Milky Way science with the MSE

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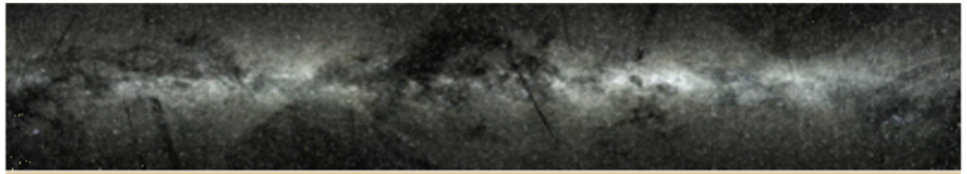
Current Science Working Group

Exoplanets and stellar astrophysics

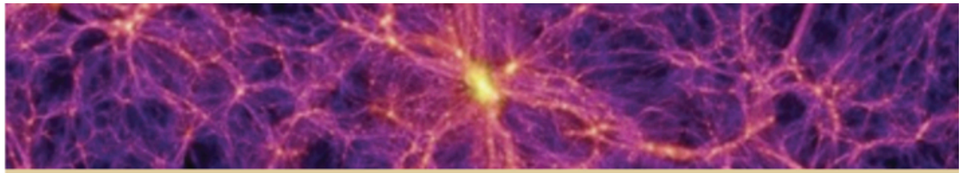


Milky Way and resolved stellar populations

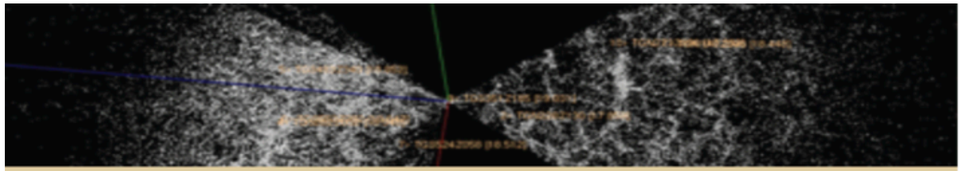
Chemical nucleosynthesis

Galaxy formation and evolution

AGN and supermassive black holes



Astrophysical tests of dark matter

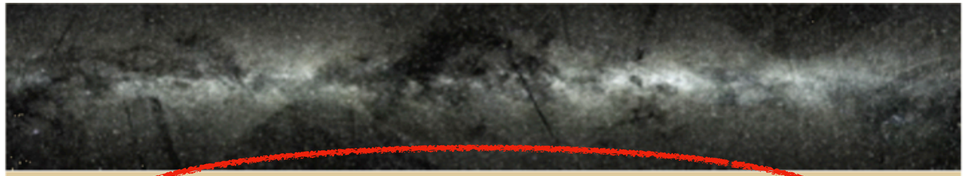


Cosmology

Time domain astronomy and transients

Current Science Working Group

Exoplanets and stellar astrophysics



Milky Way and resolved stellar populations

Chemical nucleosynthesis

Galaxy formation and evolution

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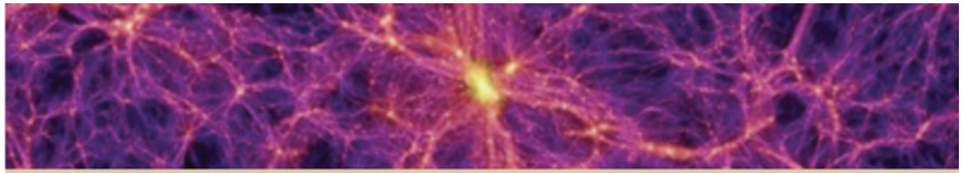

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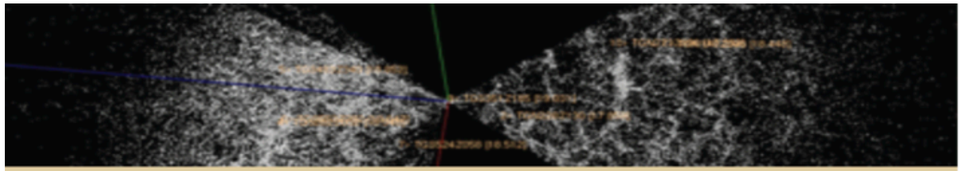
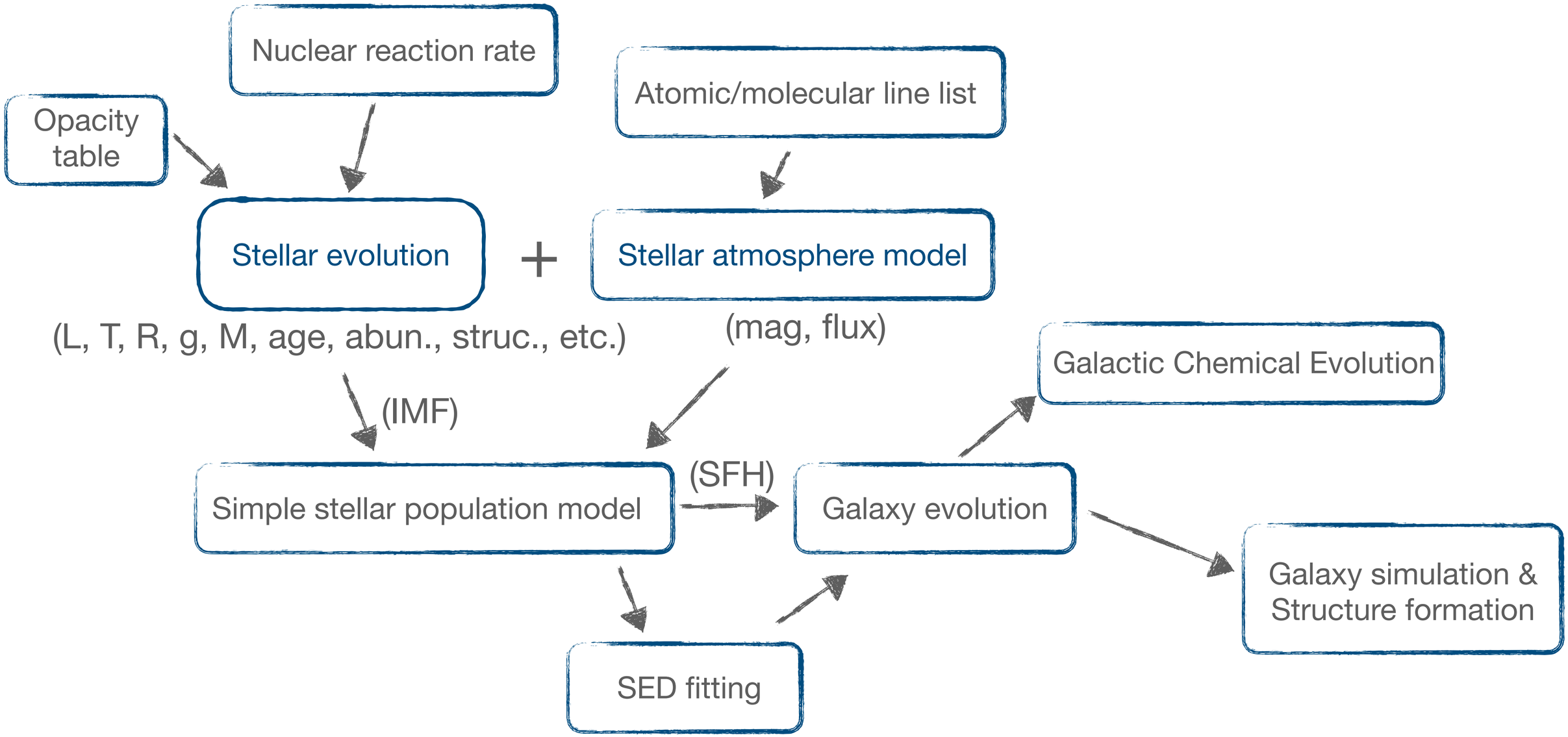


Cosmology

Time domain astronomy and transients

Chemical nucleosynthesis, Stellar astrophysics, Milky Way and resolved stellar populations

From nucleosynthesis to the Galaxy evolution



Milky Way and resolved stellar populations

From nucleosynthesis to the Galaxy evolution

Stellar chemical abundances

The Galactic Chemical Evolution

Simple stellar population cluster

Milky Way evolution

Milky Way and resolved stellar populations

From nucleosynthesis to the Galaxy evolution

- *Chemical abundance of the halo/bulge/disc stars*

Stellar chemical abundances

- *Chemical evolution of the MW and accreted galaxies*

The Galactic Chemical Evolution

Simple stellar population cluster

Milky Way evolution

- *Evolution of the Galactic Open Clusters*
- *The footprint of merger events*

- *The footprint of merger events*

Passage of the Sgr, dsph through the MW disc introduce perturbations

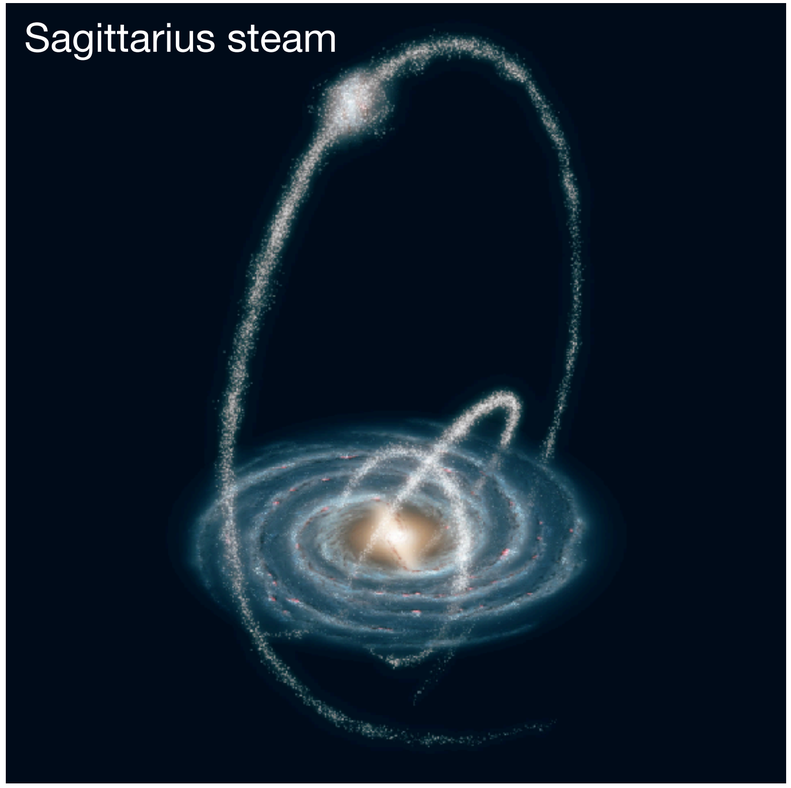


Image credit: NASA / JPL-Caltech / R. Hurt, SSC & Caltech.

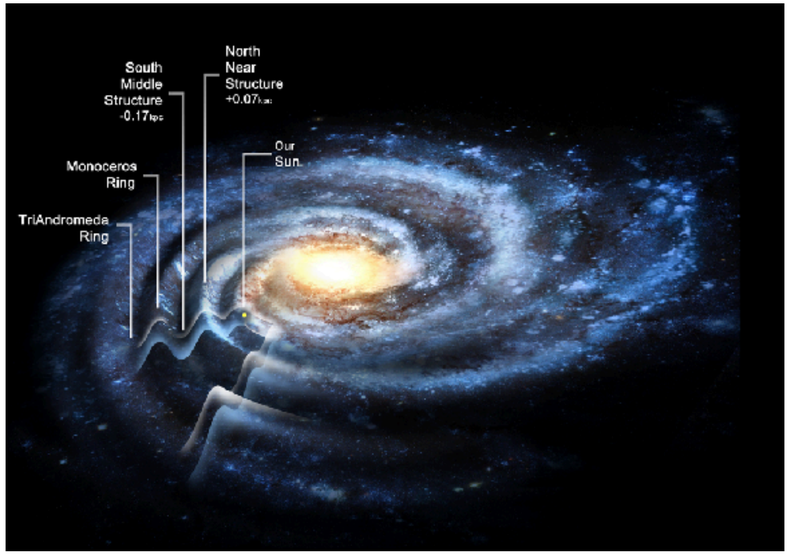
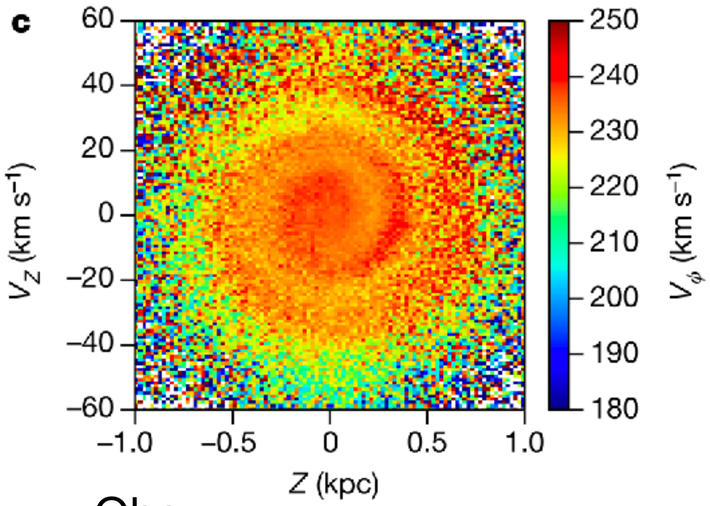


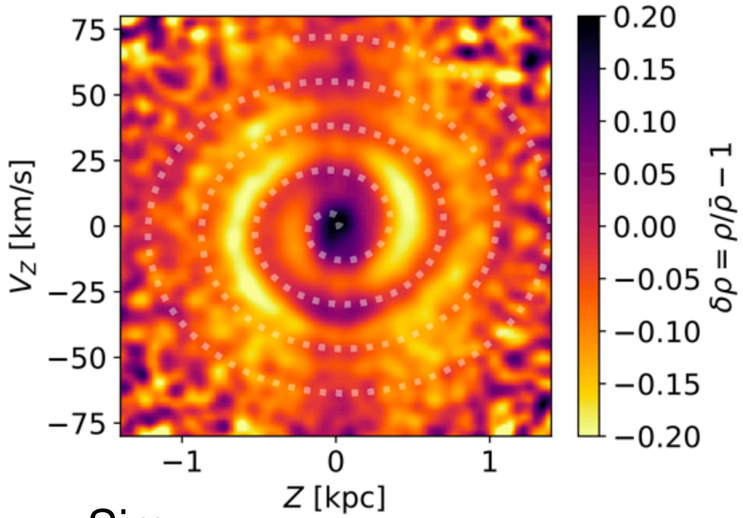
Image credit: H. Newberg / RPI

Also a snail shell / spiral pattern in the phase space within 1kpc



Obs.

Antoja+2018



Sim.

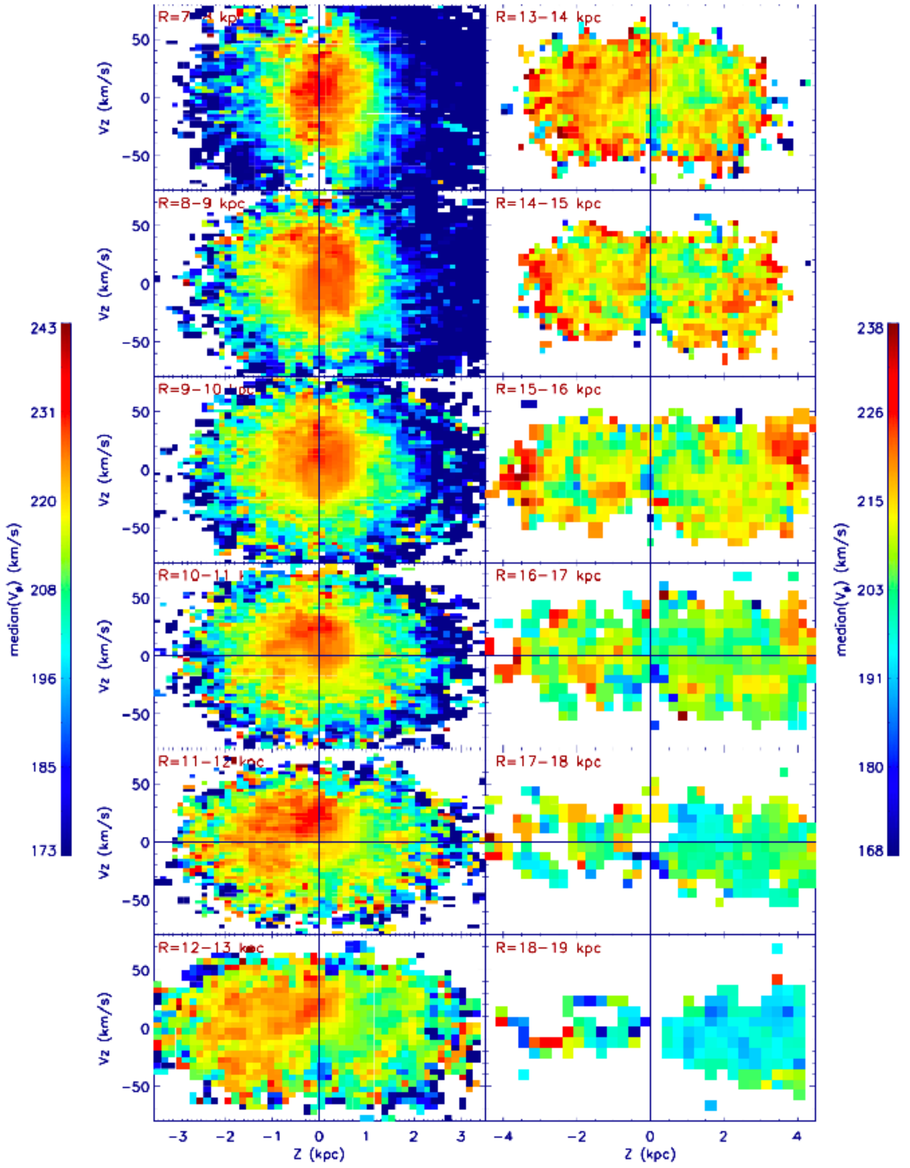
Laporte+2019

- *The footprint of merger events*

But the snail shell / spiral patter in the phase space can be seen further

“At least to R~15 kpc”

—— Xu+ 2020 with LAMOST K giants



- *The footprint of merger events*

But the snail shell / spiral patter in the phase space can be seen further

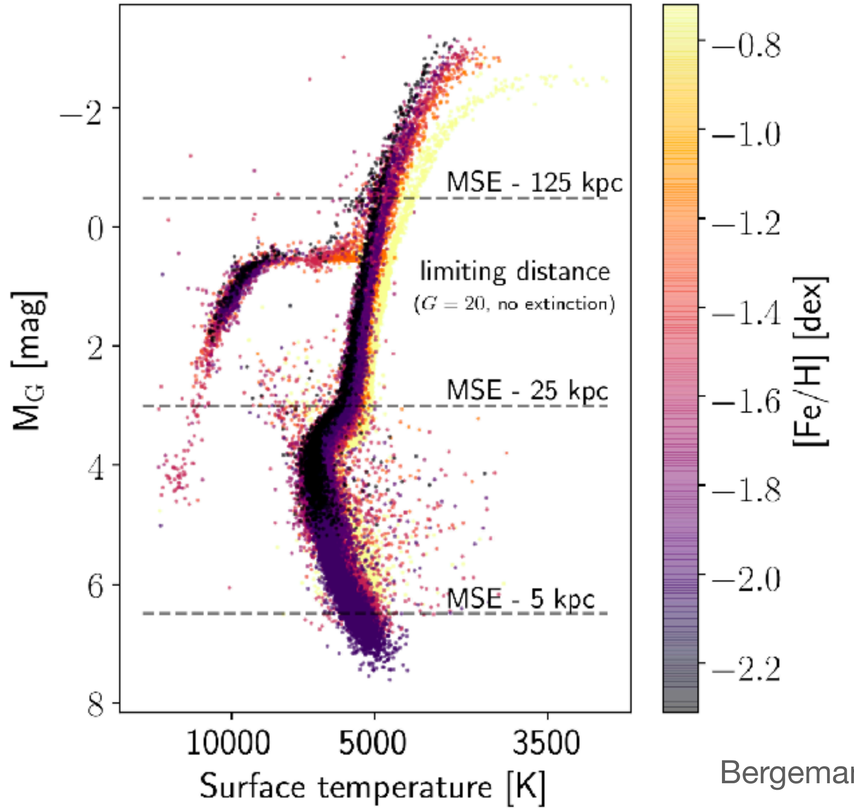
"At least to R~15 kpc"
—— Xu+ 2020 with LAMOST K giants, because of too few giants in the outer disc

Can the pattern be seen in an even further galactic radius?

Maunakea Spectroscopic Explorer

MSE: "Yes, look at the main sequence turn-off stars"

- *The footprint of merger events*



Bergemann+2019

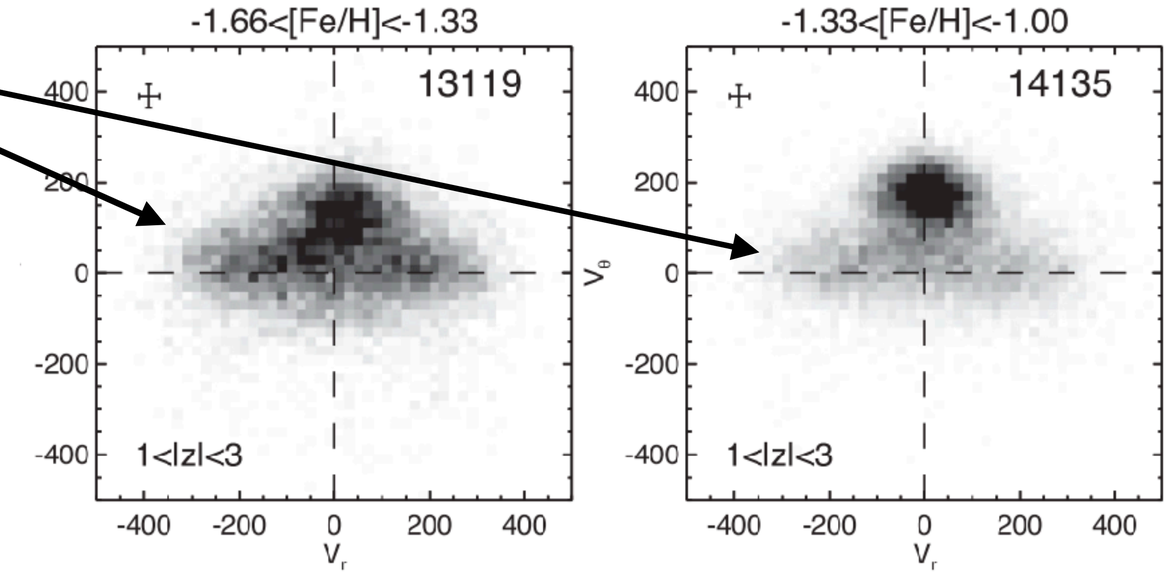
Maunakea Spectroscopic Explorer

MSE: “Yes, look at the main sequence turn-off stars”

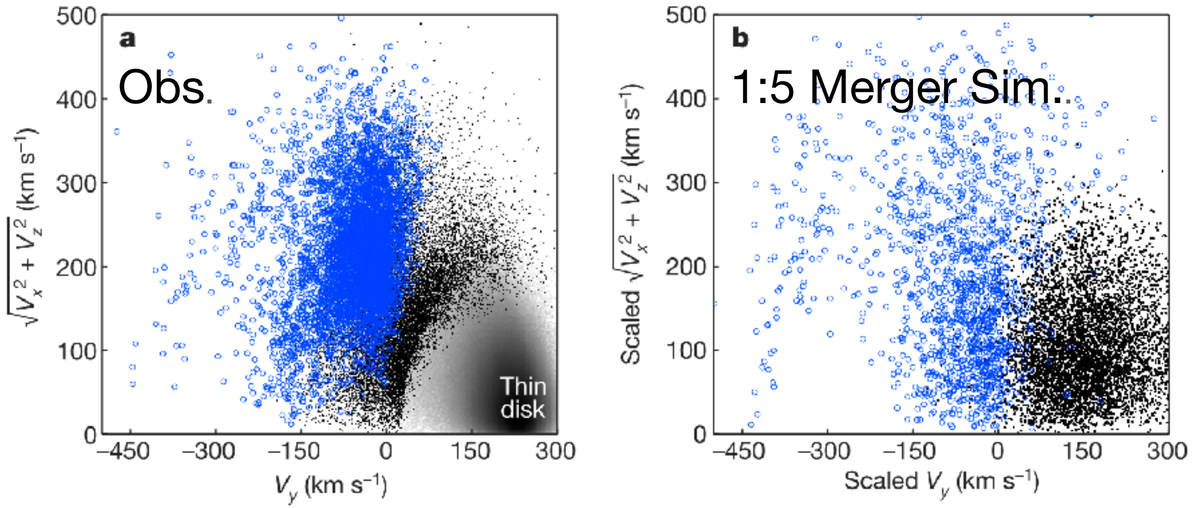
- *The footprint of merger events*

- *Chemical evolution of the MW and accreted galaxies*

Gaia-Enceladus / sausage



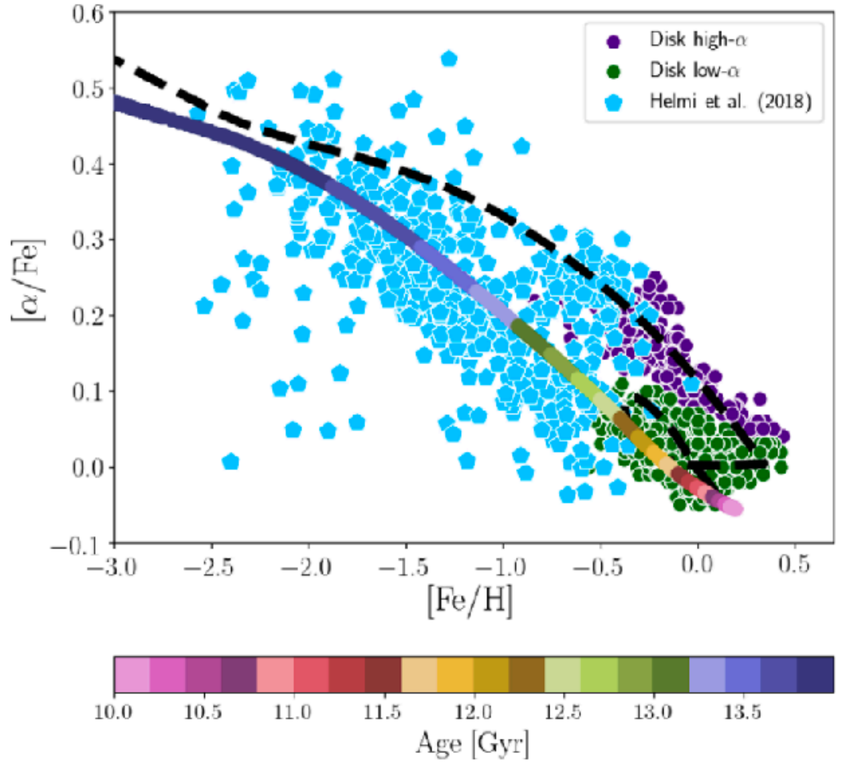
Belokurov+2018



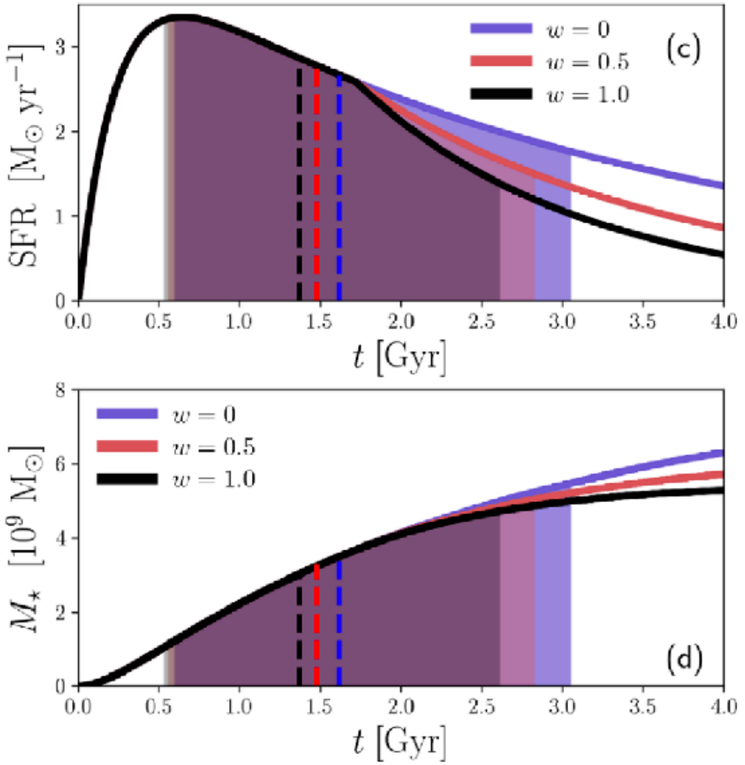
Helmi+2018

- *Chemical evolution of the MW and accreted galaxies*

Chemical evolution of the accreted Gaia-Enceladus/sausage

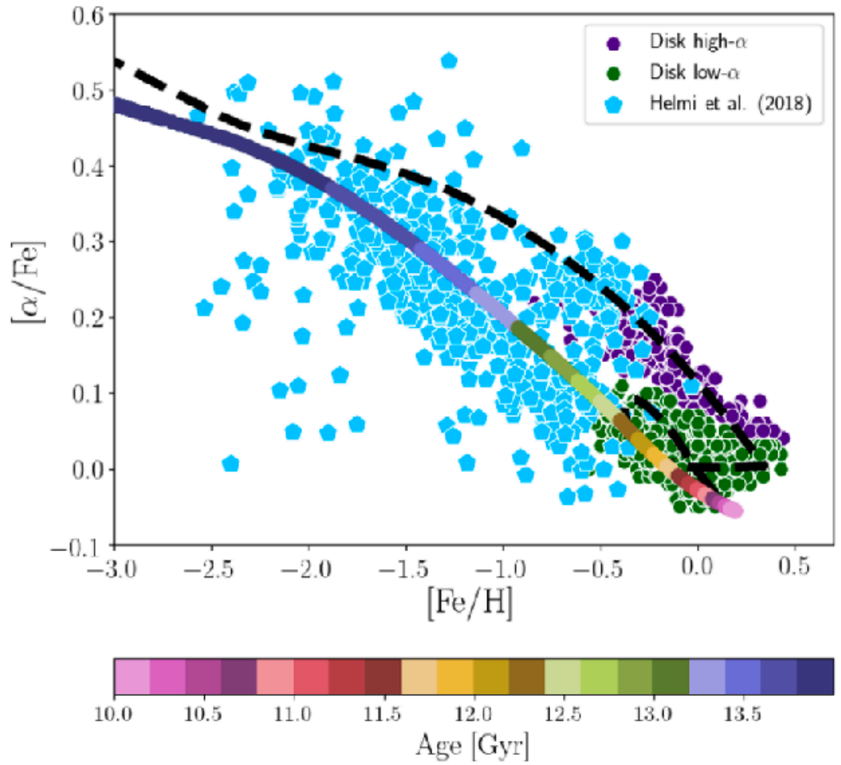


Vincenzo+2019



- *Chemical evolution of the MW and accreted galaxies*

Chemical evolution of the accreted Gaia-Enceladus/sausage



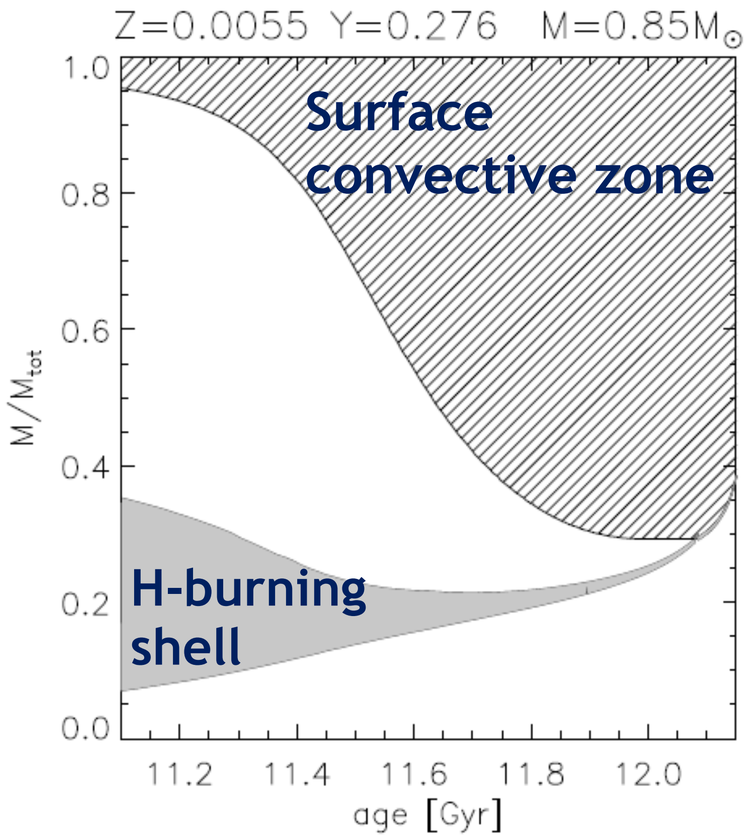
Vincenzo+2019

What is the most unknown element in other galaxies?

Lithium

Oh fragile Li, only un-evolved stars can serve to trace your evolution in a galaxy

- *Chemical evolution of the MW and accreted galaxies*



What is the most unknown element in other galaxies?

Lithium

Oh fragile Li, only un-evolved stars can serve to trace your evolution in a galaxy

Too far, too faint, too difficult to reach

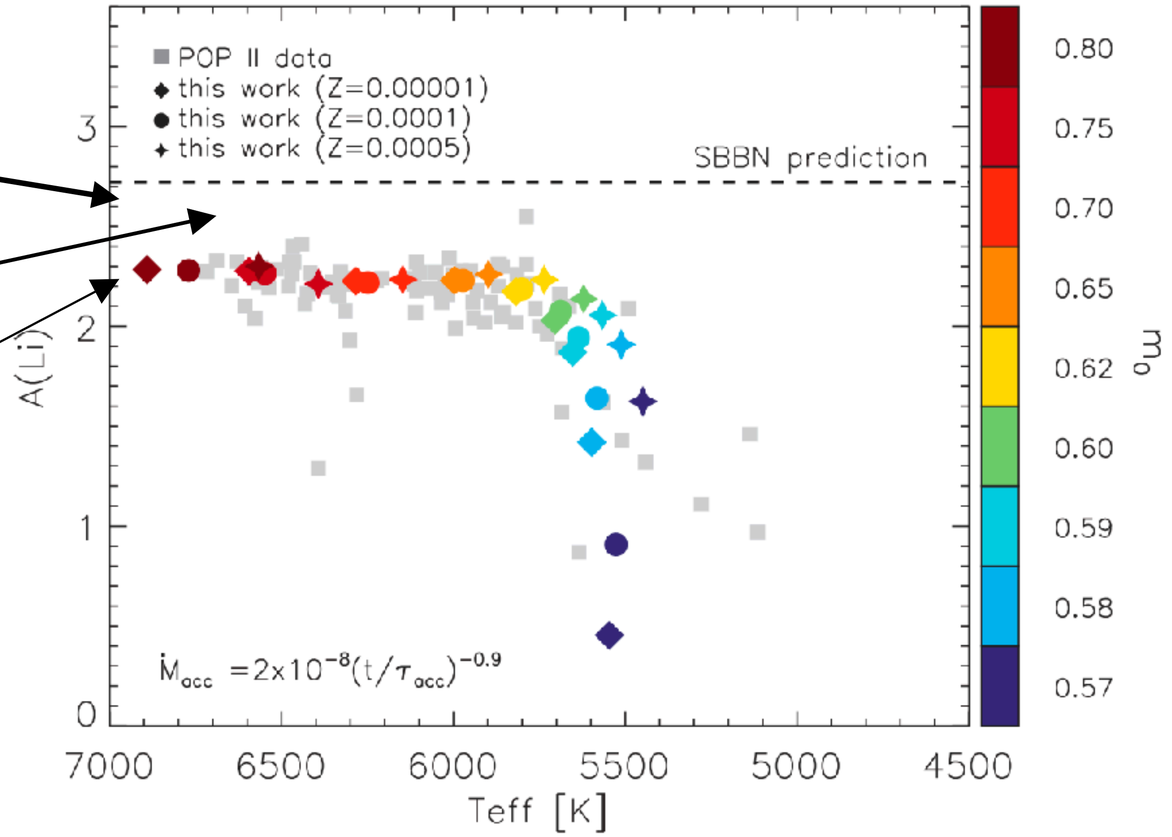
- *Chemical evolution of the MW and accreted galaxies*

Lithium in the MW

Big Bang Nucleosynthesis prediction

Cosmological Li problem

The Spite Plateau

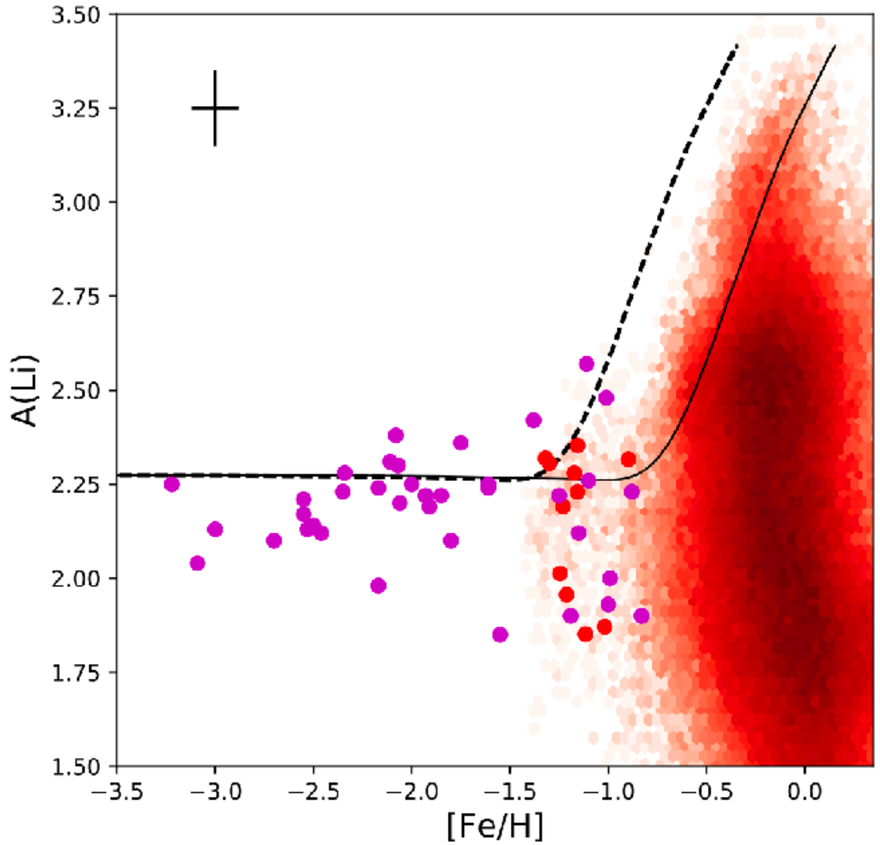


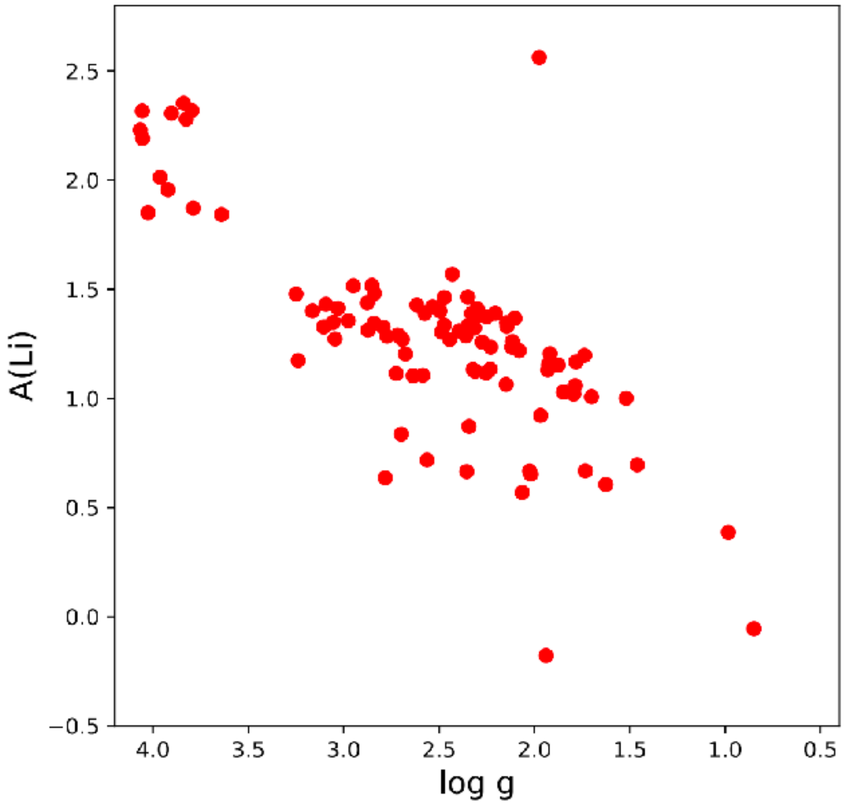
Fu+2015

- *Chemical evolution of the MW and accreted galaxies*

Lithium in the Gaia-Enceladus/sausage

The Spite Plateau exists



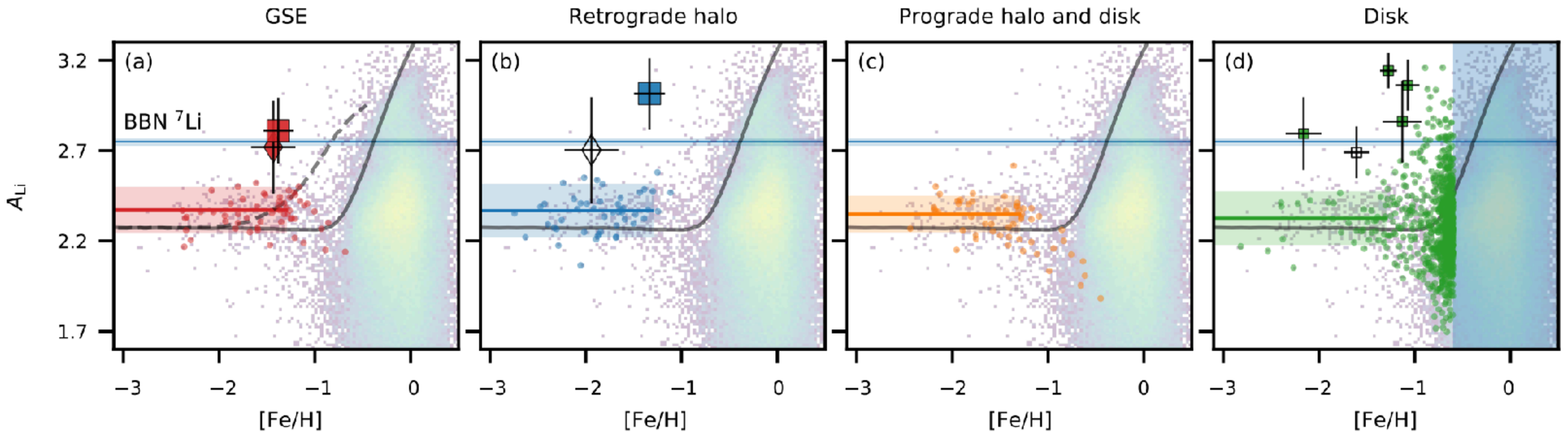


Molaro+2020, based on archive data

- *Chemical evolution of the MW and accreted galaxies*

Lithium in the Gaia-Enceladus/sausage

The Spite Plateau exists



Simpson+2021, based on GALAH DR3

- *Chemical evolution of the MW and accreted galaxies*

Lithium in the Gaia-Enceladus/sausage

The Spite Plateau exists

Is the universal? Any possibility to check other galaxies?

- *Chemical evolution of the MW and accreted galaxies*

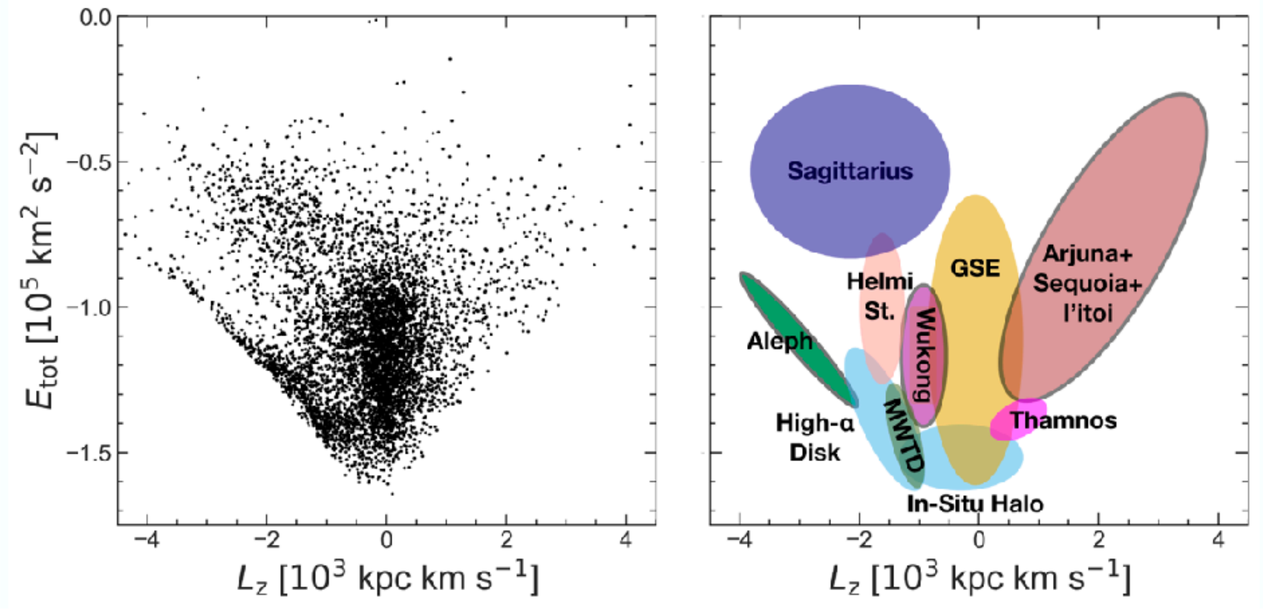
Lithium in the Gaia-Enceladus/sausage

The Spite Plateau exists

Is the universal? Any possibility to check other galaxies?

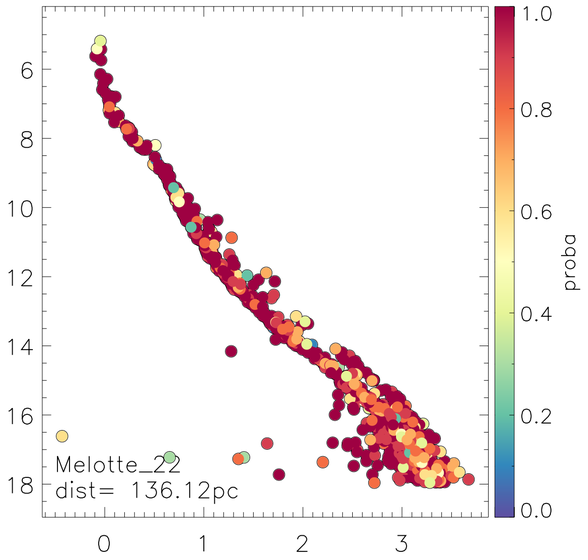
Maunakea Spectroscopic Explorer

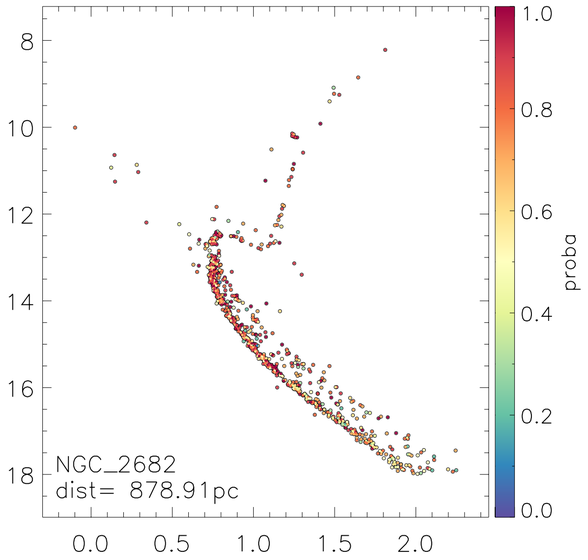
MSE: “Yes, check other accreted stars from minor merger events”

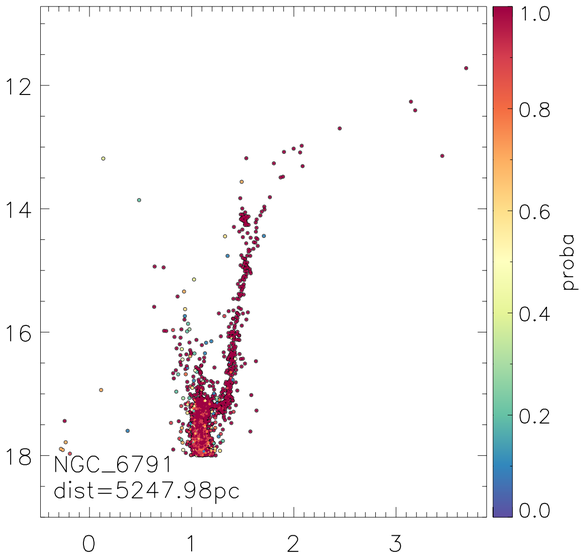


Naidu+2020

- *Evolution of the Galactic Open Clusters*



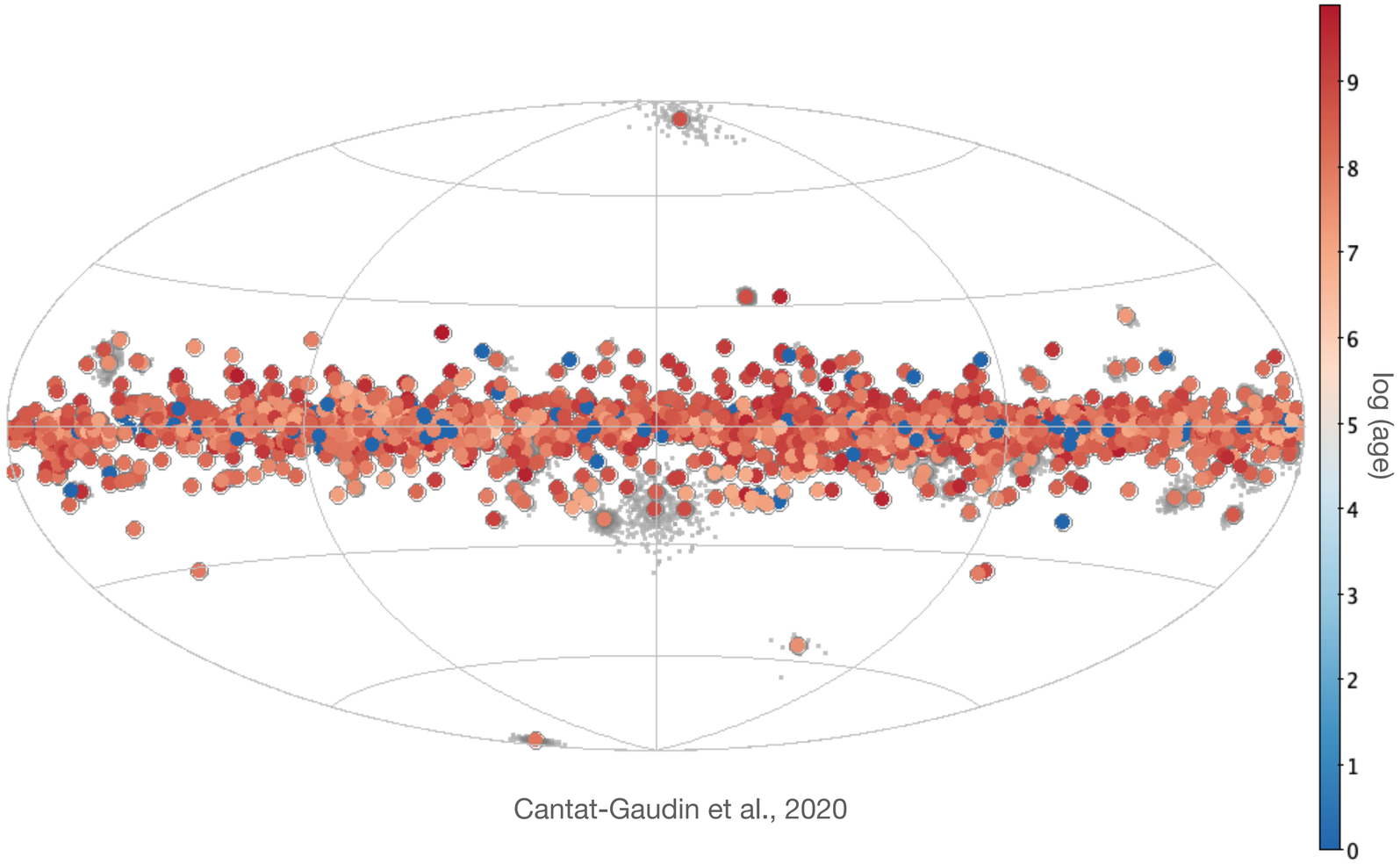




Are the open clusters really “open”?

A perfect benchmark for
- Stellar evolution
- Galactic evolution

- *Evolution of the Galactic Open Clusters*



Cantat-Gaudin et al., 2020

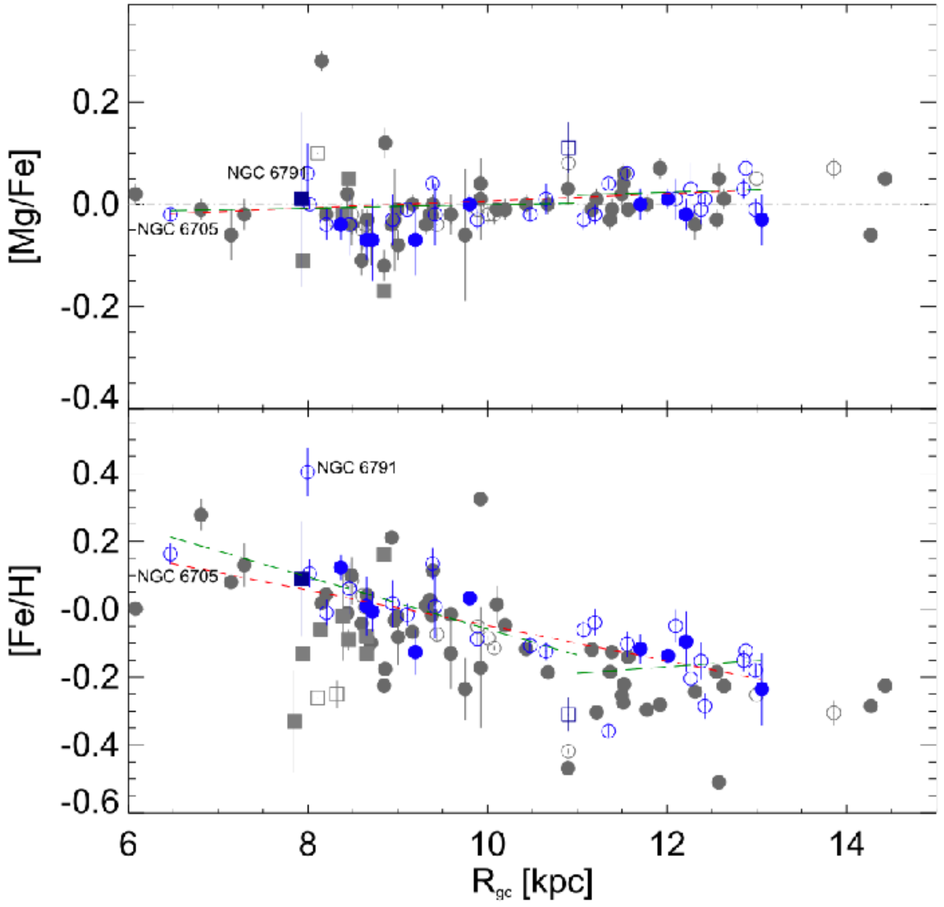
VERA C. RUBIN OBSERVATORY

gaia

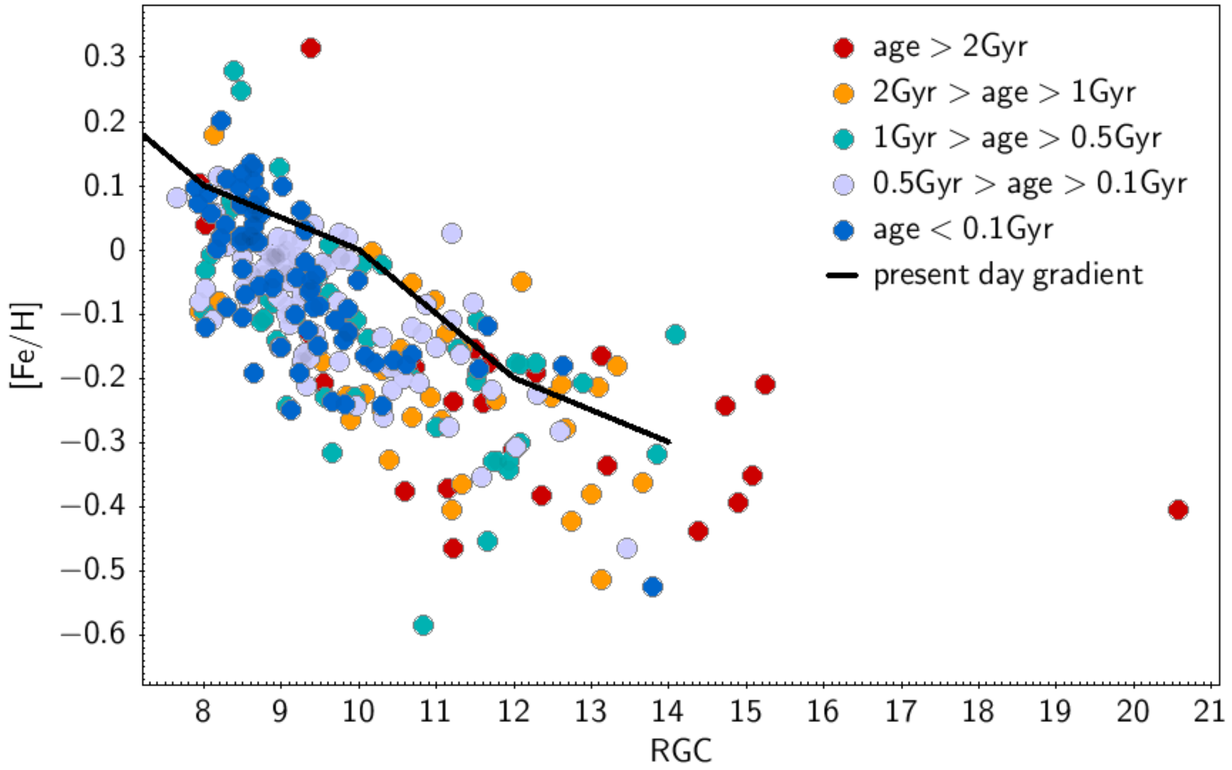
- Photometry
- Astrometry
- Spectroscopy

Chemical, kinematical, and dynamical info.

- *Evolution of the Galactic Open Clusters*



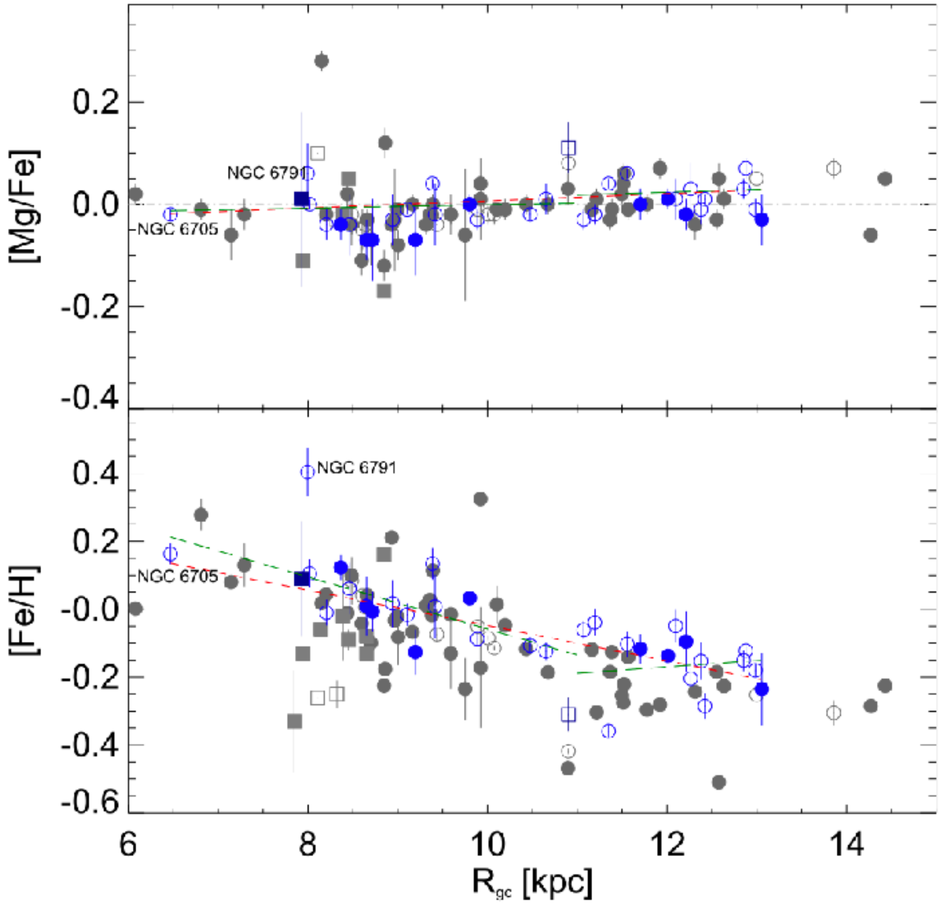
Carrera+2019, based on GALAH & APOGEE



Fu+ in prep., based on LAMOST

- *Evolution of the Galactic Open Clusters*

Can we know more about the outer disc open clusters?



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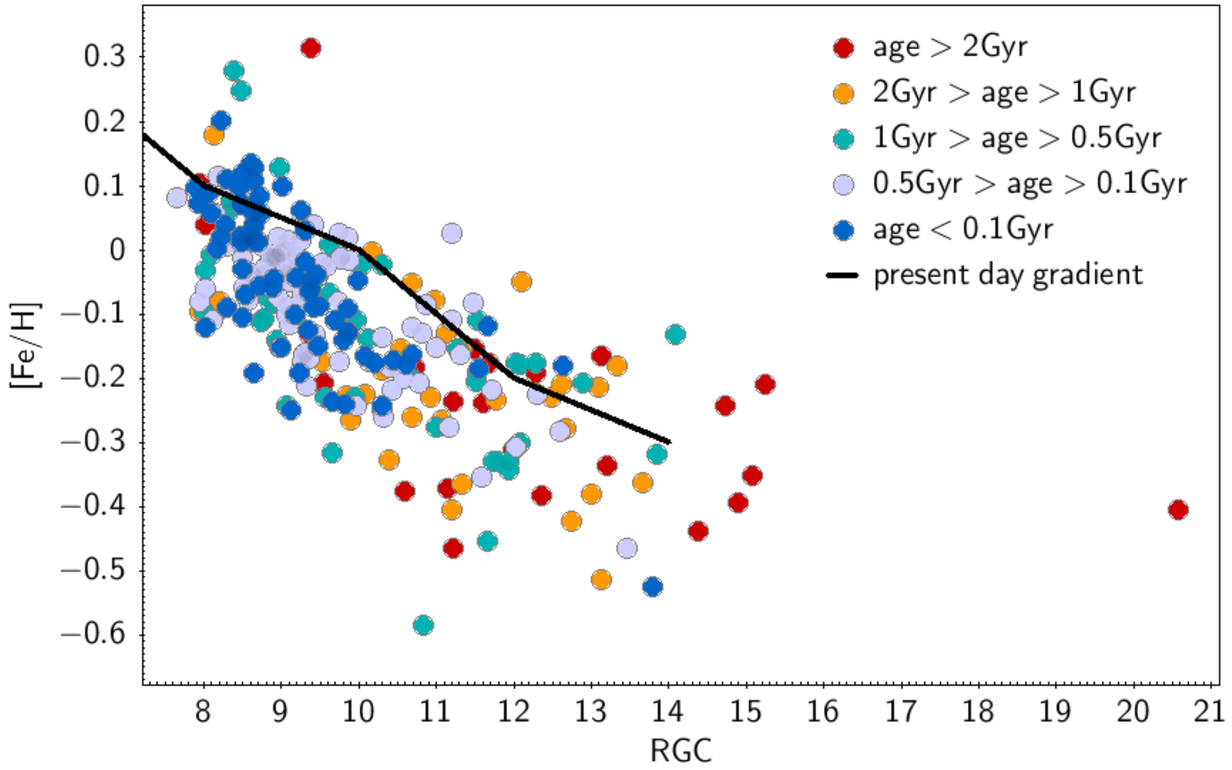


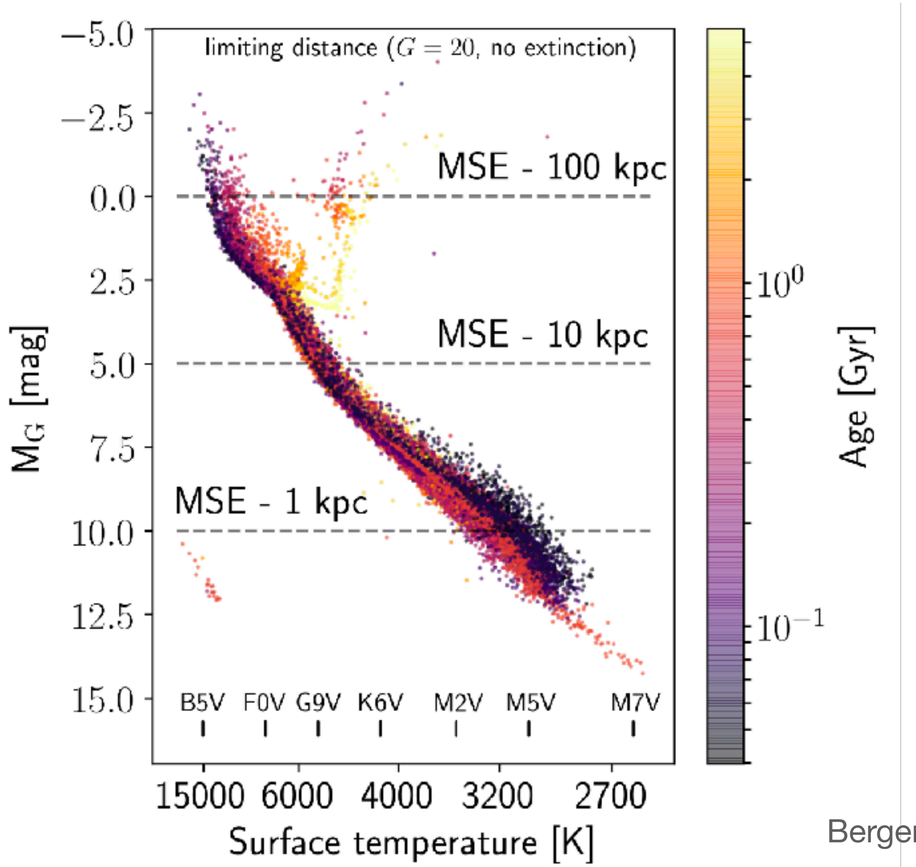
Fu+ in prep., based on LAMOST

- *Evolution of the Galactic Open Clusters*

Can we know more about the outer disc open clusters?

Maunakea Spectroscopic Explorer

MSE: “Yes, I can reach turn-off stars to 20-50 kpc”



Bergemann+2019

Milky Way and resolved stellar populations

From nucleosynthesis to the Galaxy evolution

Welcome to join us and bring more fresh ideas!