Osservatorio Astronomico di Trieste
Astronomical Observatory of Trieste

UNIVERSITÀ DEGLI STUDI DI TRIESTE

MINCE

Measuring at Intermediate Metallicity Neutron Capture Elements

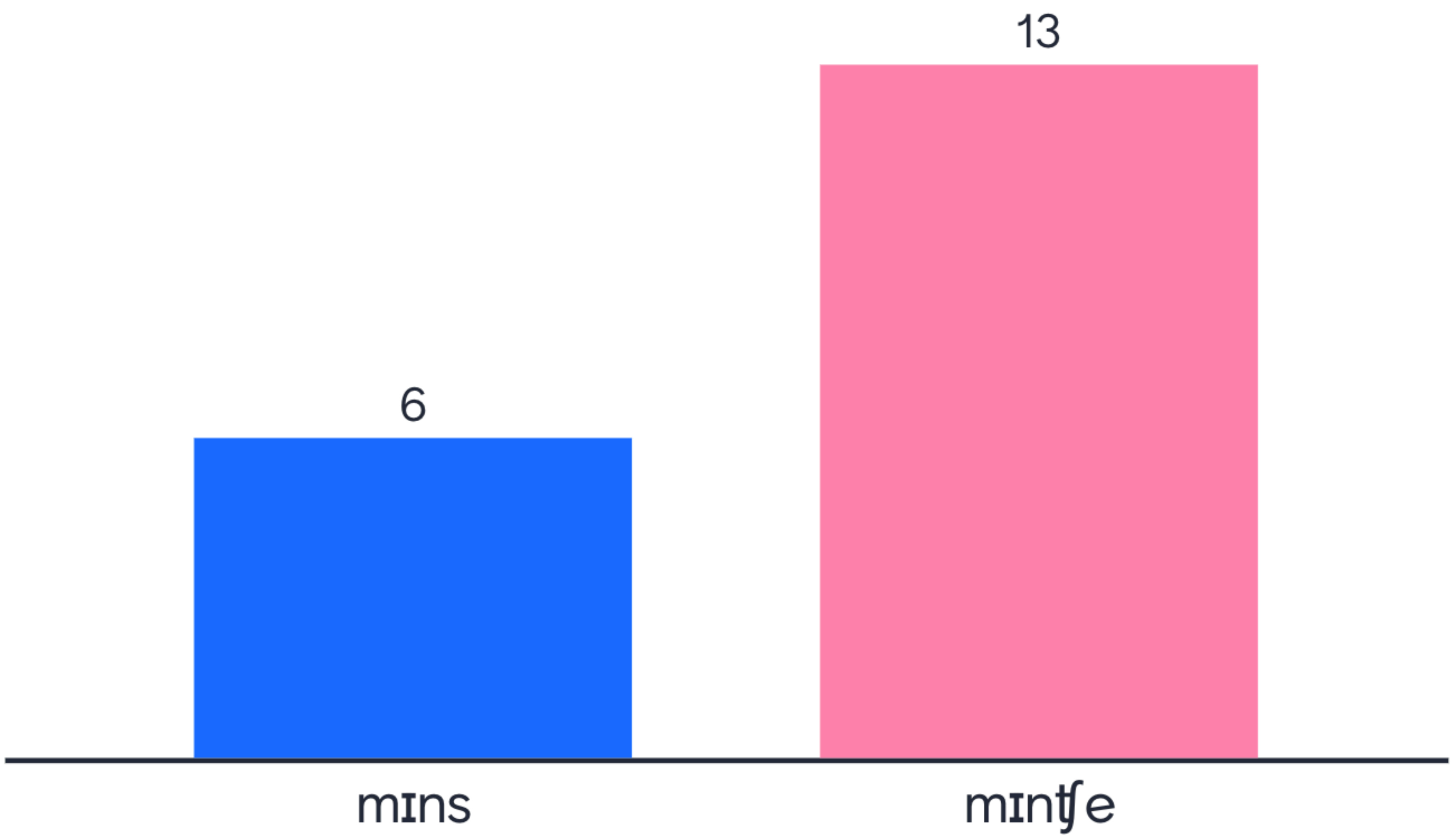
Gabriele Cescutti +
all the MINCERS

ChETEC INFRA

ChETEC Action

ChETEC GA 3 - Debrecen, 7 June 2023

How to pronounce MINCE?



Vilnius , ChETEC WG3 Meeting 2019

Focus of the meeting was preparing 2 observational proposals:

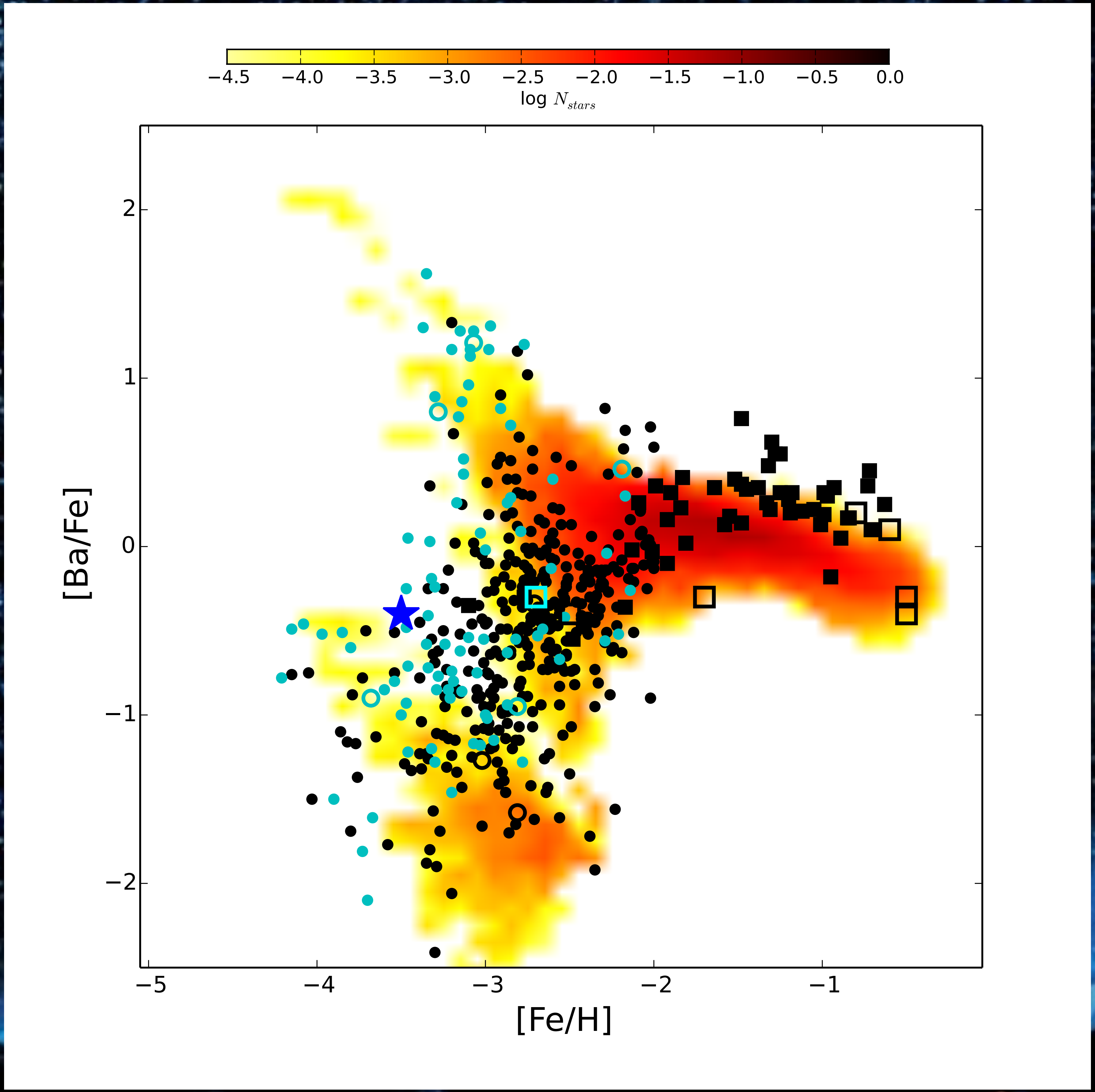
r-process

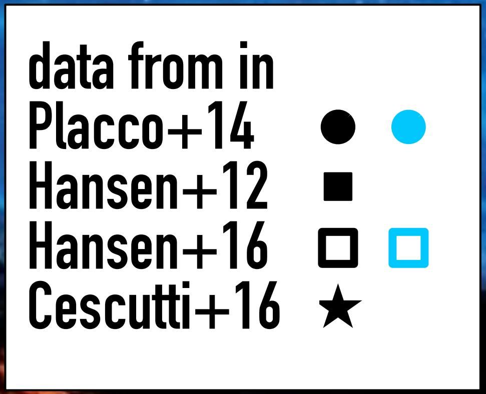
Galactic globular clusters

r-process team

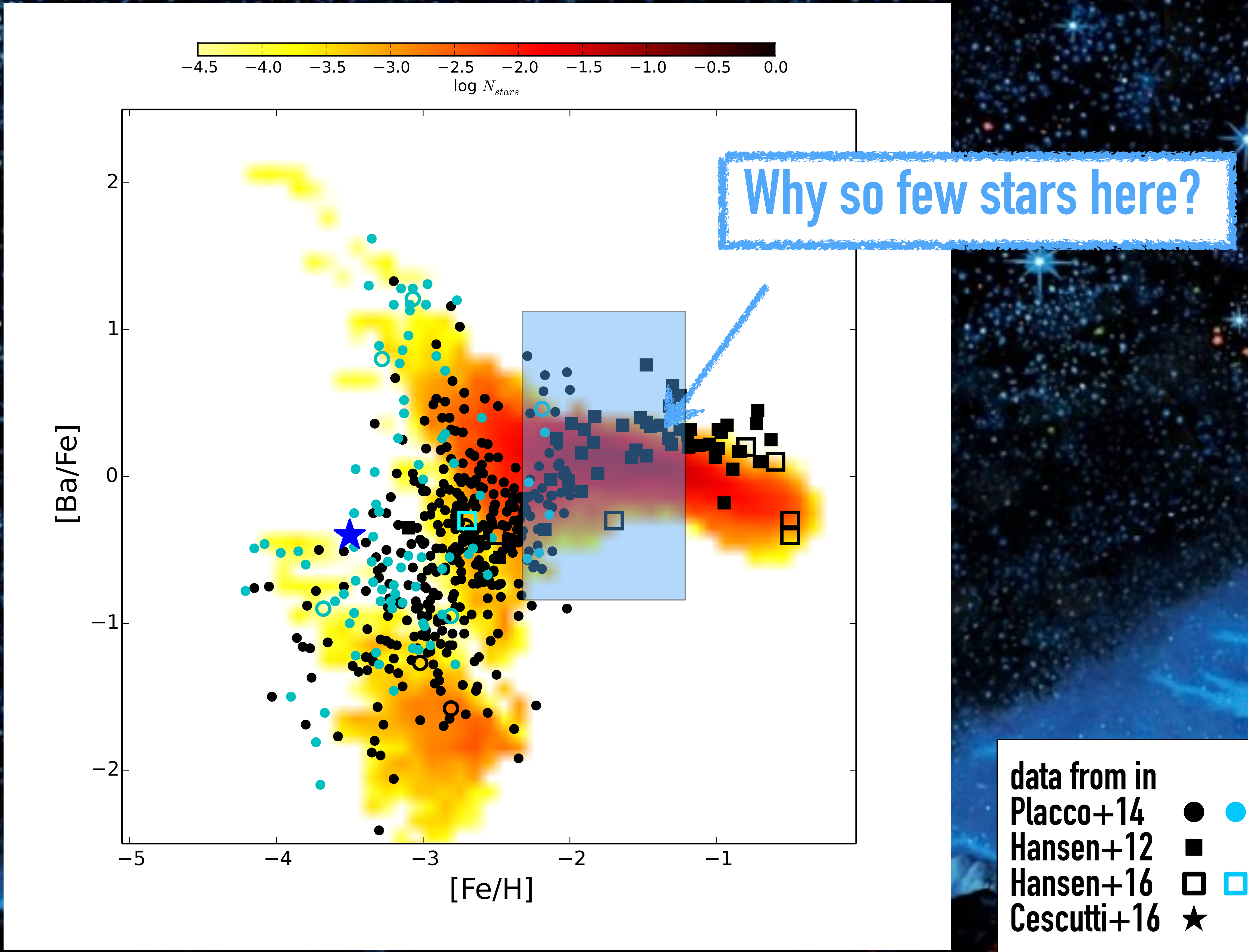
However, during a coffee break ...

Stochastic model for Ba in the Galactic halo



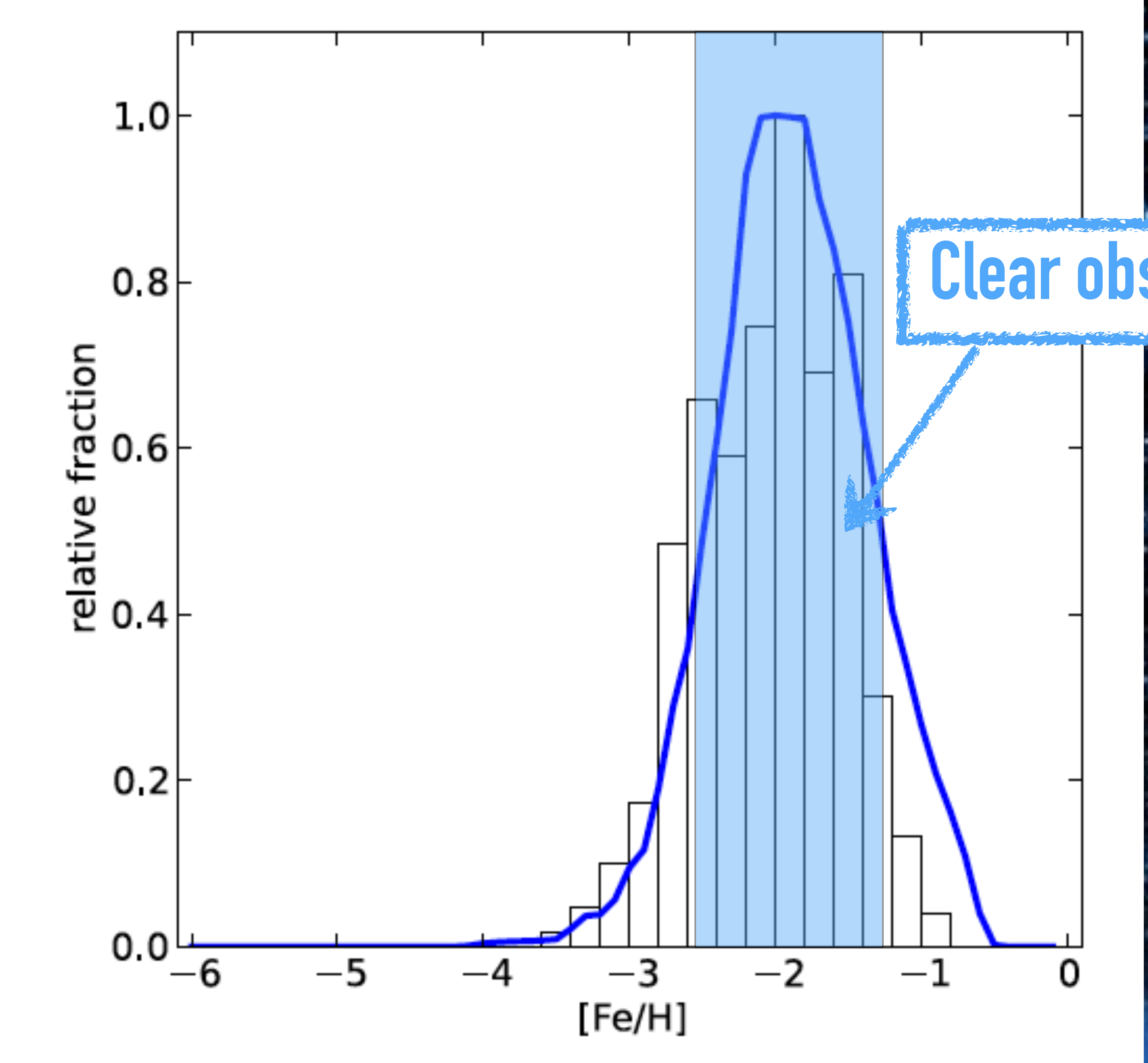


Stochastic model for Ba in the Galactic halo



data from in
Placco+14
Hansen+12
Hansen+16
Cescutti+16

Metallicity distribution function of the Galactic halo



Clear observational bias

Li et al. (2010): main-sequence turnoff stars in the HESS (Hamburg ESO)

What can we do?

Measuring nc elements is demanding:

—> HR spectroscopy

—> high S/N

(at least for most of the nc elements!)

but see results for Sr and Ba with X-shooter by
Camilla Hansen et al. 2016 and
Contursi et al. 2022 for cerium at GAIA RV

However . . .

we are not looking for the most metal poor stars, just honest halo giants. . .

(giants better suited for measuring the nc elements lines)

Nature is generous:

it provides a lot of them in our Galaxy, and some (>1000) are close enough to be measured with 2-4m telescopes (V<10-11)

or measured as a filler in top class telescopes!

TNG 3.58m
Spectrograph HARPS-N

4/4 applications successful 58 stars

PI Cescutti

Period AOT42 (October 2020 — March 2021) Submit using: www.tng.iac.es/submit.html

1. Title

Measuring at Intermediate metallicity Neutron Capture Elements (MINCE)

2. Abstract

The abundances of n-capture elements in metal-poor stars are needed to understand the physics of the different n-capture processes (slow, rapid and possibly intermediate) as well as the chemical evolution of the Galaxy. The intermediate metallicity range ($-2.5 \leq [Fe/H] \leq -1.5$) is particularly interesting because it allows to discriminate different models. Surprisingly there are far less measurements of n-capture elements abundances in this metallicity range than at lower metallicities. The Measuring at Intermediate metallicity Neutron Capture Elements (MINCE) project aims at filling this gap and providing the community with a high quality sample of stars with measured chemical abundances as legacy. The goal is to determine the abundances in about 1000 metal-poor giants in five years using several facilities. We here propose to use HARPS to observe a sample of sixteen metal-poor northern giants.

OHP 1.93m
Spectrograph SOPHIE

2/2 applications successful: 42 stars

PI Bonifacio

CFHT: 3.58m
Spectrograph ESPaDOnS

3 applications successful (filler): 15 stars

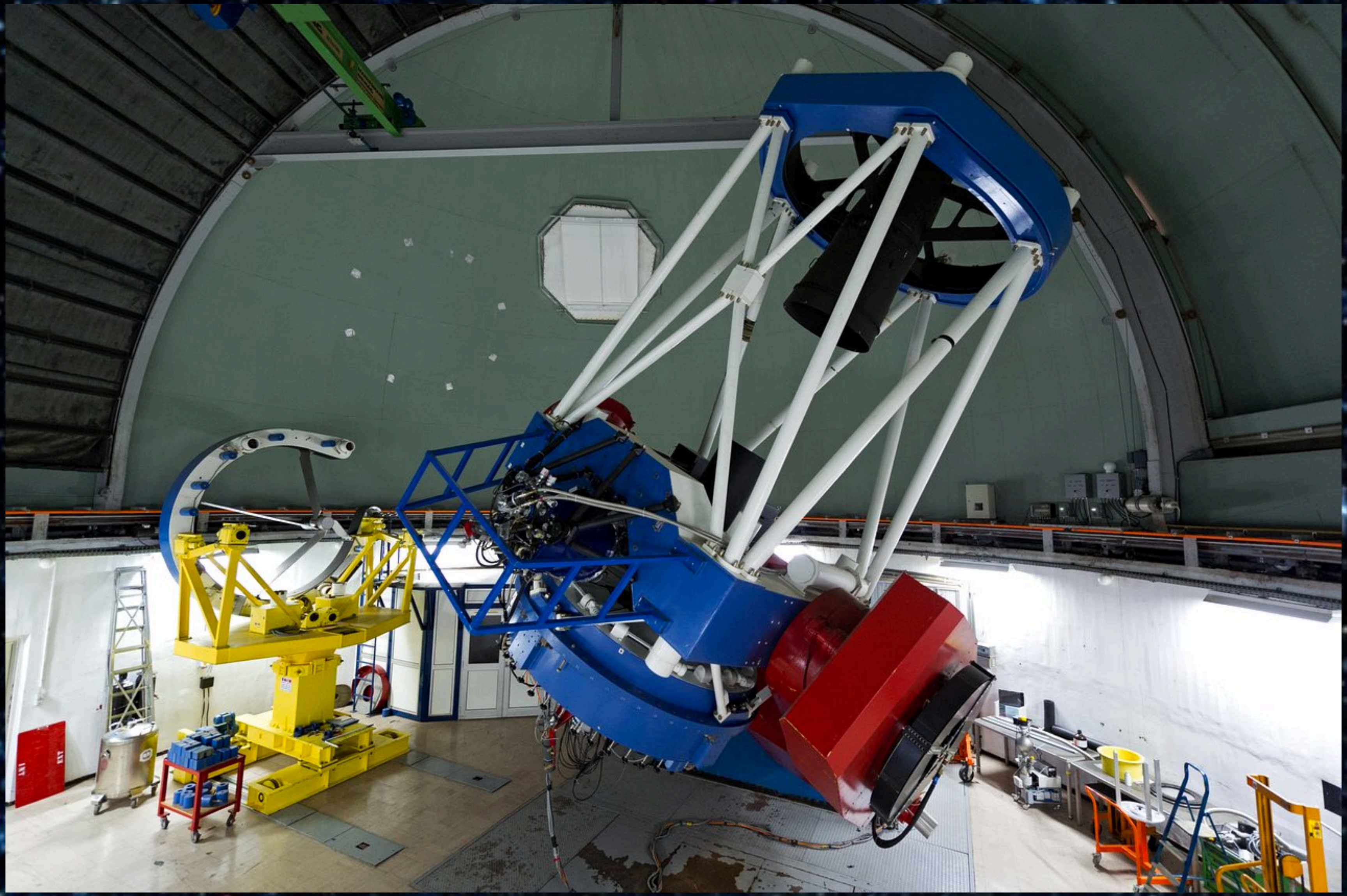
PI Bonifacio

TBL 2m
Spectrograph: NeoNArval

1/1 applications: 12 stars (but problems in the reduction)

PI Bonifacio

MPG/ESO 2.2-metre
FEROS



3/3 application 130 stars but 1 cancelled due to corona virus :(

PI Hansen

Magellan 6.5m
Spectrograph: MIKE

1/2 applications
14 stars

PI L.Monaco

VLT 8.2m
Spectrograph: UVES

2/2 applications total of 100h (50h+50h, low ranking)
P106 48 stars, P105—>P107 (50 stars)

PI Cescutti

Moletai 1.65m
Spectrograph: VUES

2/2 applications
24 stars

PI Kučinskas

NOT 2.2m
Spectrograph:FIES

2/4 applications: 24 stars +
PI Spitoni + Cescutti

NOT 2.2m
Spectrograph:FIES

2/4 applications: 24 stars +
PI Spitoni + Cescutti

+4/4 ChETEC INFRA

Summary

telescope	instrument	time	targets	status
A40-41 TNG	HARPS-N	21 h	31	observed
A42 TNG	HARPS-N	1n	12	observed
A43 TNG	HARPS-N	1n	16	observed
CFHT 2019B+20A	ESPaDOnS	30h	12	observed
CFHT 2020B	ESPaDOnS	24.5h	6	observed
OHP 2019B+20A	Sophie	6n	42	observed
TBL 2020A	NeoNArval	13h	12	observed (reduction problematic)
2019B 2.2m	FEROS	4n	65(72)	observed (2n cancelled)
2020B 2.2m	FEROS	2n	65	observed
Magellan	MIKE	2n	14 (20)	observed (1 night cancelled)
VLT ESO period 105-107	UVES	50h	50	observed
VLT ESO period 106	UVES	50h	50	observed
period 61, NOT	FIES	3n	16	observed
period 62, NOT	FIES	8h	8	observed
ChETEC-INFRA 1, NOT	FIES	3n	0 (16)	not taken due to eruption
ChETEC-INFRA 3, NOT	FIES	3n	5 (16)	bad seeing, success rate 30%
ChETEC-INFRA 5, NOT	FIES	3n	16	to be taken in Oct-Dec 2022
Moletai 1.65m	VUES	38n	24	observed

9 facilities used!

missing the 3n awarded with a proposal @NOT thanks to ChETEC INFRA time 7

~450 stellar spectra with high S/N and Resolution

Observations thanks to ChETEC-INFRA

ChETEC-INFRA 1: September 2021

Observer: Aroa del Mar Matas Pinto (Obs. de Paris)

PI Bonifacio

Observations thanks to ChETEC-INFRA

ChETEC-INFRA 1: September 2021

Observer: Aroa del Mar Matas Pinto (Obs. de Paris)

PI Bonifacio

Observations thanks to ChETEC-INFRA

ChETEC-INFRA 1: September 2021

Observer: Aroa del Mar Matas Pinto (Obs. de Paris)

PI Bonifacio

Ashes and dust. No Observations taken

Observations thanks to ChETEC-INFRA

ChETEC-INFRA 2: April 2022

Observer & PI: Andreas Korn (Uppsala University)

PI Korn

"Given the poor seeing/transparency/high winds throughout, we probably managed to get ~30% of what we had planned. So 5 stars out of 16."

Observations thanks to ChETEC-INFRA

ChETEC-INFRA 5: October 2022

Patrick Francois (Obs. de Paris)

PI Korn

Observations thanks to ChETEC-INFRA

ChETEC-INFRA 7: May 2023

Observer: Marica Valentini (AIP)

PI Korn

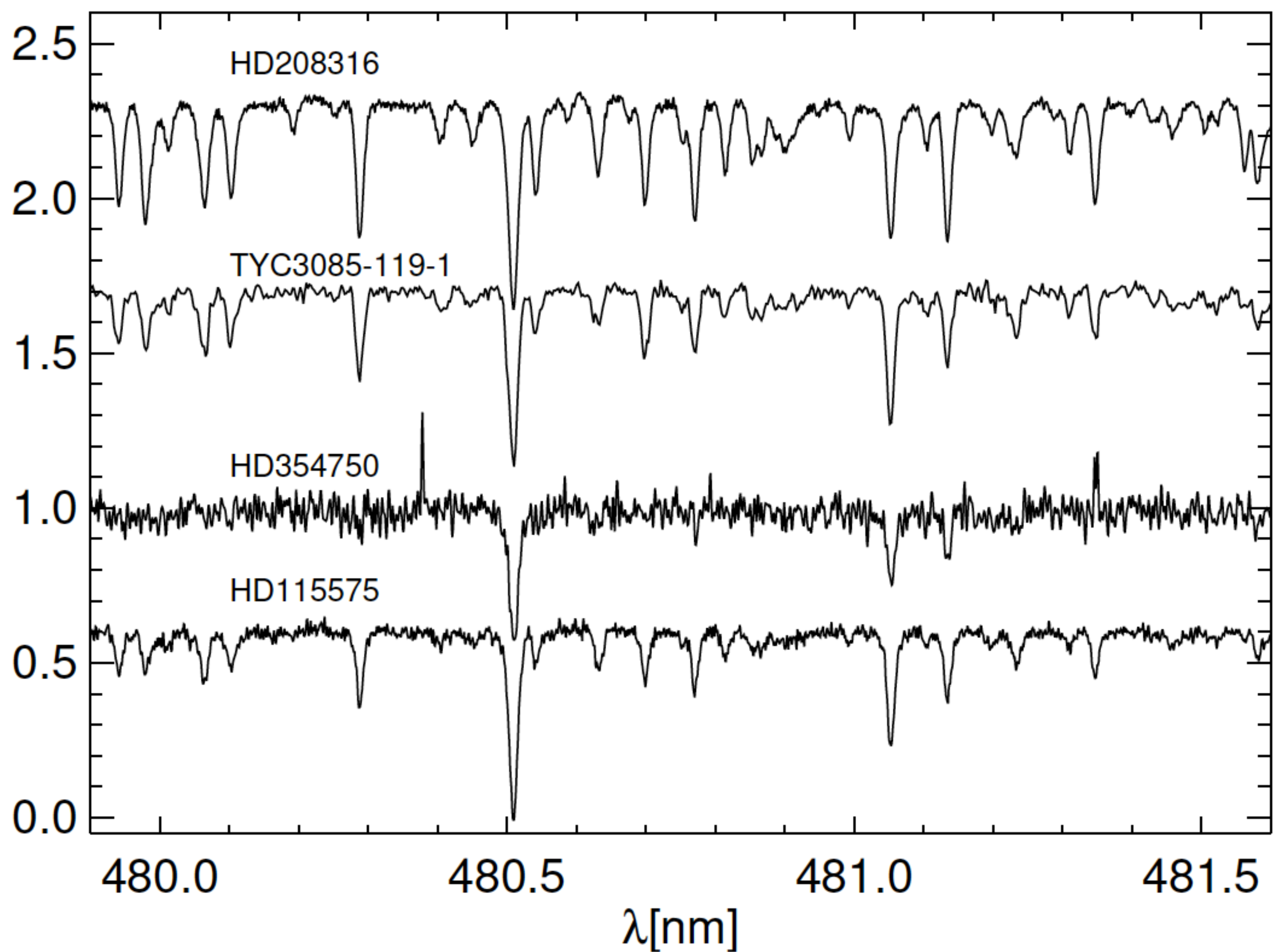
ToO for SNE in M101 (3h devoted to it) bad weather too,
4 stars over 16

Astronomy & Astrophysics manuscript no. MINCEI.01
November 14, 2022

MINCE I. Presentation of the project and of the first year sample⋆,⋆⋆

G. Cescutti[1,2,3], P. Bonifacio[4], E. Caffau[4], L. Monaco[5], M. Franchini[2], L. Lombardo[4], A.M. Matas Pinto[4]
F. Lucertini[5,6], P. François[4,7], E. Spitoni[8,9], R. Lallement[4], L. Sbordone[6], A. Mucciarelli[10,11], M. Spite[4],
C.J. Hansen[12], P. Di Marcantonio[2], A. Kučinskas[13], V. Dobrovolskas[13], A.J. Korn[14], M. Valentini[15], L. Magrini[16],
S. Cristallo[17,18], and F. Matteucci[1,2,3]

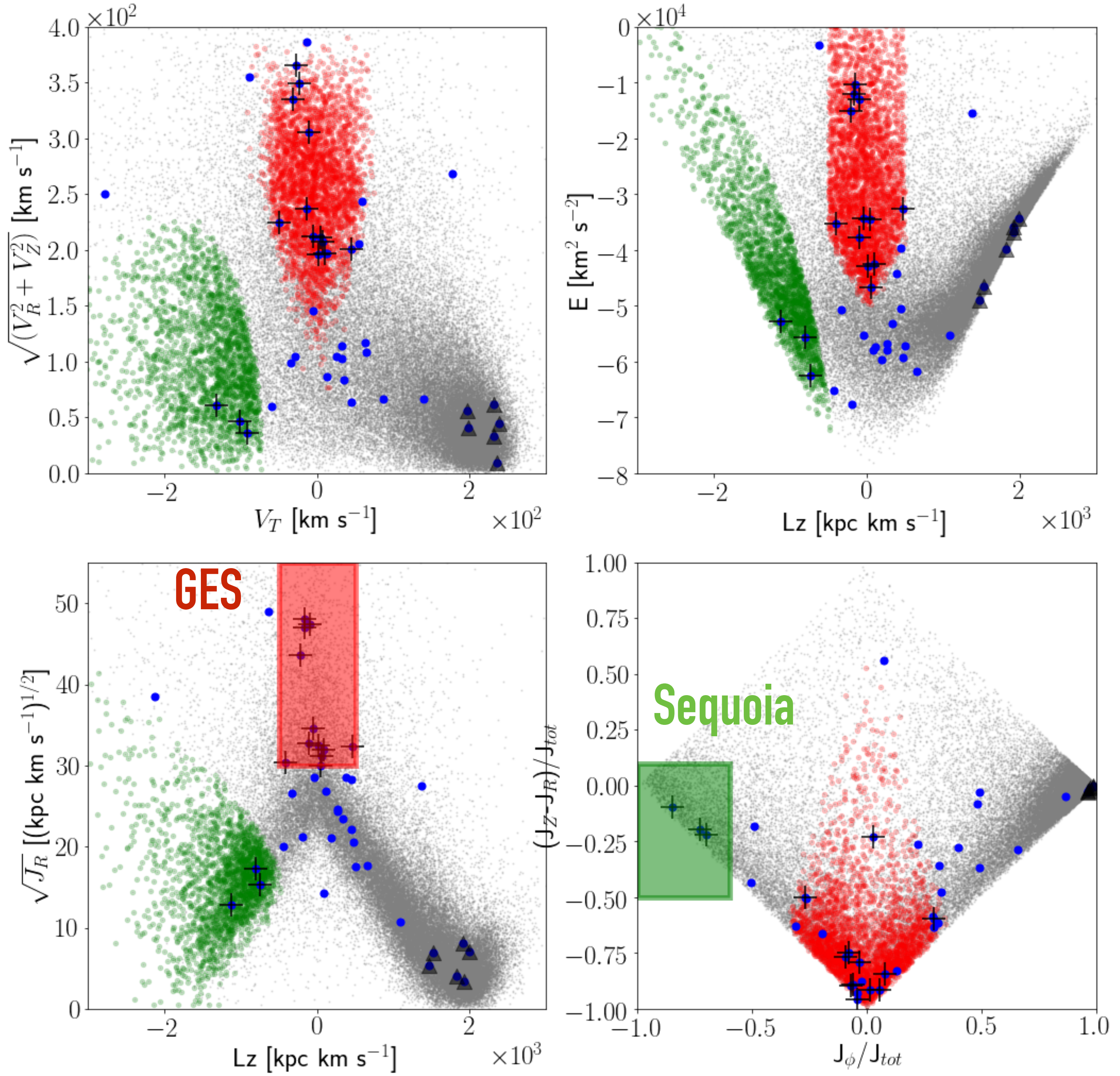
(Affiliations can be found after the references)

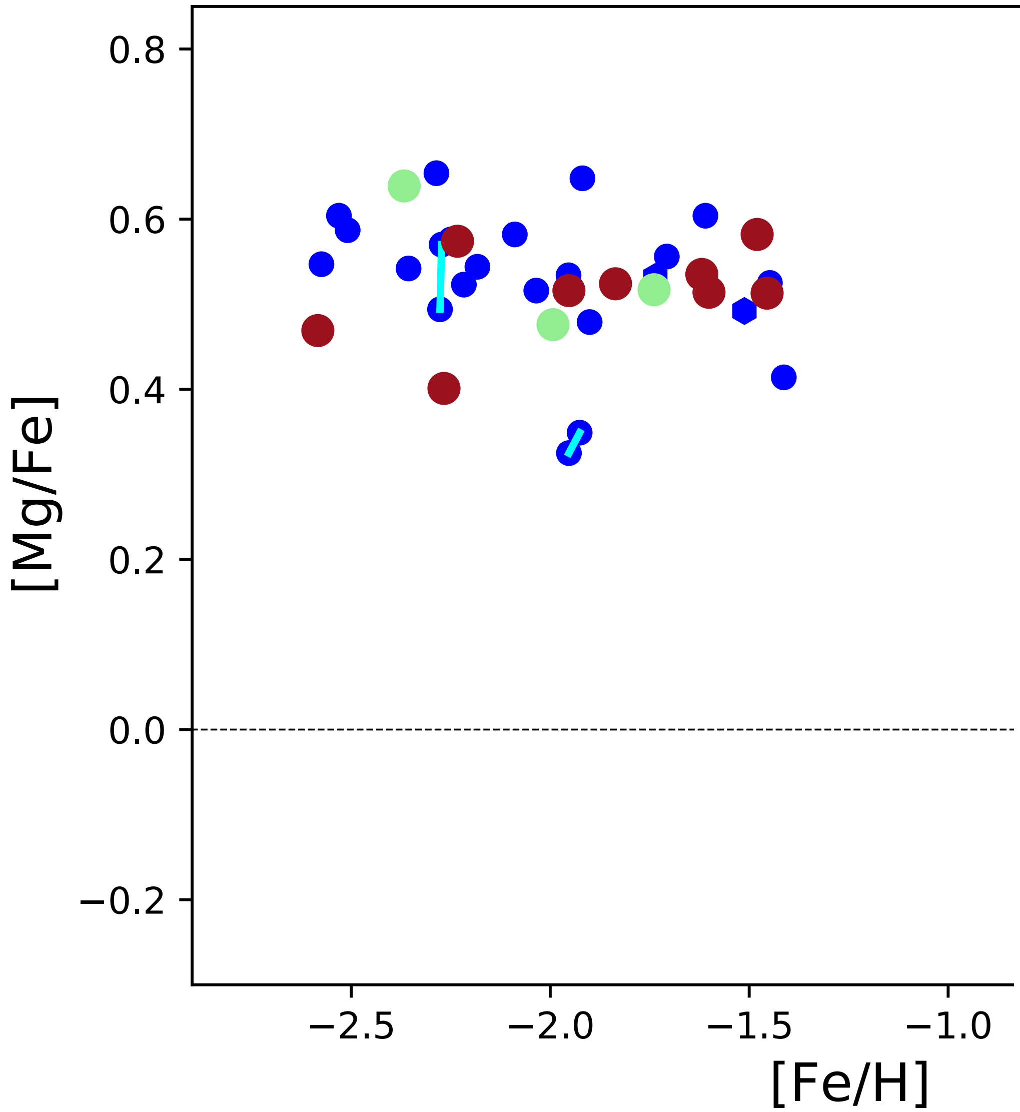


42 stars

Tracing the substructures

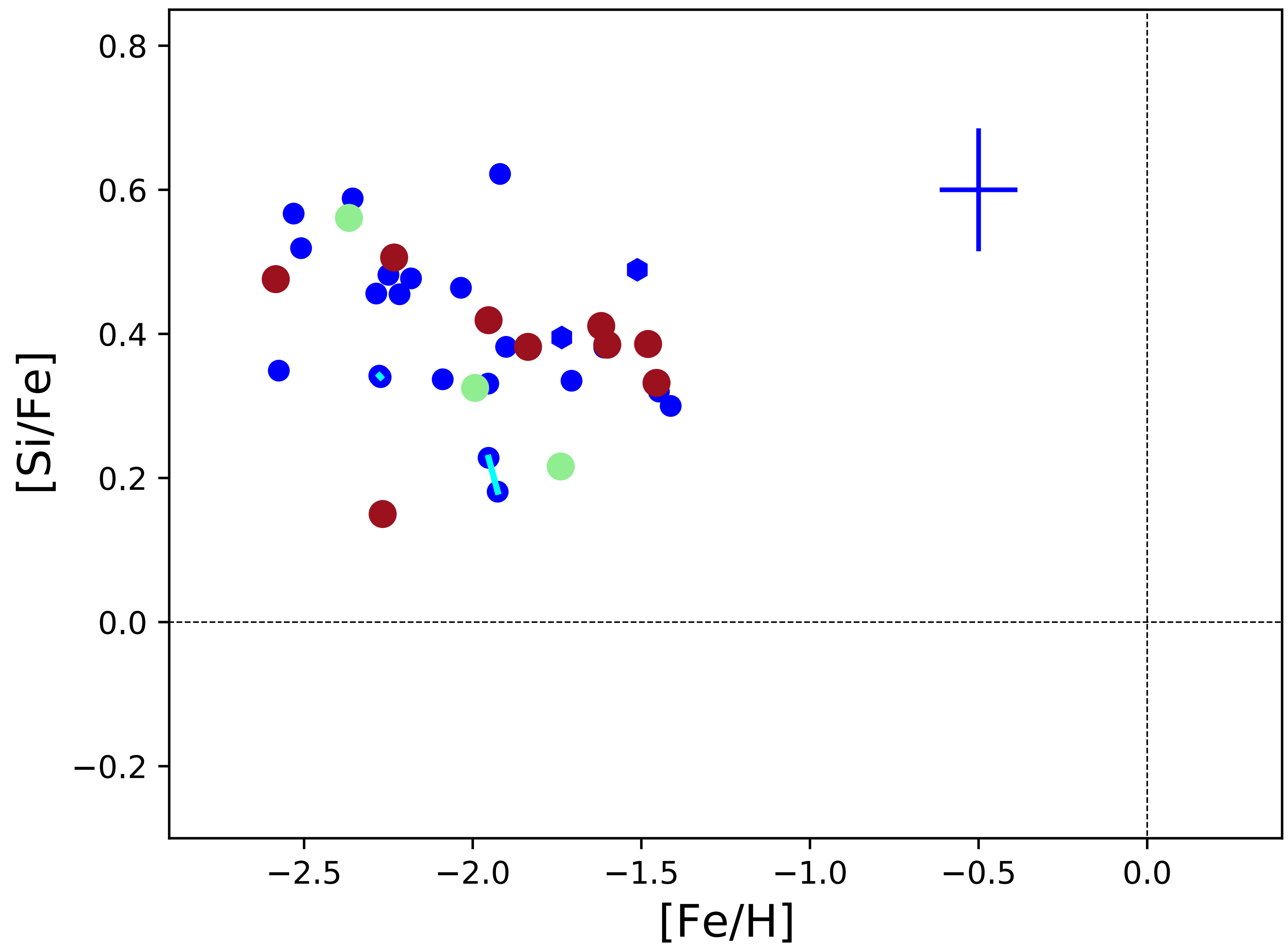
Sequoia & GES
as defined in
Feuillet+21




0.8
0.6
0.4
0.2
0.0
−0.2
[Mg/Fe]
−2.5
−2.0
−1.5
−1.0
[Fe/H]

GES &

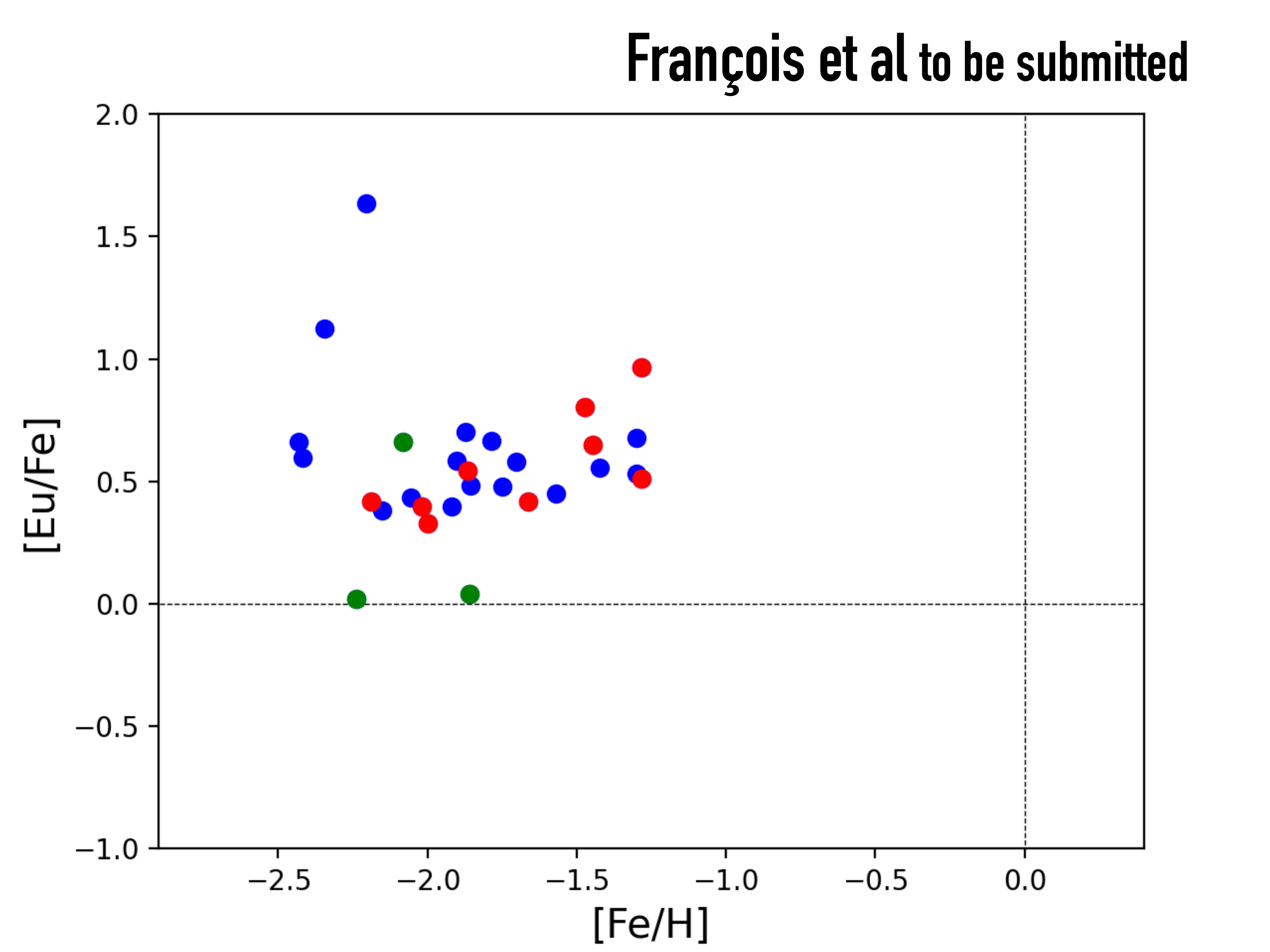
Sequoia


0.8
0.6
0.4
0.2
0.0
−0.2
[Si/Fe]
−2.5
−2.0
−1.5
−1.0
−0.5
0.0
[Fe/H]

Next future:
second MINCE paper with detailed analysis of the nc elements

+ other papers are coming

(see also Lombardo+21 on massive giants)



The final goal of MINCE
is to publish
all results & spectra
in a public database

http://archives.ia2.inaf.it/mince/

IA2 Italian Center for Astronomical Archives
Centro Italiano Archivi Astronomici

ChETEC INFRA

MINCE

Name resolver: Object name | Resolve

☑ **RA** hh:mm:ss.ss ☑ **Dec** dd:mm:ss.ss **Radius (arcmin)** 10

☑ **Object**

☑ **Instrument** All

☑ **T_{eff}** **Min** **Max**

☑ **log g** **Min** **Max**

☑ **[Fe/H]** **Min** **Max**

☑ **Chemical Abundance** Select Element **Min** **Max**

Download | Edit query **Rows displayed:** 20

R.A.	Dec	Object	Instrument	Teff	log g	[Fe I/H]	[O I/H]	[Na I/H]	[Mg I/H]	[A
249.13796823401	20.42953452623	BD+20 3298	Espadons	4154	0.57	-1.95	-1.08	-2.06	-1.44	-1.
157.07175275159	30.44126036941	BD+31 2143	Espadons	4565	1.15	-2.37	-1.27	-2.5	-1.73	-9
217.91228168557	31.98280165634	BD+32 2483	Espadons	4516	1.17	-2.25	-99	-2.44	-1.67	-9
270.94723989385	39.54211562921	BD+39 3309	Espadons	4909	1.73	-2.58	-99	-99	-2.12	-9