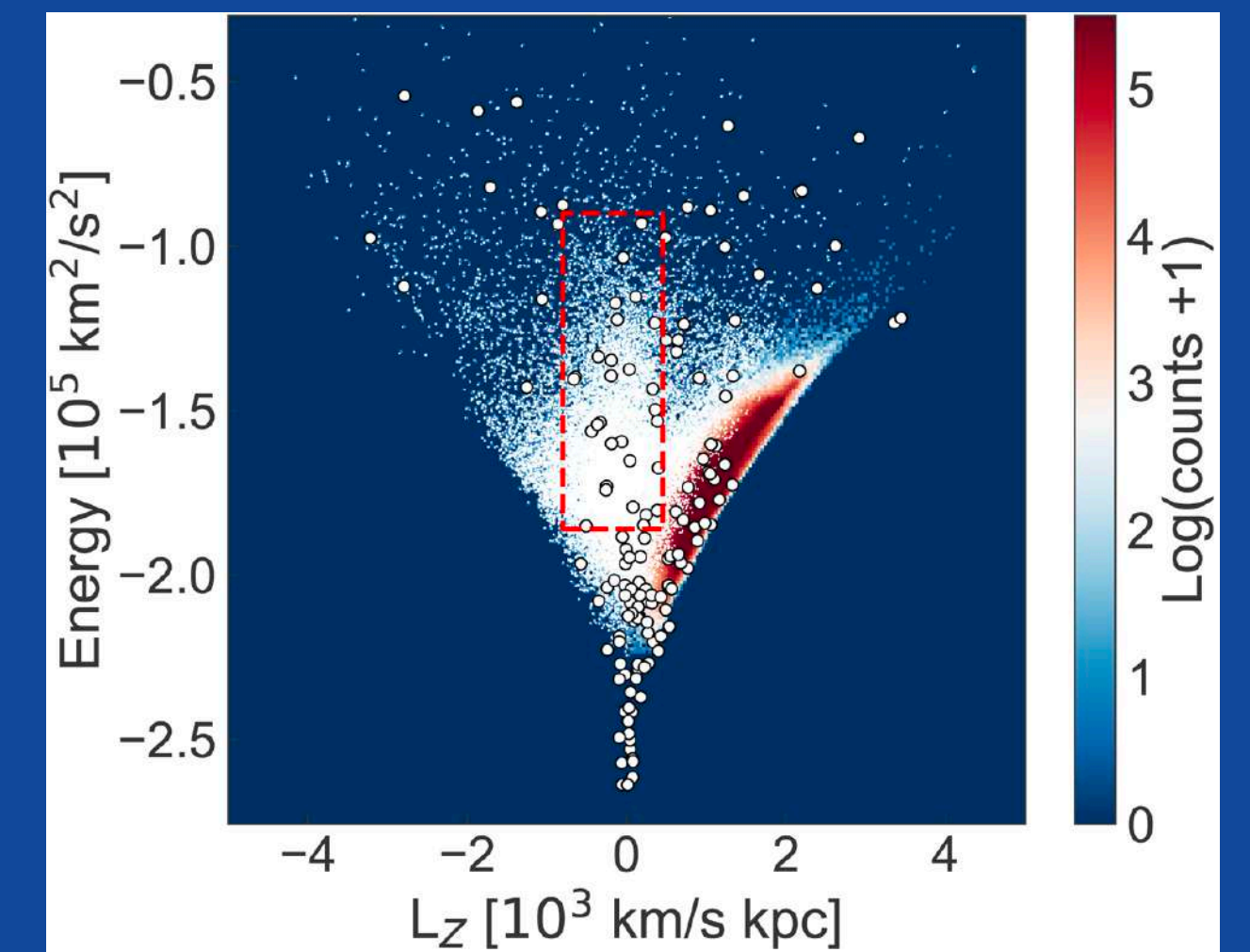
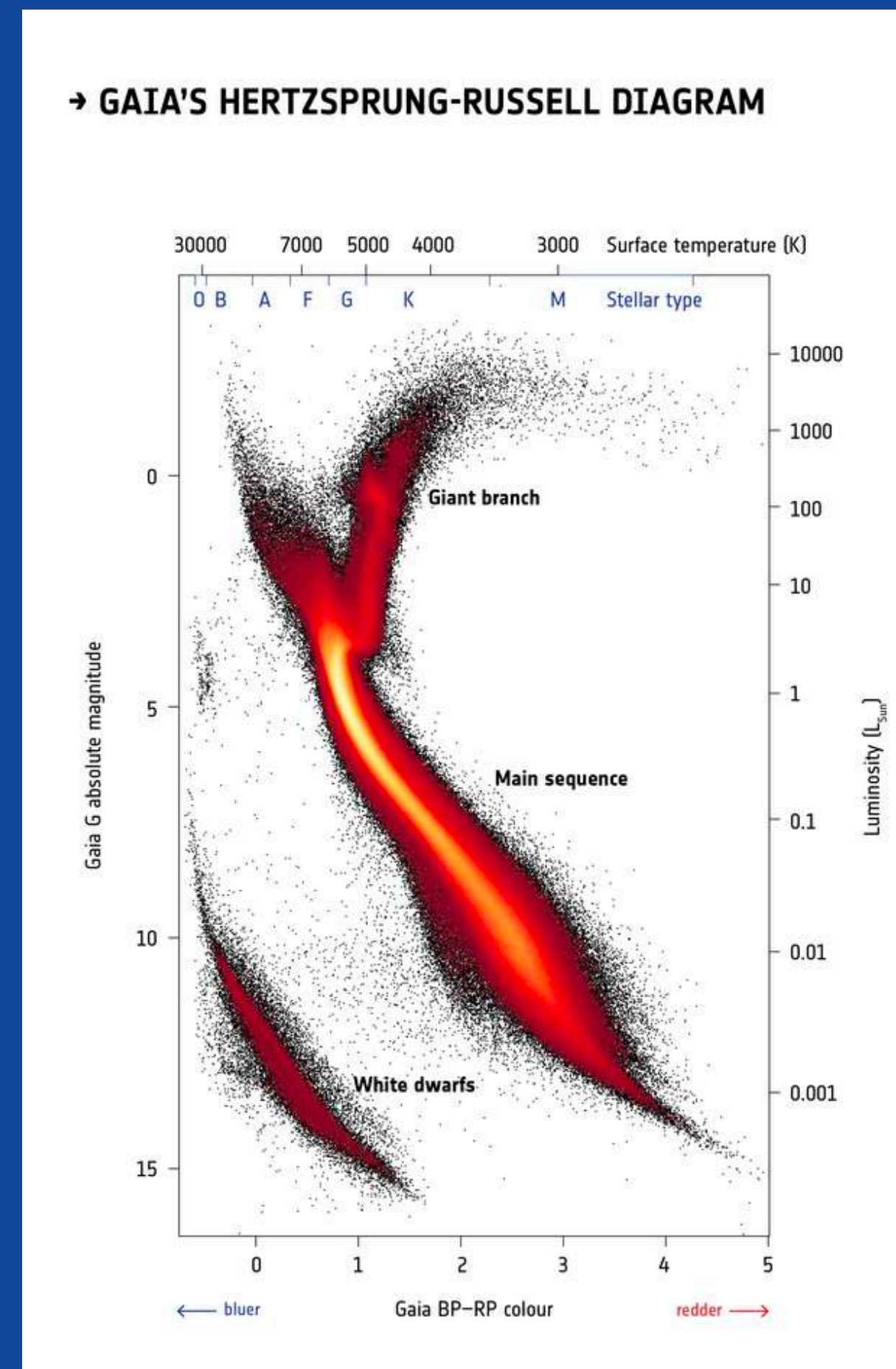
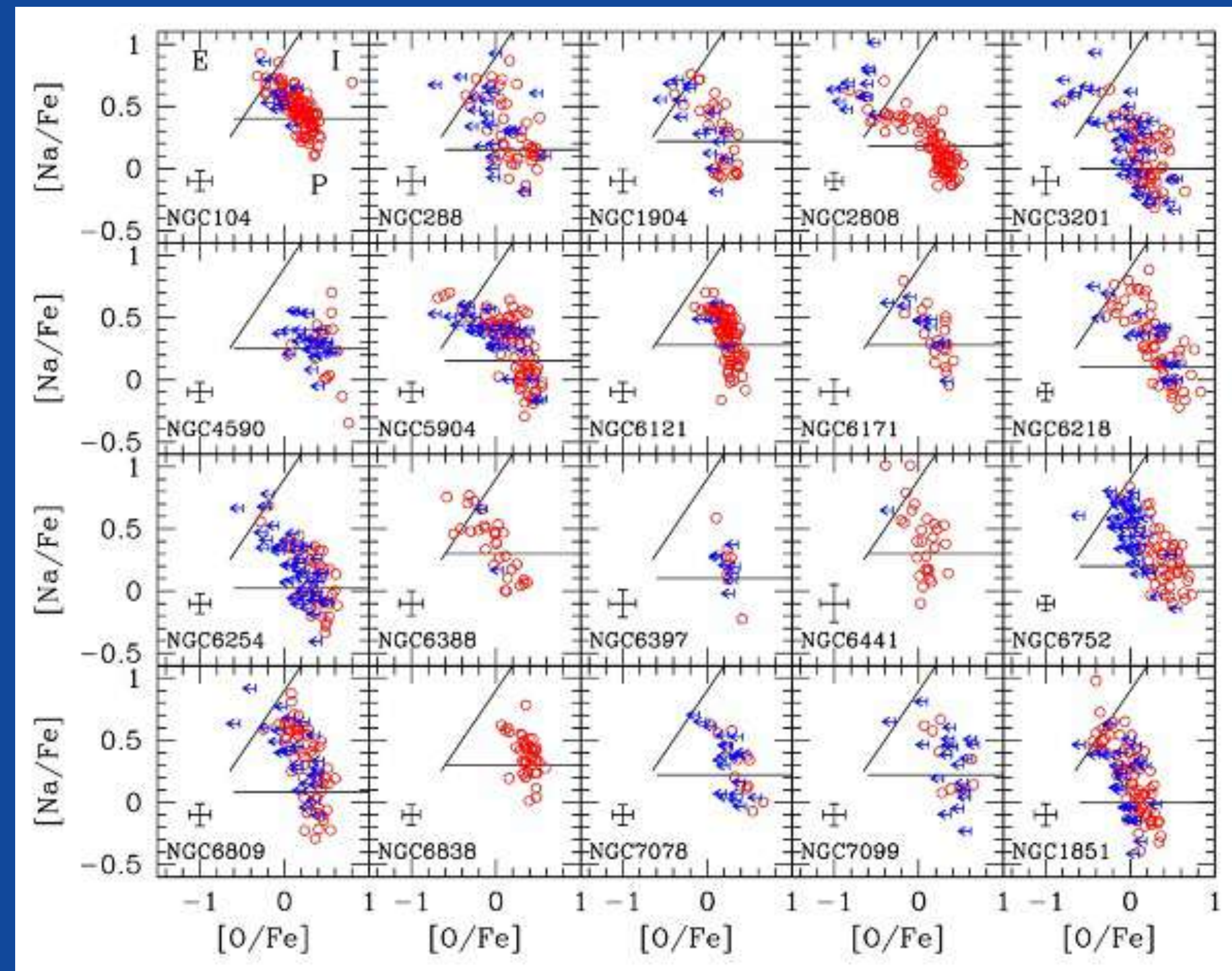
Star clusters

Dwarf galaxies

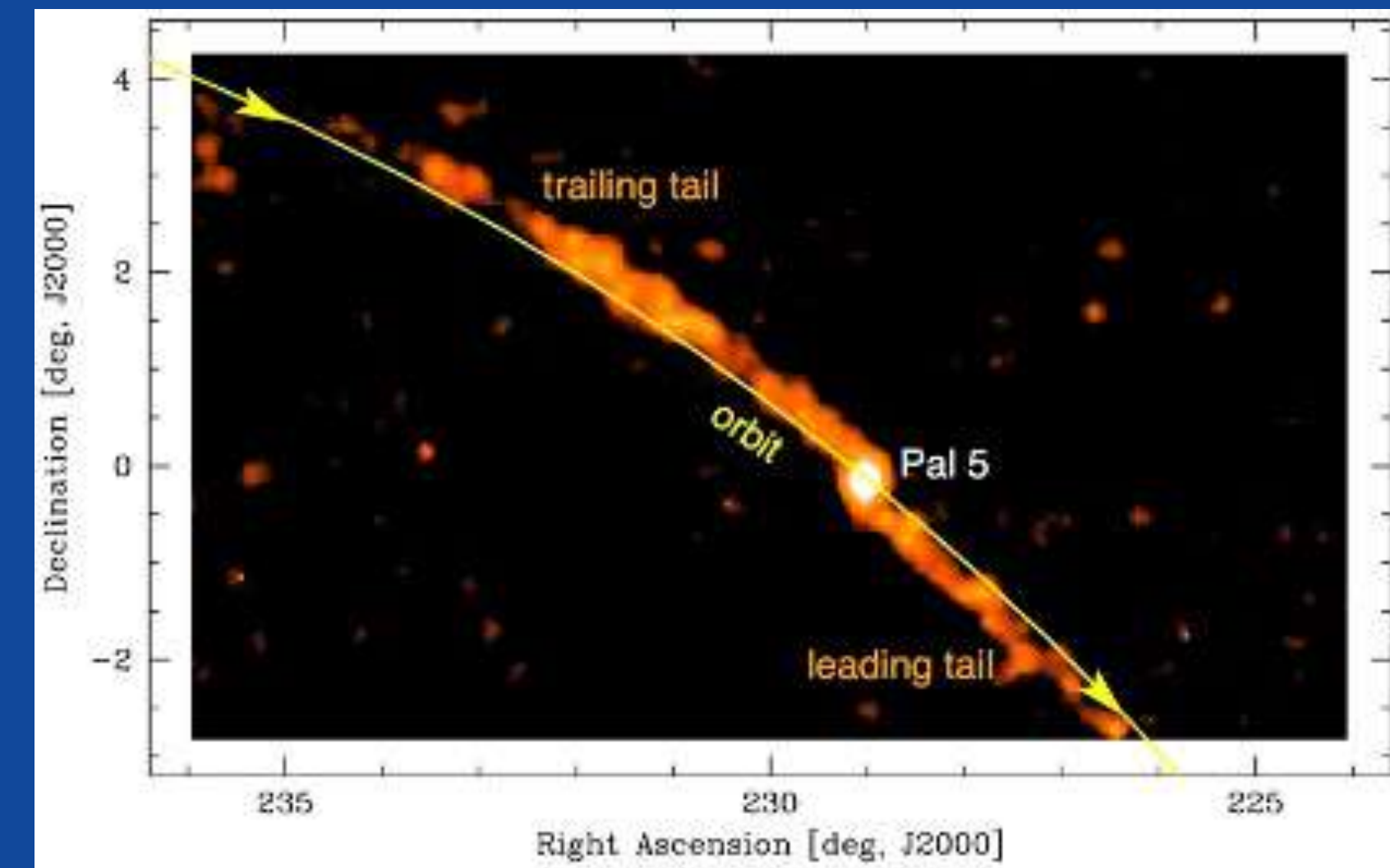
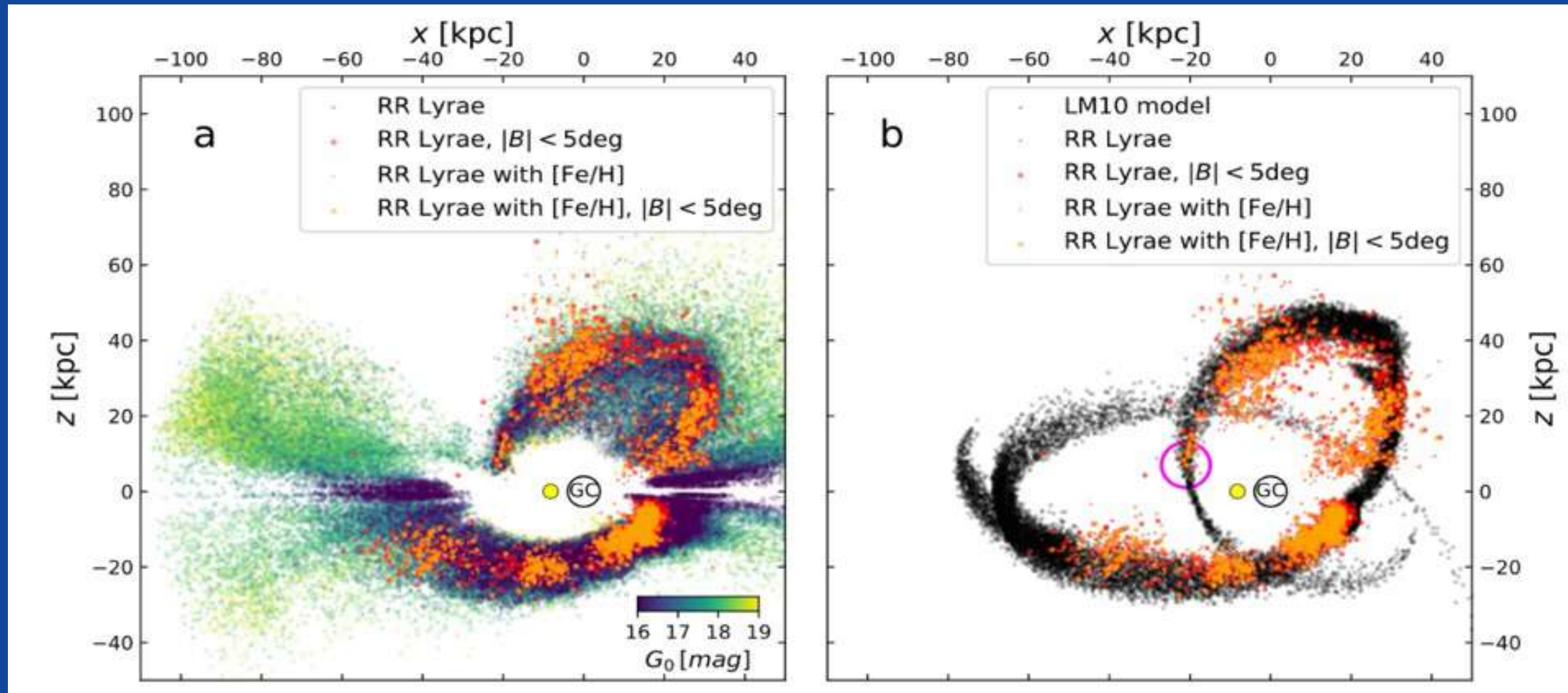
Large galaxies



Spectroscopy/chemistry, photometry/CMDs, astrometry/kinematics, theory/simulations

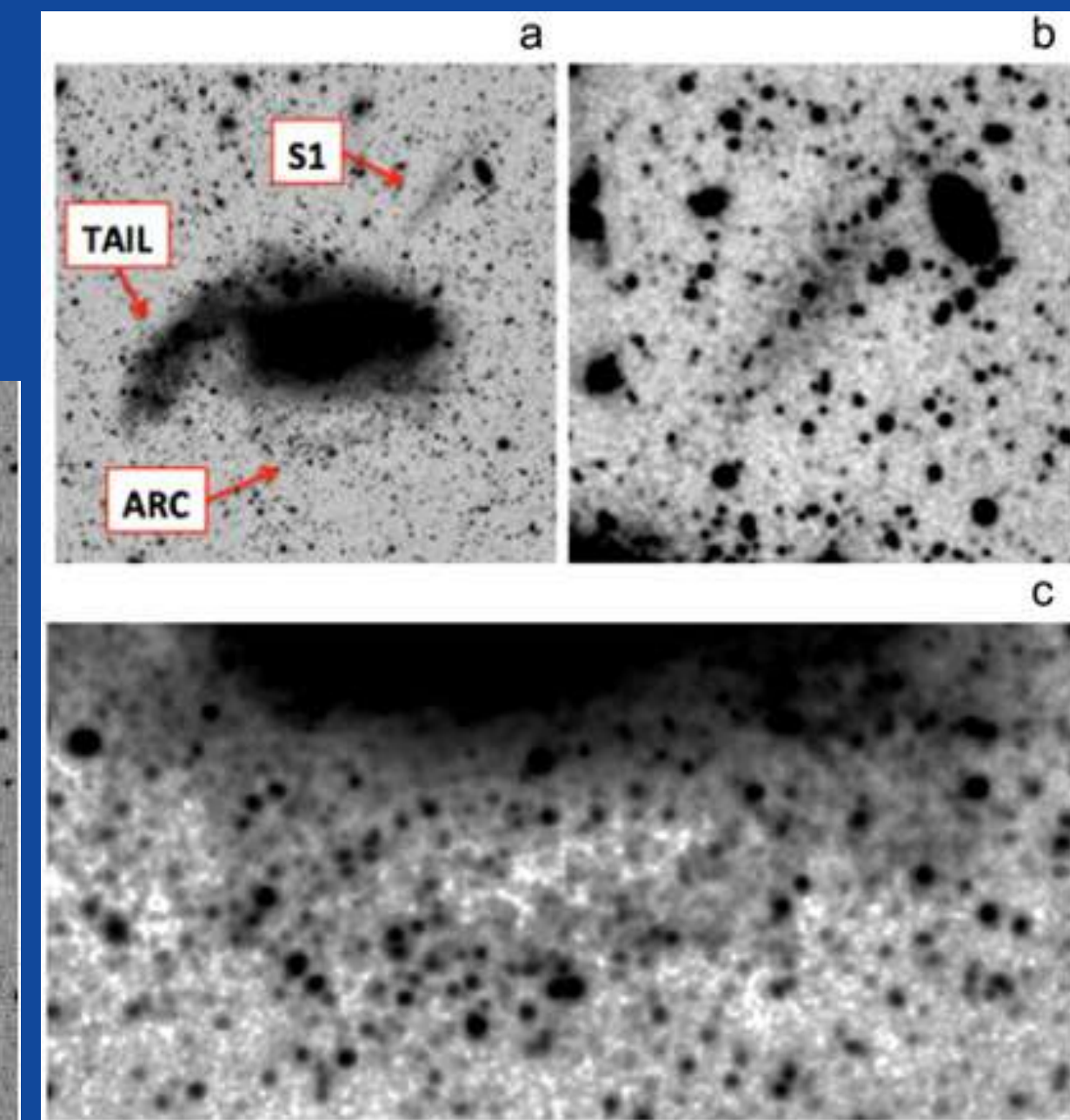
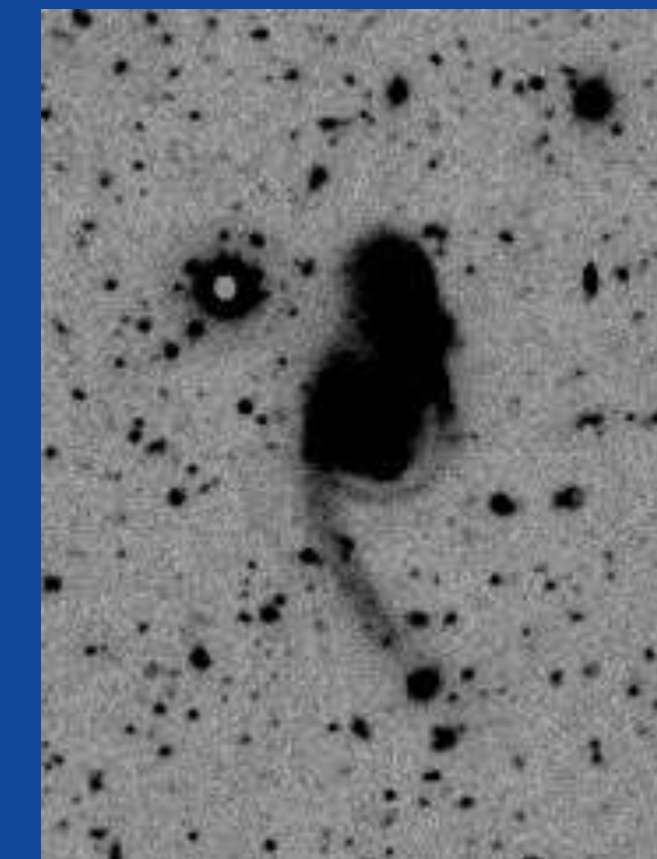


Galactic archaeology at all scales



Sagittarius stream

Tracing hierarchical galaxy formation



Galactic archaeology at all scales



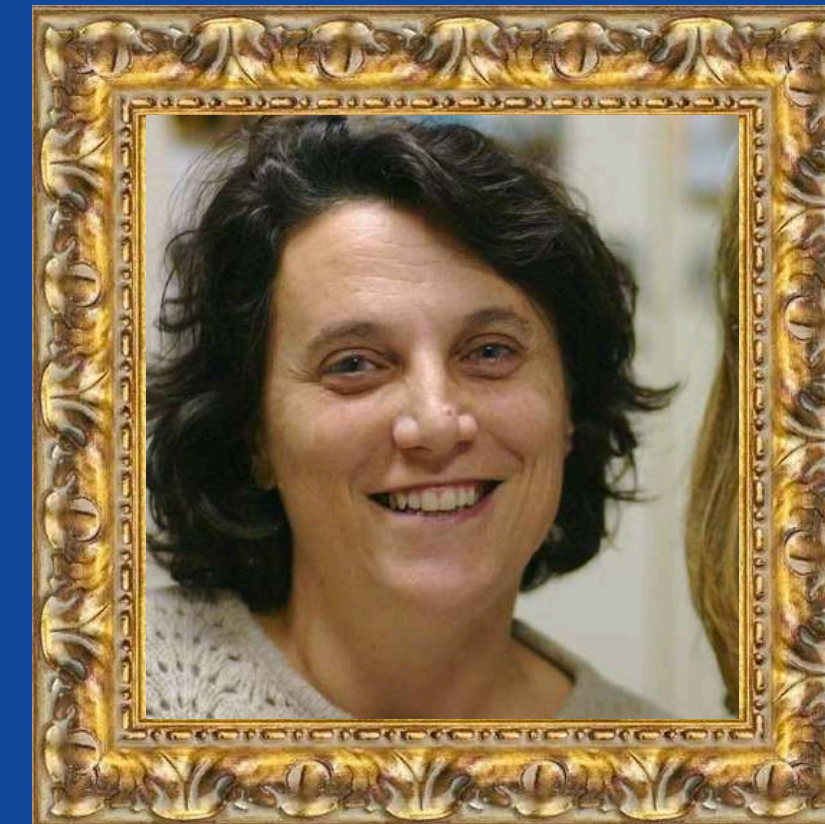
**Michele Bellazzini —
Dynamics, chemistry**



**Angela Braglia —
Spectroscopy, chemistry**



**Davide Massari —
Photometry, kinematics,
dynamics**



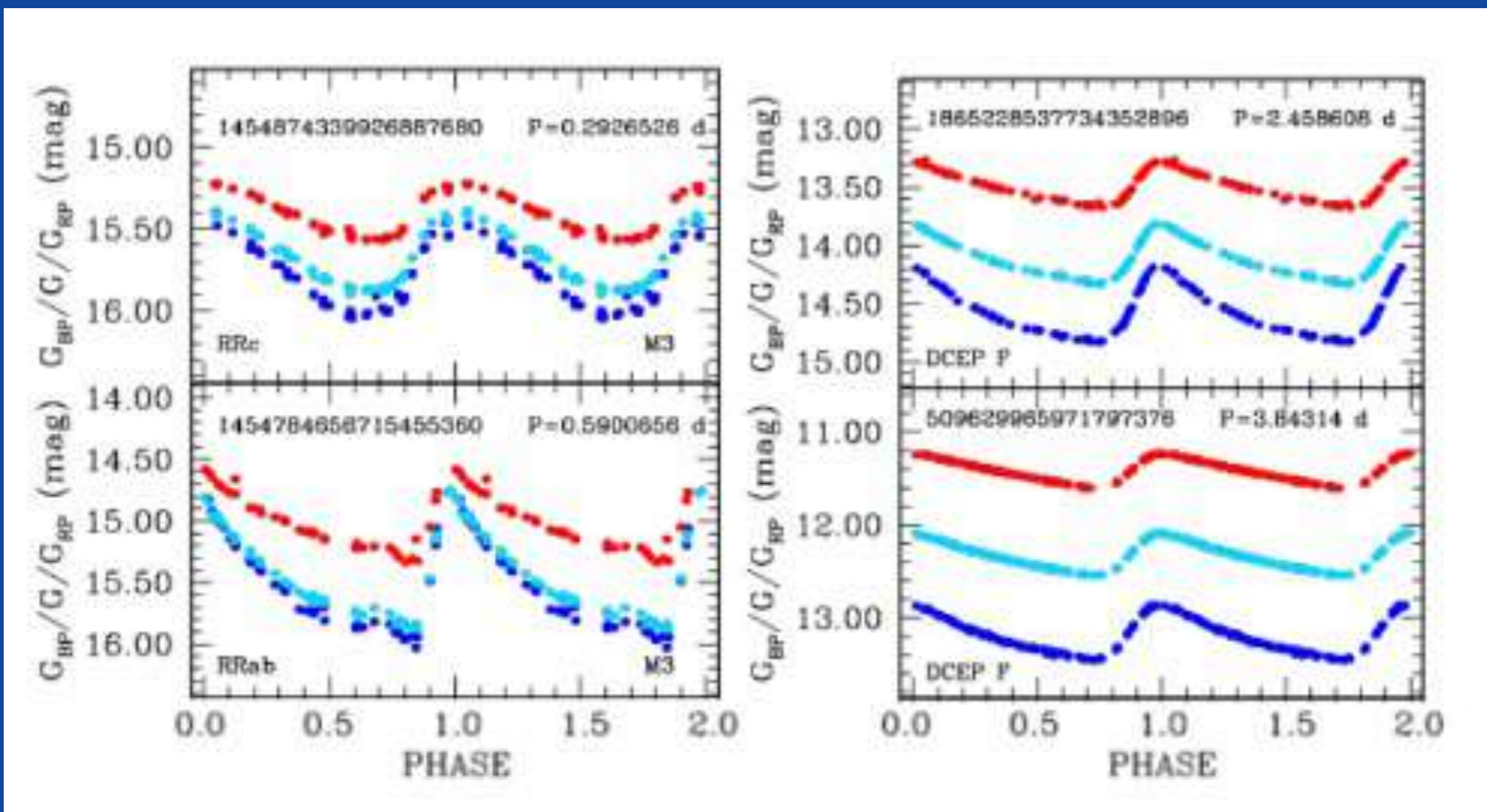
**Livia Origlia —
Spectroscopy, chemistry**



**Donatella Romano —
Chemical evolution models**

name.surname@inaf.it

Pulsating variable stars and the distance scale



Light curves of RR Lyrae and Cepheids

VMC survey - Muraveva et al. 2018

Structure of the SMC from RR Lyrae stars 3141

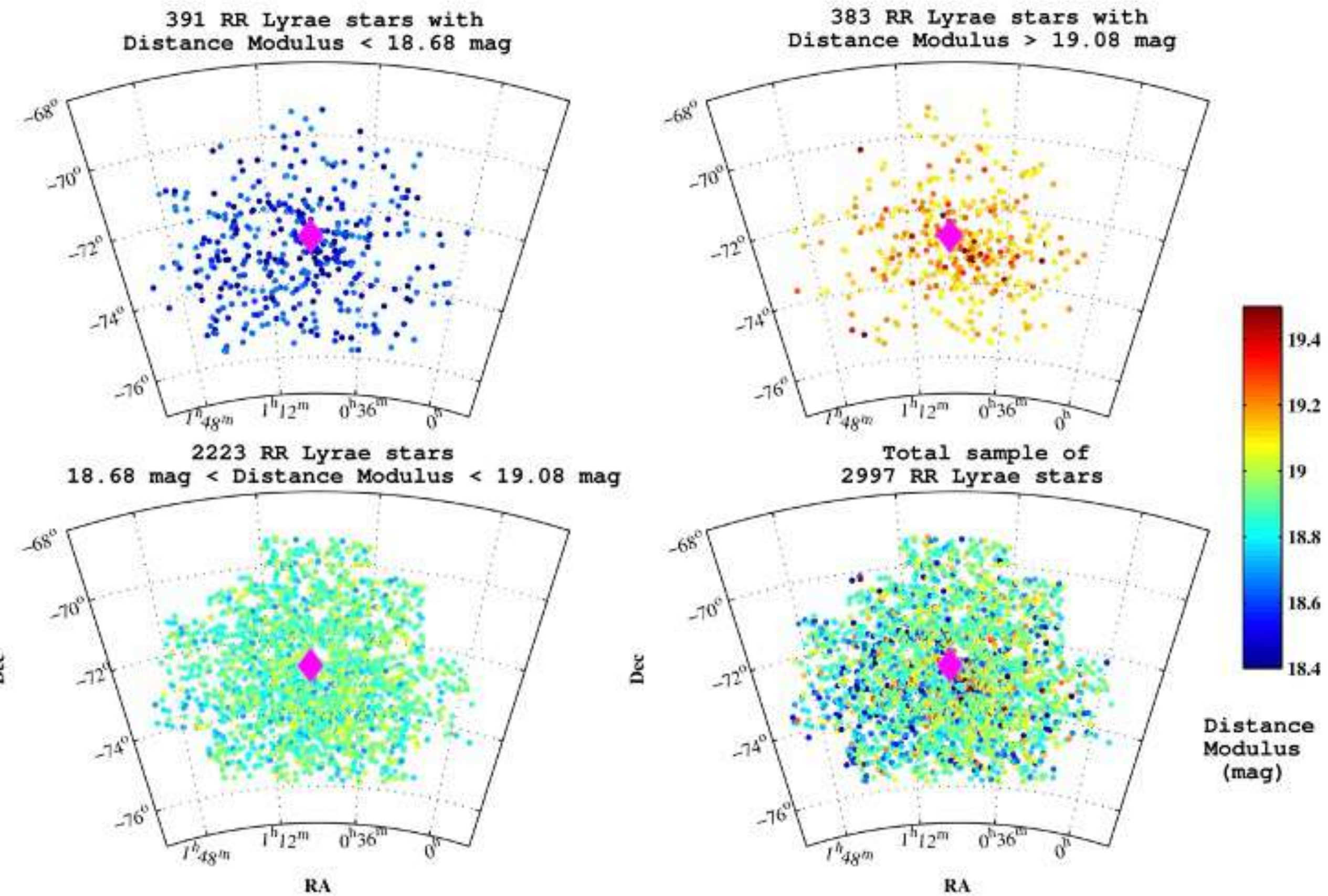
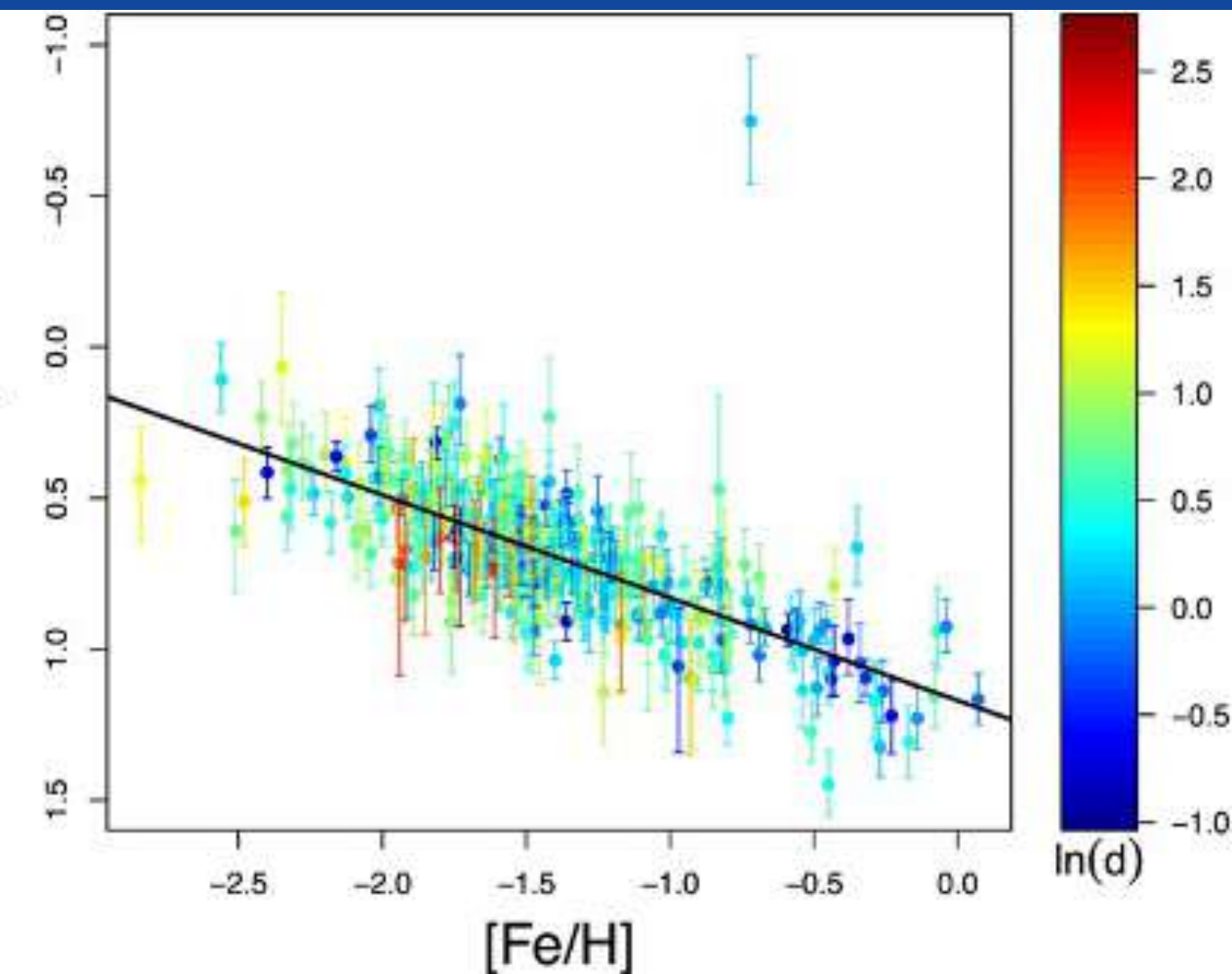
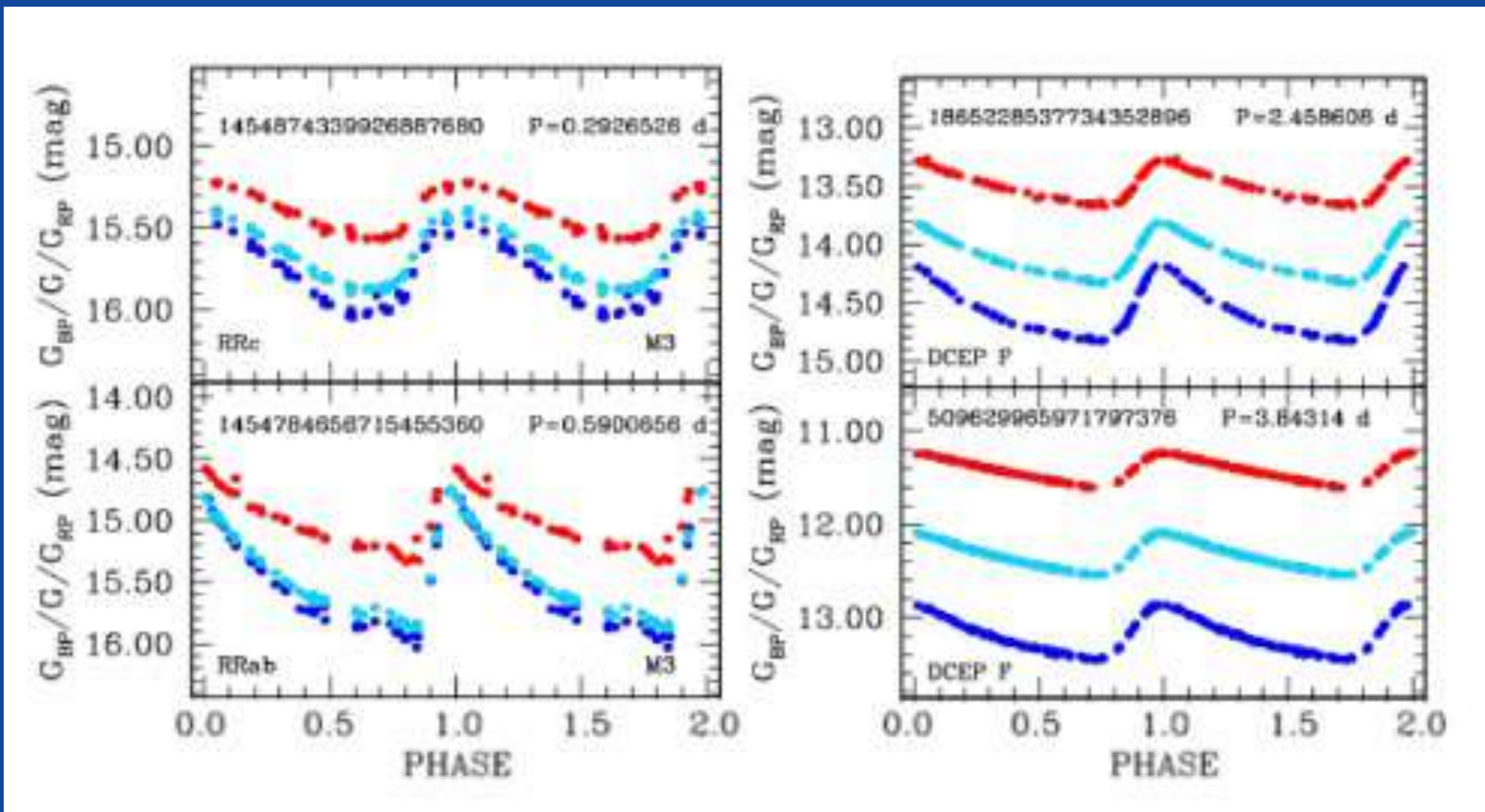


Figure 9. Two-dimensional distribution of the RR Lyrae stars' distance moduli. The upper-left, upper-right, lower-left and lower-right panels show, respectively, the closer RR Lyrae stars with $(m - M)_0 < 18.68$ mag, the more distant RR Lyrae stars with $(m - M)_0 > 19.08$ mag, the sample within 1σ error of the mean distance modulus and the total sample. The magenta diamond in all panels represents the centroid of the sample.



RR Lyrae luminosity-metallicity relation with Gaia

Pulsating variable stars and the distance scale



Light curves of RR Lyrae and Cepheids

VMC survey - Muraveva et al. 2018

Structure of the SMC from RR Lyrae stars 3141

Variable stars as tracers of old populations
 ↓
 Galactic structure and archaeology
 3D structure of resolved galaxies

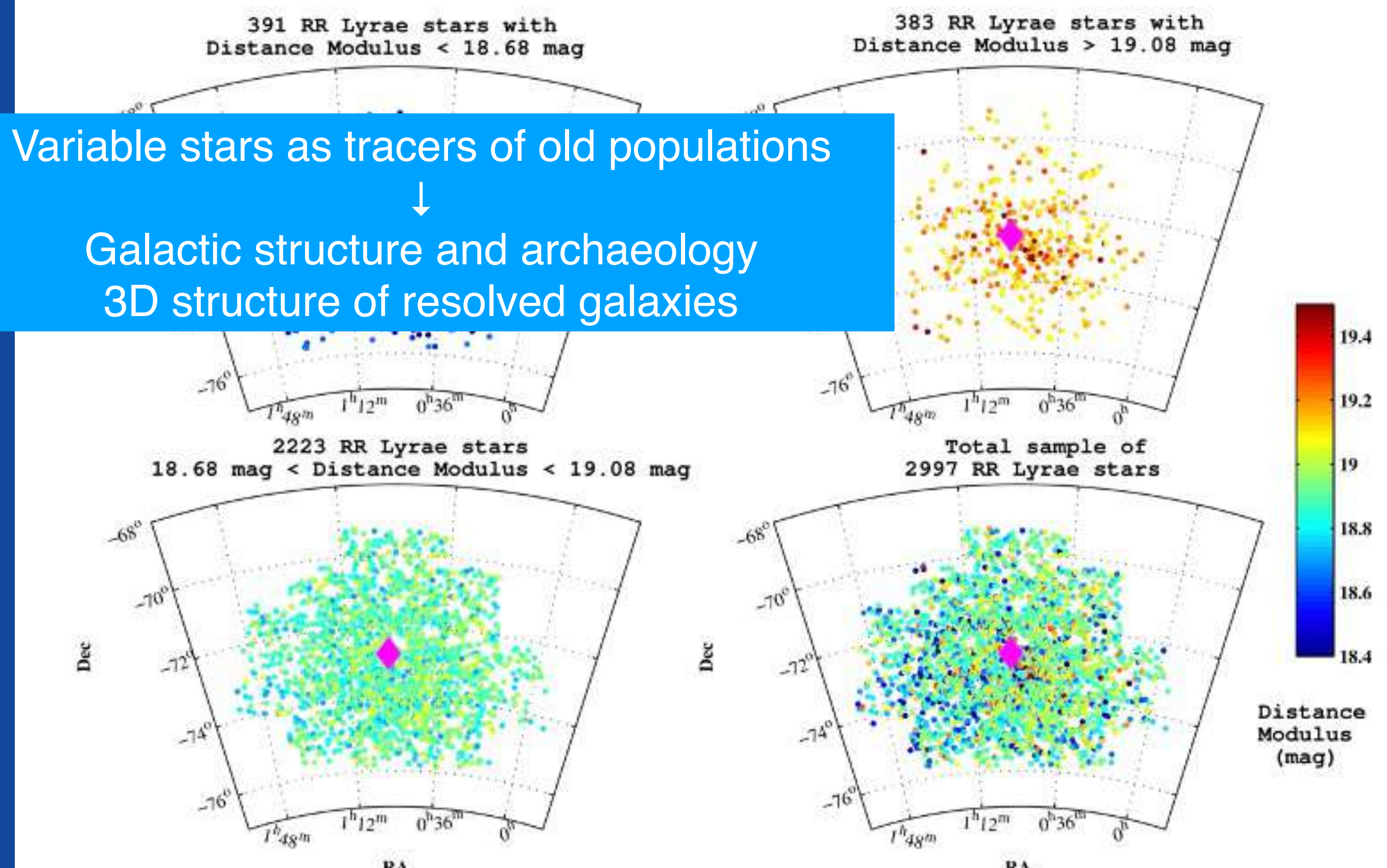
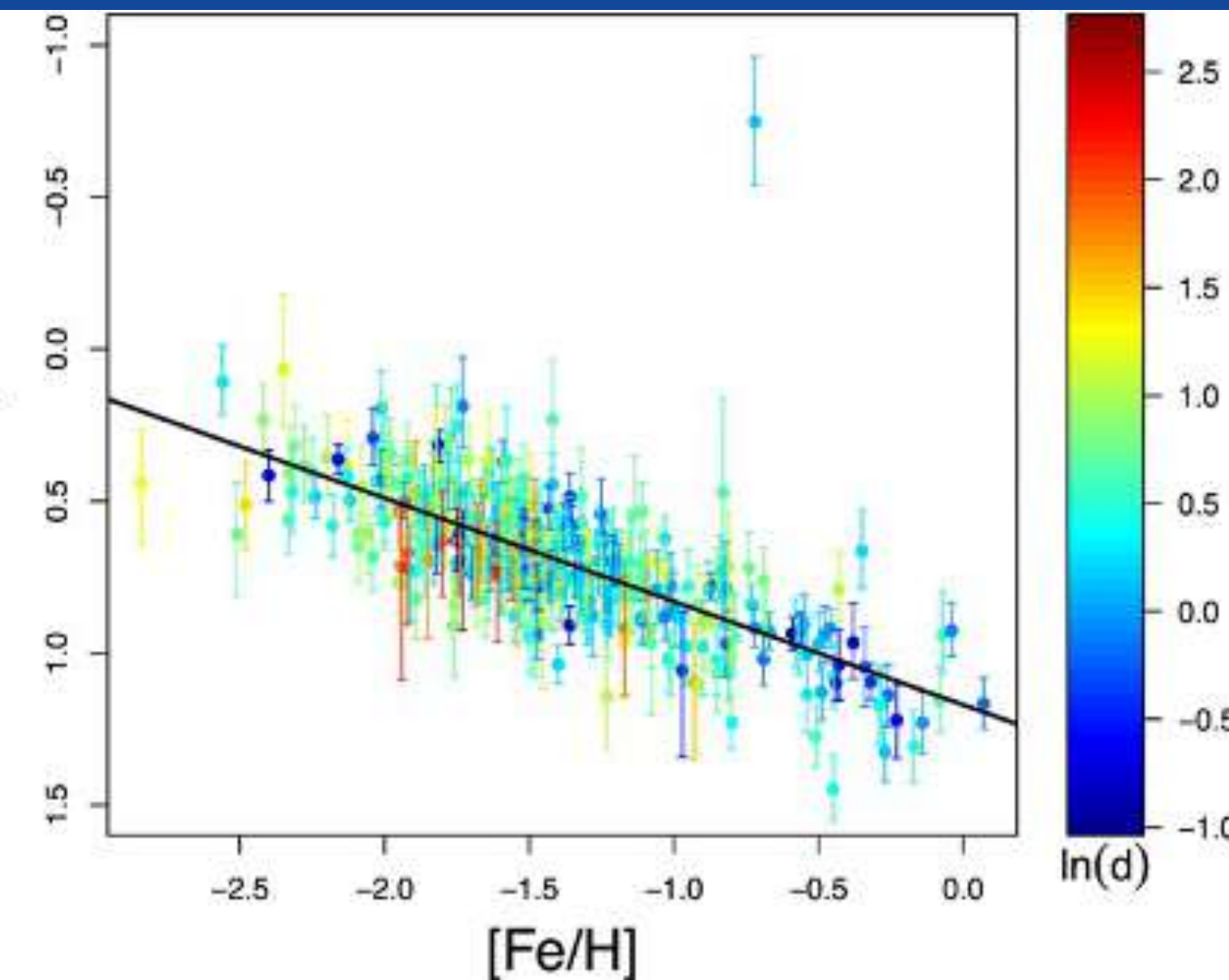


Figure 9. Two-dimensional distribution of the RR Lyrae stars' distance moduli. The upper-left, upper-right, lower-left and lower-right panels show, respectively, the closer RR Lyrae stars with $(m - M)_0 < 18.68$ mag, the more distant RR Lyrae stars with $(m - M)_0 > 19.08$ mag, the sample within 1σ error of the mean distance modulus and the total sample. The magenta diamond in all panels represents the centroid of the sample.

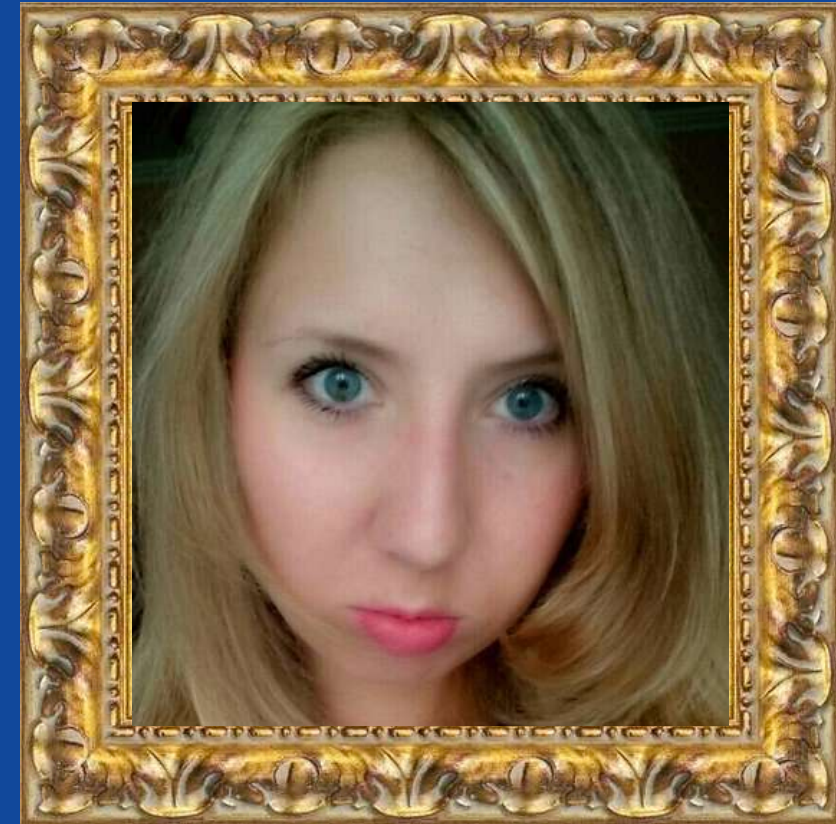


Variable stars as standard candles
 ↓
 H_0 and tracers of stellar populations

RR Lyrae luminosity-metallicity relation with Gaia

Application of Machine Learning/Deep Learning Algorithms to analyses of variable stars

Pulsating variable stars and the distance scale



**Tatiana Muraveva — RR
Lyrae, light curves**



**Felice Cusano — Dwarf
galaxies**

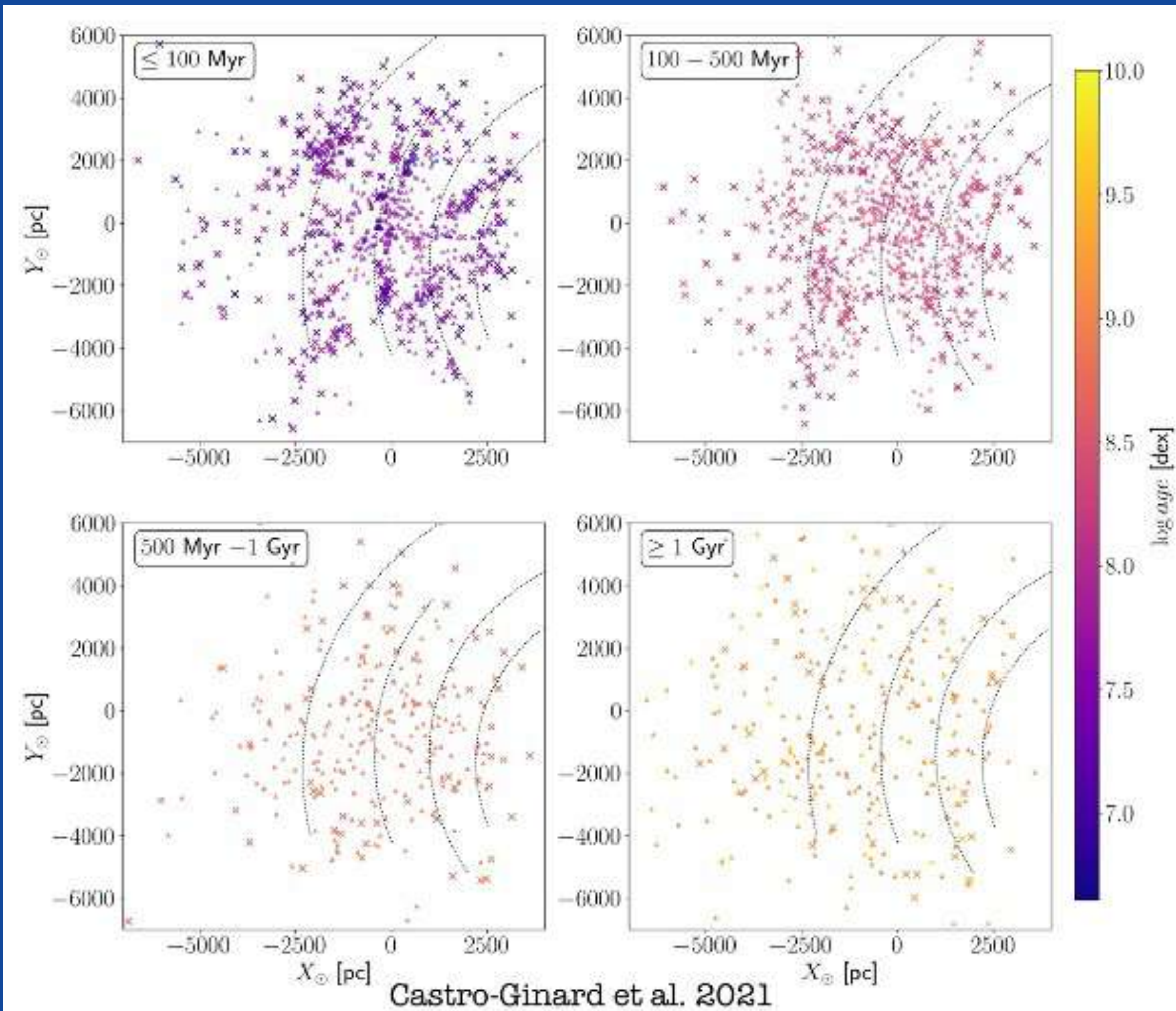


**Alessia Garofalo (TD) —
RR Lyrae, photometry**

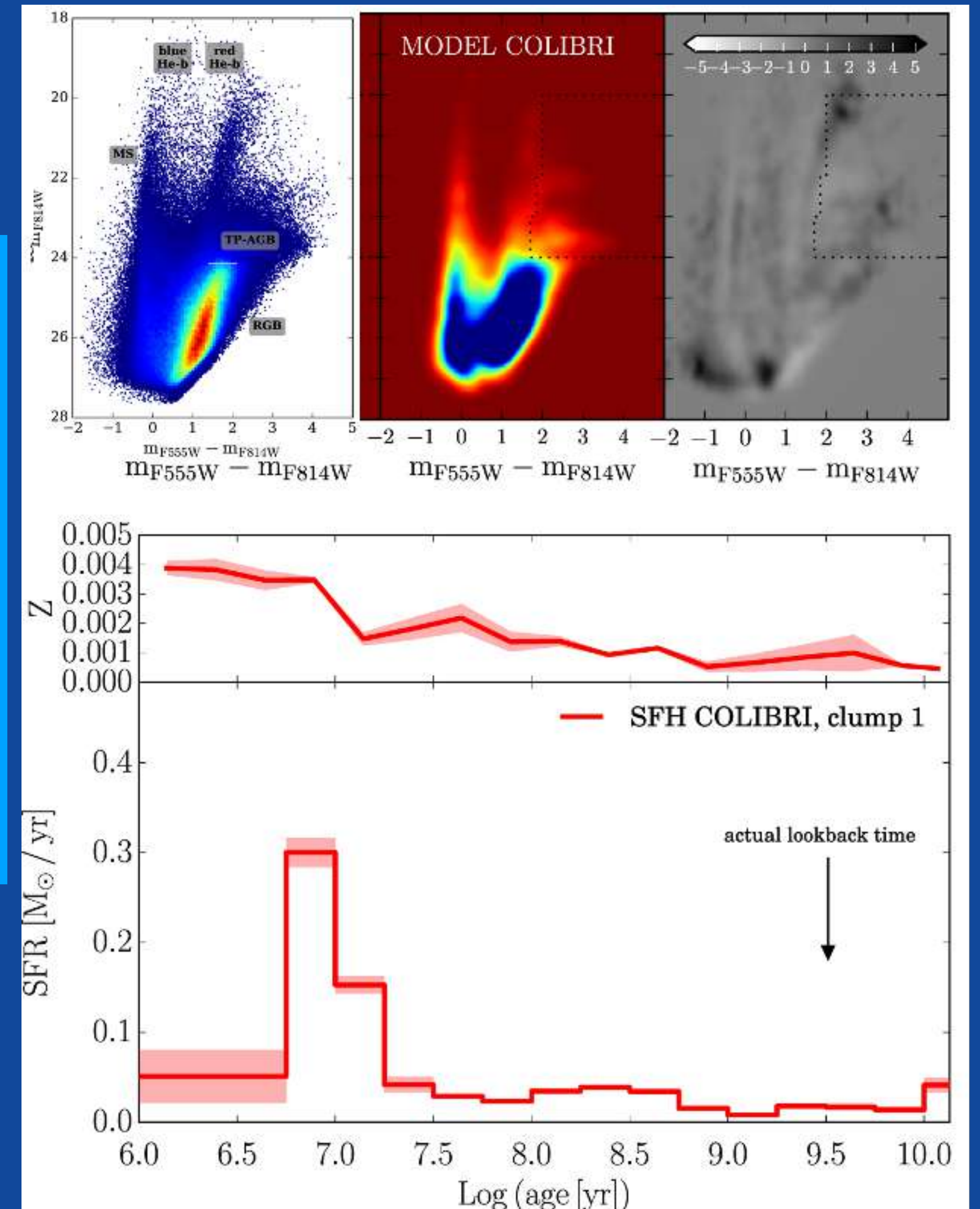
name.surname@inaf.it

Open and globular clusters as tracers of the Galactic Disc/Halo/Bulge

Star Formation Histories of galaxies



Stellar photometry in crowded fields (UV, VIS & NIR) Modeling of CMDs & LFs to extract Star Formation Histories & Age-Metallicity Relations



Open and globular clusters as tracers of the Galactic Disc/Halo/Bulge

Star Formation Histories of galaxies



Francesca Annibali —
Photometry, SFH



Angela Bragaglia —
Spectroscopy, chemistry



Francesco Calura —
Hydrodynamical simulations



Eugenio Carretta —
Spectroscopy, chemistry



Emanuele Dalessandro —
Photometry, kinematics

name.surname@inaf.it

ESA Gaia mission DPAC

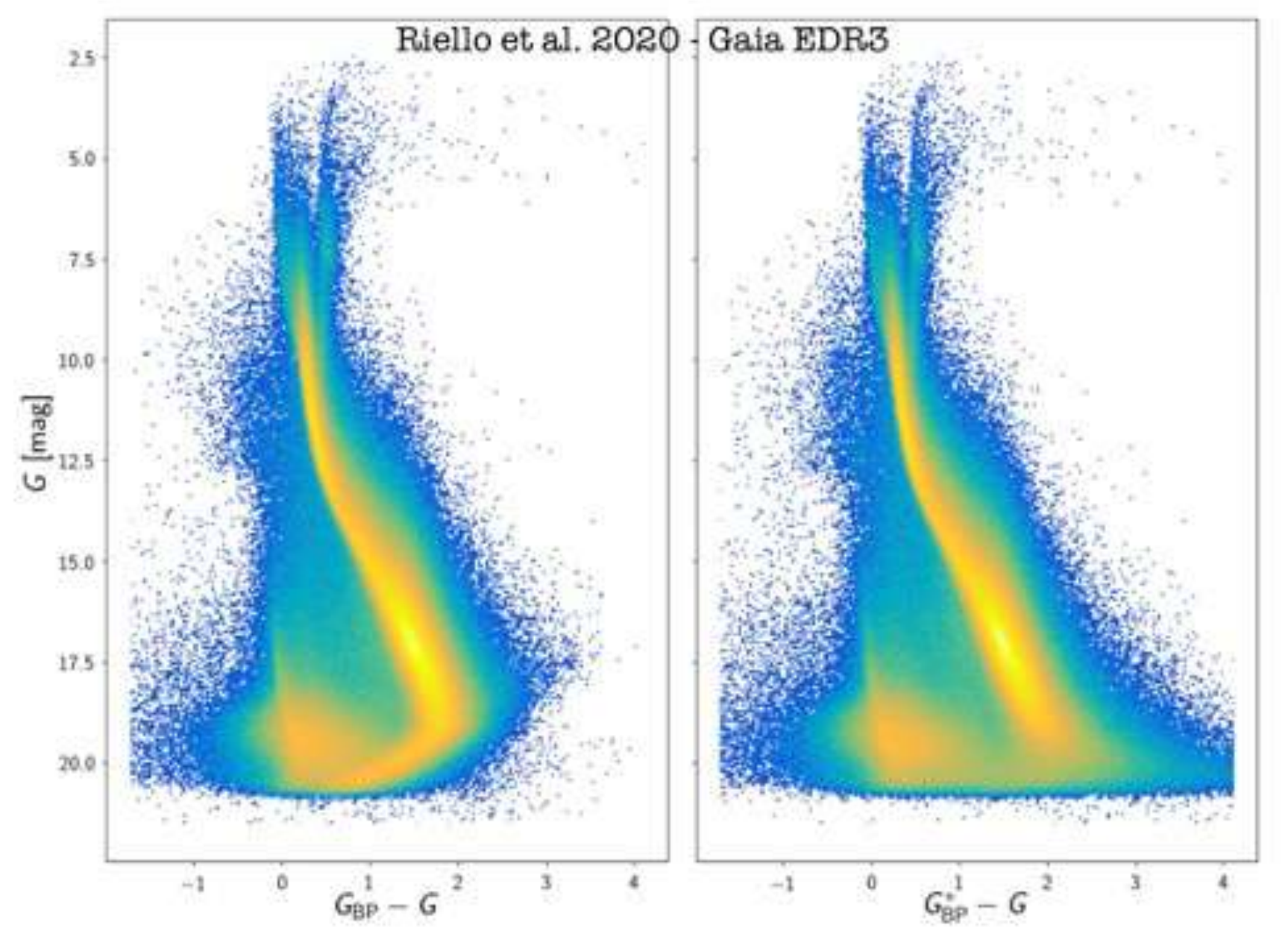


Fig. 26. Colour-magnitude diagram for a sample of ≈ 3.4 million nearby sources selected from the *Gaia* EDR3 archive. *Left panel:* CMD produced using the G and G_{BP} magnitudes from the *Gaia* EDR3 archive, which presents a tail like feature bending progressively towards bluer colours for fainter G magnitudes. *Right panel:* CMD for the same sources but with G_{BP}^* recomputed without the low flux threshold.

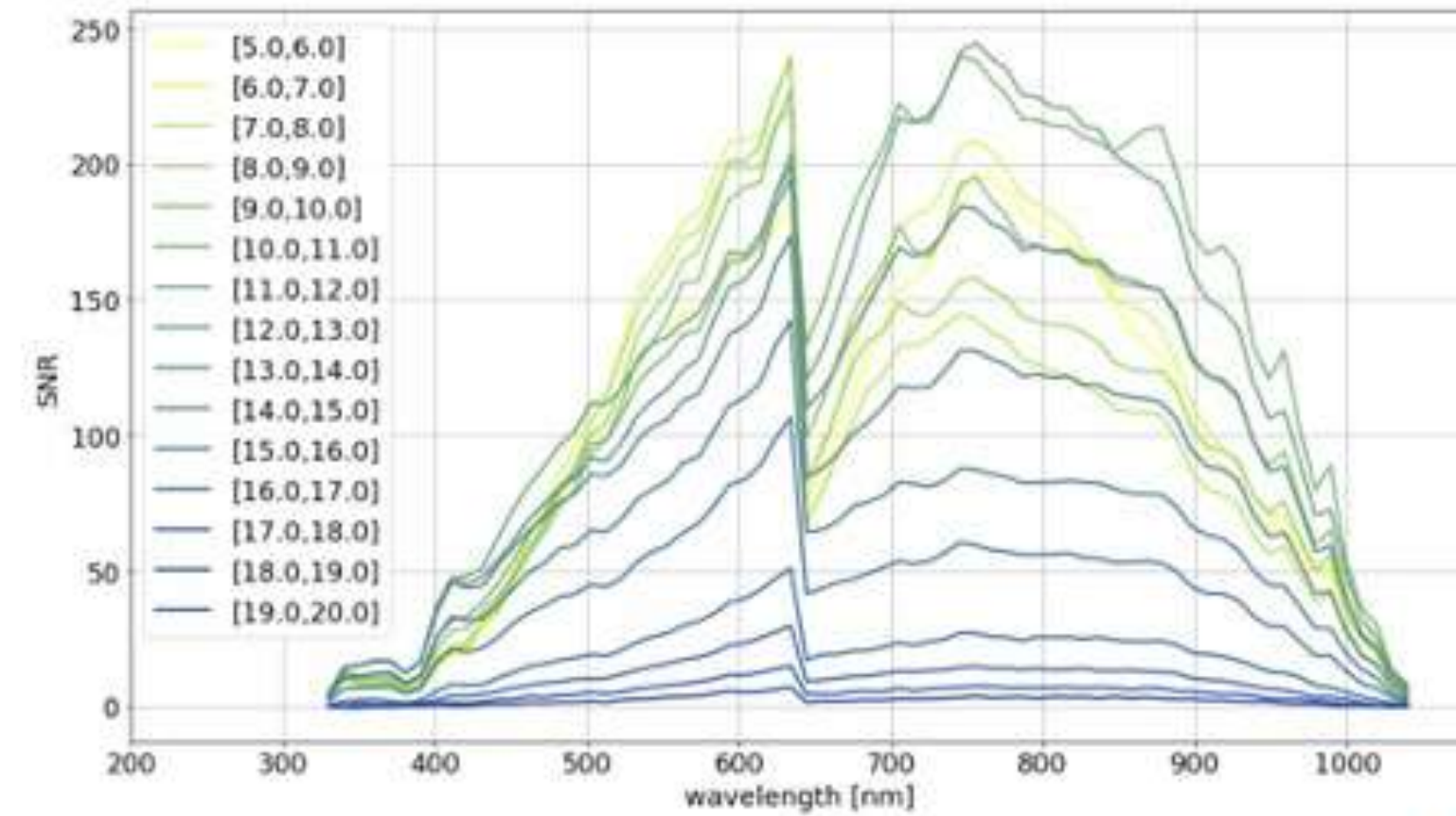


Figure 1: The Signal-to-Noise ratio as a function of absolute wavelength averaged over sources within magnitude bins. [Image credit: ESA/Gaia/DPAC - CC BY-SA 3.0 IGO. Acknowledgement: ESA/Gaia/DPAC, F. De Angeli, P. Montegriffo and the whole of CUS and DPAC teams.]

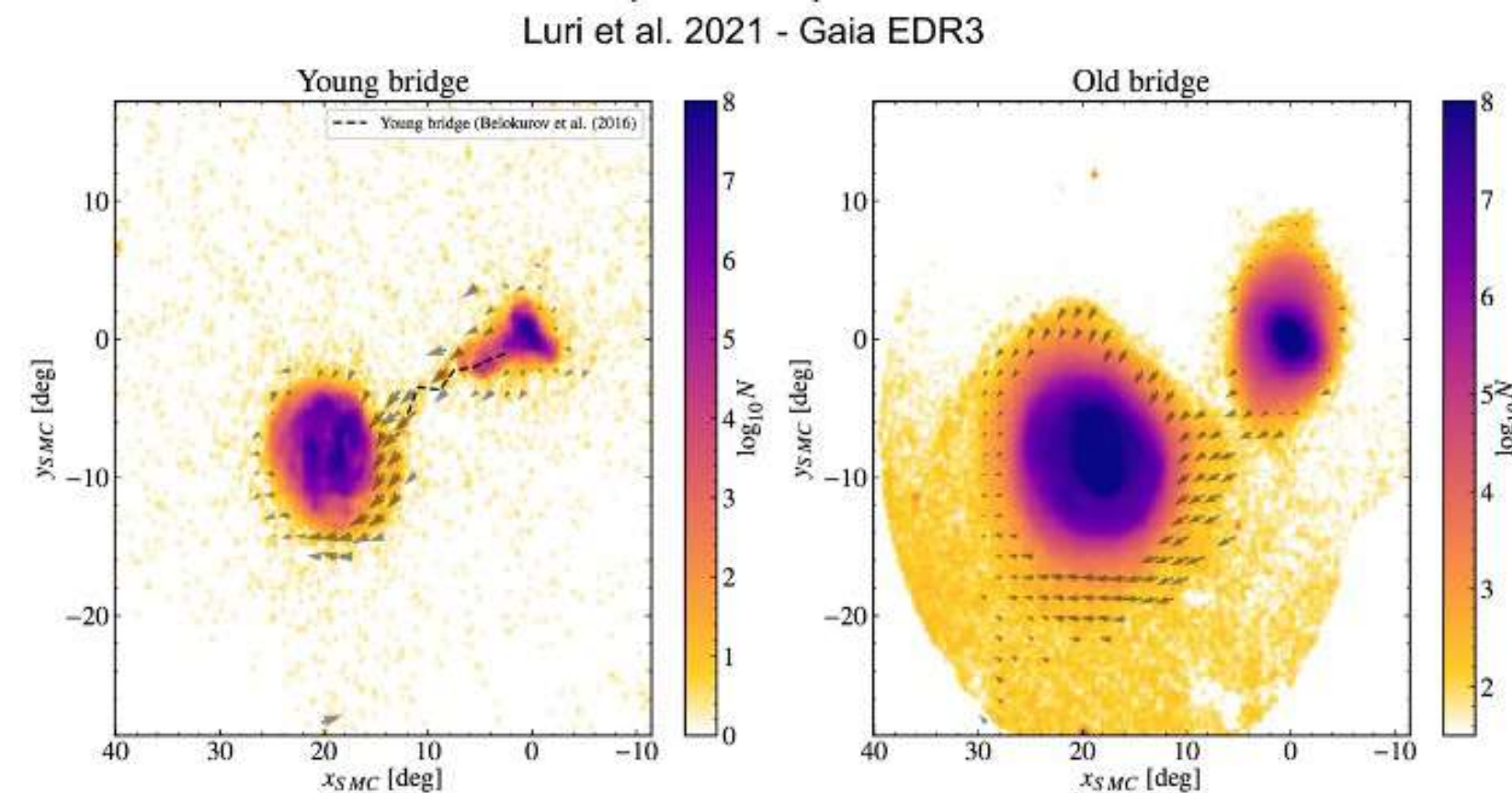
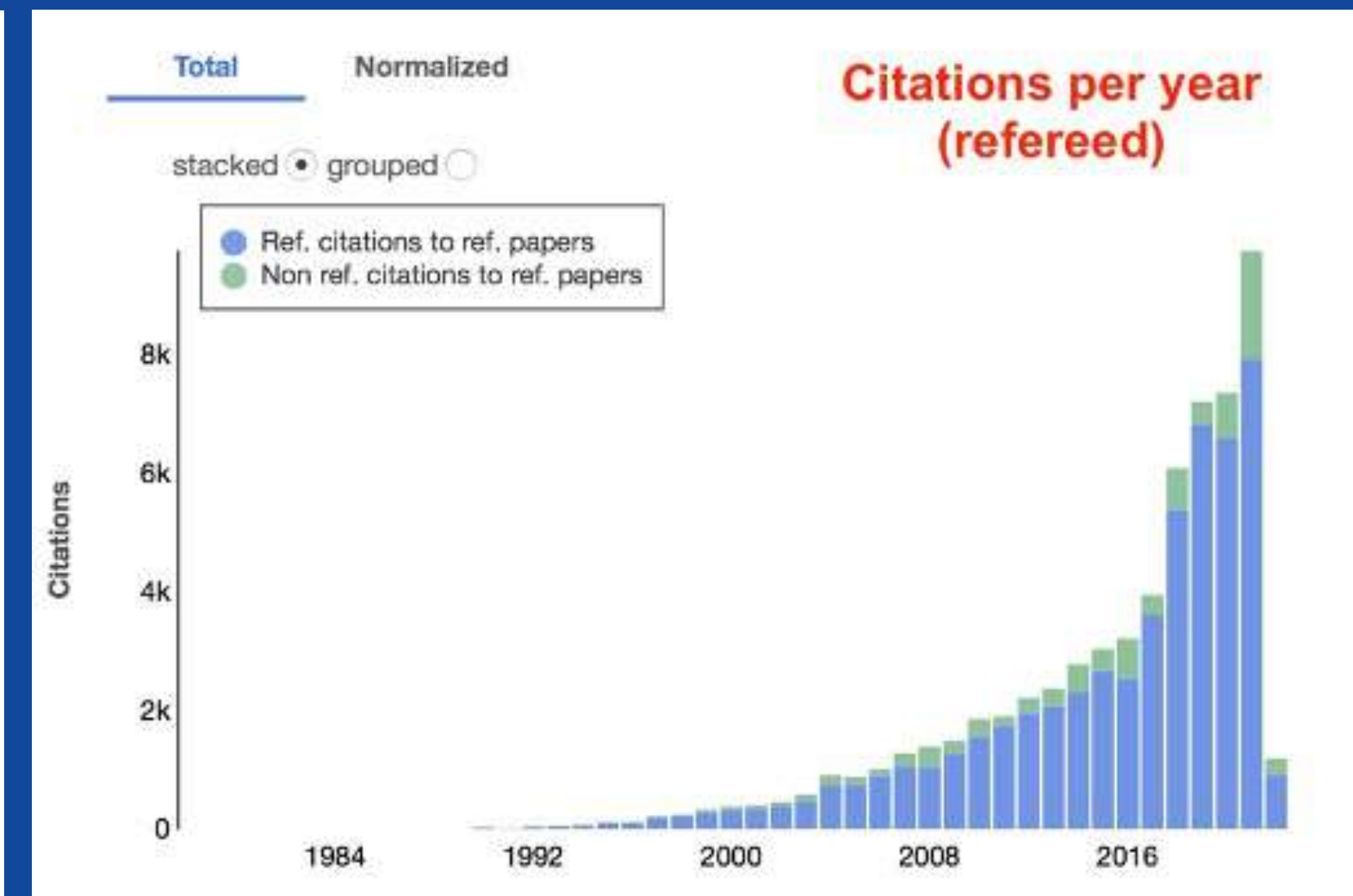
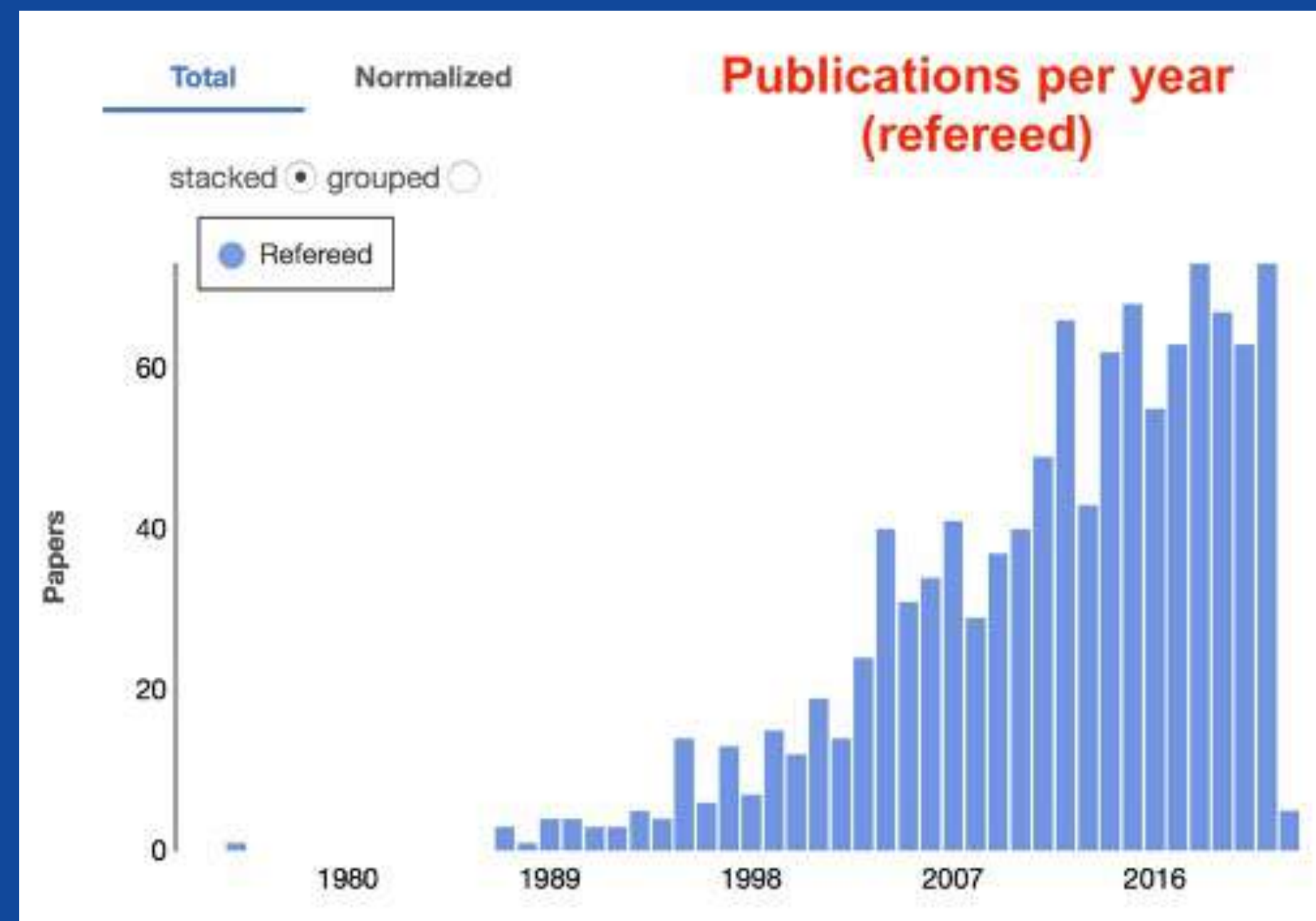
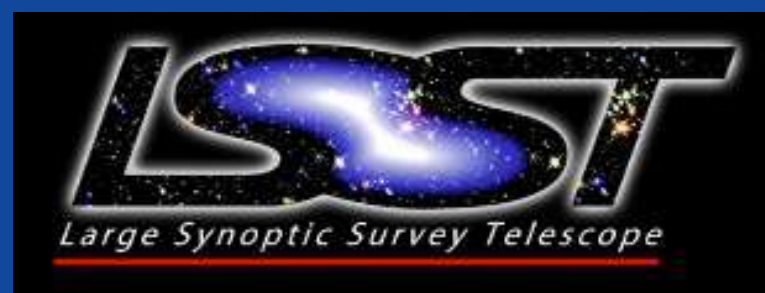


Fig. 16: Vector field of the proper motions in the Magellanic Clouds using the *Young 1 + Young 2* (left panel) and *RC* (right panel) samples. Note that the coordinates are centered in the SMC. In the background, to guide the eye of the reader, we show in logarithmic scale the density and the dashed line in the left panel shows the location of the young bridge from Belokurov et al. (2017). The velocity vector field is only shown for bins with more than 10 (200) stars in the *Young 1 + Young 2* (*RC*) sample.

M. Bellazzini, A. Bragaglia, A. Garofalo, D. Massari & T. Muraveva are deeply involved in the reduction of Gaia mission data. Photometry, variable stars, validation: Being part of a breakthrough space mission!



Strong involvement in key scientific surveys and instrument development



Current list of projects

(<https://www.oas.inaf.it/it/alta-formazione/tesi-day/>)

1. *“A study of dust in Local star-forming dwarf galaxies”*. Tutors: Francesca Annibali, Carlotta Gruppioni (UniBO supervisor: Carlo Nipoti)
2. *“A study of accretion events in Local star-forming dwarf galaxies”*. Tutor: Francesca Annibali (UniBO supervisor: Carlo Nipoti)
3. *“Updating the Revised Bologna Catalog of M31 Globular Clusters”*. Tutor: Michele Bellazzini (UniBO supervisors: Francesco Ferraro, Alessio Mucciarelli)
4. *“The HST treasury programme “Missing Globular Cluster Survey”. Preparing the database”*. Tutors: Michele Bellazzini, Davide Massari (UniBO supervisor: Alessio Mucciarelli)
5. *“Multiple populations in globular clusters using Stromgren photometry”*. Tutors: Angela Bragaglia, Davide Massari, Emanuele Dalessandro (UniBO supervisor: Alessio Mucciarelli)
6. *“Nova nucleosynthesis and Galactic chemical evolution”*. Tutor: Donatella Romano (UniBO supervisor: Alessio Mucciarelli)
7. *“Abundance ratios for chemical tagging”*. Tutor: Donatella Romano (UniBO supervisor: Alessio Mucciarelli)