SPA-OC 2 Workshop ”High resolution spectroscopy of open clusters”

Report of Abstracts

https://indico.ict.inaf.it/e/3370

Abstract ID : **1**

The SPA-OC project: updates

Content

n/a

Author: BRAGAGLIA, Angela (Istituto Nazionale di Astrofisica (INAF))

Presenter: BRAGAGLIA, Angela (Istituto Nazionale di Astrofisica (INAF))

Status: SUBMITTED

Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Thursday 16 October 2025**

Abstract ID : **2**

Stellar Population Astrophysics (SPA) with the TNG 23 IR elemental abundances of 114 giant stars in 41 Open Clusters

Content

Open clusters have been shown to provide powerful and reliable tracers of Galactic chemical evolution. The reason for this is that the stars within them share fundamental properties such as age, Galactocentric radius, metallicity, and overall chemical composition. By studying the abundance patterns of these elements, we gain direct insights into the distribution of elements and their nucleosynthetic origins across the Galactic disc. In this study, we present a comprehensive analysis of elemental abundance trends with metallicity, age, and Galactocentric radius. This analysis is based on high-resolution infrared spectroscopy, which facilitates the measurement of species such as K and F, which are not readily accessible in the optical spectrum.

Derived stellar parameters and abundances for up to 23 elements in 114 stars spanning 41 open clusters have been obtained using spectra obtained with the GIANO-B spectrograph at the Telescopio Nazionale Galileo. The analysis was conducted utilising the Python version of Spectroscopy Made Easy (PySME), with a comprehensive array of diagnostics employed in the H-band, encompassing OH, CN, and CO molecular lines, along with atomic transitions of Mg I, Si I, Ti I, Ti II, C I, and Fe I. This approach was undertaken to accurately determine stellar parameters. The elements for which abundances are reported encompass light elements (C, N, F, Na, Mg, Al, Si, S, K, Ca, Ti), odd-Z and iron-peak elements (V, Cr, Mn, Fe, Co, Ni, Cu, Zn), and neutron-capture elements (Y, Ce, Nd, Yb). Where possible, a comparison was made between the determinations obtained in this study and the values reported in the literature. To enhance the accuracy of the results, a non-local thermodynamic equilibrium (NLTE) analysis was applied to C, Na, Mg, Al, Si, S, K, Ca, Ti, Mn, Fe, and Cu.

An examination of Galactic trends for each element was conducted by considering [X/Fe] and [X/H] as functions of metallicity, stellar age, and Galactocentric radius. Significantly, this study reports, for the first time, the radial abundance gradients of heavy neutron-capture elements in open clusters, thereby expanding the available observational constraints on Galactic chemical evolution. Radial gradients are evident for a wide range of elements, with [X/Fe] slopes ranging from −0.061 to +0.065 dex/kpc, indicative of an inside-out formation scenario for the Galactic disc, wherein enrichment progresses from the inner regions towards the outer regions over time. The [X/Fe] trends observed across α elements, odd-Z elements, iron-peak elements, and neutron-capture elements highlight the varied nucleosynthetic origins and enrichment timescales of these groups. It is particularly noteworthy that the positive [Zn/H] and [Zn/Fe] gradients suggest a distinctive nucleosynthetic pathway for Zn, which is likely associated with metallicity-dependent yields. Furthermore, a positive gradient in [Yb/Fe] is reported, which offers new constraints on neutron-capture enrichment processes and provides fresh insight into the chemical evolution of the Galactic disc.

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Co-authors: ANDREUZZI, Gloria (NAF - Osservatorio Astronomico di Roma); BRAGAGLIA, Angela (Istituto Nazionale di Astrofisica (INAF)); D'ORAZI, Valentina (University of Rome Tor Vergata /

INAF OAPd); Dr DAL PONTE, Marina (INAF-Osservatorio Astronomico di Padova,); JIAN, Mingjie (Stockholm University); Dr JÖNSSON, Henrik (Malmö University)

Presenter: BIJAVARA SESHASHAYANA, Shilpa (Malmö University)

Status: SUBMITTED

Submitted by **BIJAVARA SESHASHAYANA, Shilpa** <shilpa.bijavara-seshashayana@mau.se> on **Thursday 16 October 2025**

Abstract ID : **3**

The impact of rotational mixing in intermediate-age star clusters with extended main-sequence turn-offs and extended red clumps

Content

The extended main-sequence turn-offs (eMSTOs) and extended red clumps (eRCs) observed in intermediate-age star clusters challenge the traditional understanding of clusters as simple stellar populations. Recently, eMSTOs have been interpreted as signatures of stellar rotation. In this work, we test the effectiveness of rotational mixing in shaping the colour-magnitude diagram (CMD) of star clusters.

We computed a set of separate single-age synthetic stellar populations, referred to as "Base Stellar Populations" (BSPs), including stellar rotation. These BSPs were generated from two grids of stellar models that share the same input physics but differ in the efficiency of rotational mixing. We used an optimization algorithm to determine the best combination of BSPs to fit the CMDs of two star clusters: the Small Magellanic Cloud cluster NGC 419 and the Milky Way cluster NGC 1817.

The synthetic clusters with weak rotational mixing provide the best fit to both the eMSTO and eRC features for both clusters, and are consistent with the luminosities and asteroseismic masses we derived for eRC stars in NGC 1817. In contrast, synthetic clusters with strong rotational mixing result in overly bright post-main-sequence stars, inconsistent with observations. This suggests that, for intermediate-mass stars, the influence of rotational mixing of chemical elements on stellar evolution cannot be so strong as to significantly increase the post–main-sequence luminosity.

A simple test suggests that accounting for self-extinction by decretion discs in equator-on fast rotators could influence inferred rotation distributions and help reconcile the projected rotational velocity discrepancy across the eMSTO between models and observations.

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Presenter: MARTINELLI, Lorenzo (School of Information and Physical Sciences, University of Newcastle)

Status: SUBMITTED

Submitted by **MARTINELLI, Lorenzo** <lorenzo.martinelli@uon.edu.au> on **Thursday 23 October 2025**

Abstract ID : **4**

One Element, Two Tracks: Age-Resolved Phosphorus Variation in the Young side of Milky Way

Content

Phosphorus (P) is a life-linked element, yet its recent buildup history remain poorly charted because stellar P lines are weak and often hard to observe. I will present an age-resolved map of P on the young side of the Milky Way disk, using high-resolution near-infrared spectroscopy of open clusters and classical Cepheids. The resulting P–age relation separates into two enrichment regimes. In older clusters (>1 Gyr), P increases with age, consistent with enrichment dominated by massive stars during earlier, high-intensity star formation. In younger populations (<1 Gyr), the trend is flat to mildly decreasing, pointing to a late, gentle contribution from low-mass sources (e.g., AGB stars) at near-solar metallicity. Beyond addressing the scarcity of P measurements, this dual-channel picture provides new constraints for Galactic chemical-evolution models.

Author: JIAN, Mingjie (Stockholm University)

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Status: SUBMITTED

Submitted by **JIAN, Mingjie** <mingjie.jian@astro.su.se> on **Monday 27 October 2025**

Abstract ID : **5**

Barium isotopic ratios in metal-poor stars: Calibrating the method with globular clusters

Content

Although the main neutron-capture processes —the rapid (r), slow (s), and intermediate (i) —have been identified, the astrophysical sites where they operate remain under study and debate. Abundance measurements derived from observations of metal-poor stars ([Fe/H] < −1) drive the field, as increasingly sophisticated theoretical models are being developed to reproduce their chemical signatures. However, observational abundances are not infallible, as they strongly depend on the adopted model atmospheres and simplified line-formation assumptions.

A competitive method to probe the relative s-, r-, and i-process contributions in stellar atmospheres is the modeling of the barium resonance line at 4934 Å. Its profile is influenced by well-determined isotopic shifts, with characteristic shapes for each of those processes. The problem with this method appears when the line gets over-saturated, as in such case the microturbulence parameter (vmic, typically derived from Fe lines) –that should be common to all spectral lines –becomes unsuitable, which leads to incorrect isotopic determinations. Unfortunately, this is typical in metal-poor stars, as giant stars are generally the only objects bright enough to permit high-quality spectroscopic observations.

To overcome this impasse, we are making use of stellar clusters, which serve as excellent calibration objects due to their relatively small internal abundance spreads. In this first work, we have used NGC 6752 as a benchmark to constrain an ad hoc vmic-equivalent width relation for Ba lines in giant stars. We show how the application of this relation corrects the determination of isotopic ratios in typical field stars and carbon enhanced ones. We show preliminary results of the evolution of s- and r-process nucleosynthesis of old stellar populations with -3 < [Fe/H] < -1.

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Status: SUBMITTED

Submitted by **ESCATE GIRIBALDI, Riano Isidoro** <riano.escategiribaldi@inaf.it> on **Thursday 30 October 2025**

Abstract ID : **6**

Origin and evolution of phosphorus: the known and the unknown

Content

TBD

Author: ROMANO, Donatella (Istituto Nazionale di Astrofisica (INAF))

Presenter: ROMANO, Donatella (Istituto Nazionale di Astrofisica (INAF))

Status: SUBMITTED

Submitted by **ROMANO, Donatella** <donatella.romano@oabo.inaf.it> on **Tuesday 4 November 2025**

Abstract ID : **7**

The OCCASO project

Content

I will review the current status of the OCCASO (Open Clusters Chemical Abundances from Spanish Observatories= project. OCCASO has completed more than 300 observing nights. More than 400 stars belonging to more than 70 open clusters have been targeted.

Author: CARRERA, Ricardo Jesus (Istituto Nazionale di Astrofisica (INAF))

Presenter: CARRERA, Ricardo Jesus (Istituto Nazionale di Astrofisica (INAF))

Status: SUBMITTED

Submitted by **CARRERA, Ricardo Jesus** <ricardo.carrera@oapd.inaf.it> on **Wednesday 5 November 2025**

Abstract ID : **8**

Chemical characterization of the Milky Way strings

Content

The recent discovery of filamentary stellar structures in the Milky Way disk raises the question of their formation in the
context of the Galaxy evolution.
In this work, we want to chemically characterize these structures looking for clues about their origin and formation mechanism. We used the results of recent work that identified Galactic strings and cross-matched these data with the kinematics derived from the Gaia catalog and the chemical data provided by the GALAH survey. We found that most strings contain one or more open clusters and are slightly kinematically hotter than open clusters, with internal velocity dispersions in the range 2–8 km s−1 . They appear chemically homogeneous with a σ[Fe/H] $\leq$ 0.1 dex. Two strings
(Theia 908 and 1415) are composed of stars indistinguishable from the field stars and may be moving groups. One object (Theia 216)
shows clues of chemical gradients along its extension in Galactic longitude.
Conclusions. These objects may be evaporating or disrupted open clusters in which the chemical homogeneity is preserved in an
unbound and expanding cloud of stars or co-moving stars belonging to a former and now disrupting star formation hub. In a few
cases, they seem to be moving groups with no chemical homogeneity likely formed by the dynamical action of the Galactic bar or
spiral arms.

Author: VALLENARI, Antonella (Istituto Nazionale di Astrofisica (INAF))

Co-author: BOECHE, Corrado (INAF, OAPD)

Presenter: VALLENARI, Antonella (Istituto Nazionale di Astrofisica (INAF))

Status: SUBMITTED

Submitted by **VALLENARI, Antonella** <antonella.vallenari@oapd.inaf.it> on **Wednesday 5 November 2025**

Abstract ID : **9**

Asteroseismology of Blue Straggler Stars: Modelling of collision products and search for BSS candidates among pulsating stars

Content

TBD

Author: BRIGANTI, Lorenzo (DIFA, University of Bologna; Istituto Nazionale di Astrofisica (INAF))

Presenter: BRIGANTI, Lorenzo (DIFA, University of Bologna; Istituto Nazionale di Astrofisica (INAF))

Status: SUBMITTED

Submitted by **BRIGANTI, Lorenzo** <lorenzo.briganti2@unibo.it> on **Wednesday 5 November 2025**

Abstract ID : **10**

Investigating the Stellar Mass Function and Metallicity in Young Open Clusters

Content

Open clusters serve as ideal laboratories for studying star formation and stellar evolution, particularly the stellar mass function and its potential variations. In this work, we investigate the present-day mass functions of a sample of nearby young open clusters using reliable membership selection with quantified completeness and contamination rates. First, we employ N-body simulations of observation-like clusters to assess selection effects from different clustering algorithms. Cluster properties including age, mass function, and unresolved binary fraction are then derived from color-magnitude diagram fitting. A key focus of this study is the relationship between the mass function and cluster age, which may reflect both the initial conditions of star formation and dynamical evolution effects. However, for a more precise age determination and to explore a possible relation between metallicity and the mass function, we are exploiting spectroscopic surveys to derive metallicity and radial velocity for young open clusters. Preliminary results are presented. These metallicity measurements will ultimately enable us to break the age-metallicity degeneracy and improve our understanding of the interplay between cluster age, chemical composition, and the observed mass function.

Author: SHEN, Yueyue (Istituto Nazionale di Astrofisica (INAF))

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Status: SUBMITTED

Submitted by **SHEN, Yueyue** <yueyue.shen@inaf.it> on **Thursday 6 November 2025**

Abstract ID : **11**

Calibrating Chemical Clocks with Open Clusters and Asteroseismic Stars

Content

Chemical clocks – defined as abundance ratios between elements with opposite temporal trends – are powerful tools for estimating stellar ages in spectroscopic surveys. Among these, [C/N] and ratios between s-process and alpha-elements (e.g., [Ce/Mg], [Zr/Ti]) are particularly valuable.

In this talk, I will present a robust method for calibrating empirical relationships between stellar ages and chemical clocks, using open clusters and asteroseismic field stars as calibrators. Applying these relationships, I derive "chemical ages"for hundreds of thousands of stars observed in large spectroscopic surveys, revealing key trends in Galactic stellar populations.

Upcoming spectroscopic surveys such as WEAVE and 4MOST, together with the PLATO space mission for asteroseismology, will further refine this method in the coming years.

Author: Dr CASALI, Giada (Australian National University (ANU))

Presenter: Dr CASALI, Giada (Australian National University (ANU))

Status: SUBMITTED

Submitted by **Dr CASALI, Giada** <giada.casali@anu.edu.au> on **Sunday 9 November 2025**

Abstract ID : **12**

LAMOST Medium-Resolution Observations of Open Clusters: The Test Case of the Pleiades

Content

In this talk, I will show how the LAMOST Medium-Resolution Spectroscopic (MRS) survey (R~8000), when analyzed accurately, can yield invaluable information regarding the membership and properties of nearby young open clusters.
I will focus on the ROTFIT analysis tool, which was specifically adapted for these spectra, and present the results for the Pleiades, one of the best-studied young open clusters. Our analysis of approximately 1,600 spectra belonging to 283 cluster members allowed us to precisely measure the distributions of both radial velocity and metallicity. Furthermore, by applying the EAGLES code for empirical Lithium depletion isochrones to the equivalent widths (EWs) measured in our spectra, we achieved an accurate and confirmed age determination.
The study also includes an investigation of chromospheric activity. analyzing its distribution as a function of relevant stellar parameters, and reports several flare detections. Finally, we pinpoint several candidate single-lined spectroscopic binaries (SB1s) and announce the discovery of a new double-lined spectroscopic binary (SB2) within the cluster.

Author: Dr FRASCA, Antonio (Istituto Nazionale di Astrofisica (INAF))

Presenter: Dr FRASCA, Antonio (Istituto Nazionale di Astrofisica (INAF))

Status: SUBMITTED

Submitted by **FRASCA, Antonio** <antonio.frasca@inaf.it> on **Monday 10 November 2025**

Abstract ID : **13**

Asteroseismology and LAMOST medium-resolution observations of NGC1647

Content

NGC1647 is a poorly studied open cluster, with considerable discrepancies in age reported in previous works. To improve the precision of its characterization, we applied HDBSCAN clustering in astrometric space, complemented by radial-velocity filtering, and identified 271 high-confidence cluster members. Isochrone fitting to extinction-corrected photometry suggests a preliminary cluster age range of $\log(t/\mathrm{yr}) \approx 8.10$–$8.45$. From TESS and K2 time-series photometry, we identified 95 periodic variables, including nine p-mode pulsators. By fitting stellar evolutionary models to these p-mode pulsators, we derived asteroseismic cluster parameters: Age = 169^{+12}_{-14}~Myr and [Fe/H] = $-0.07^{+0.02}_{-0.03}$. The seismic metallicity is consistent with spectroscopic estimates, while the derived age exhibits significantly higher precision than traditional isochrone-based results. Additionally, we analyzed LAMOST spectra using ROTFIT and performed SED fitting to determine cluster extinction and conduct gyrochronology studies. This combined approach provides a refined benchmark for the fundamental parameters of NGC1647.

Author: Dr QIN, Mingfeng (Beijing Normal University; INAF- Catania)

Co-author: FRASCA, Antonio (Istituto Nazionale di Astrofisica (INAF))

Presenter: Dr QIN, Mingfeng (Beijing Normal University; INAF- Catania)

Status: SUBMITTED

Submitted by **FRASCA, Antonio** <antonio.frasca@inaf.it> on **Tuesday 18 November 2025**

Abstract ID : **14**

Beyond the iron peak: Galactic evolution of Molybdenum and Ruthenium through Open Clusters

Content

I will submit it later

Authors: ALVAREZ BAENA, Natalia (PhD student in Astronomy, Astrophysics and Space Science (AASS), Università degli Studi di Roma Tor Vergata); D'ORAZI, Valentina (University of Rome Tor Vergata / INAF OAPd)

Presenter: ALVAREZ BAENA, Natalia (PhD student in Astronomy, Astrophysics and Space Science (AASS), Università degli Studi di Roma Tor Vergata)

Status: SUBMITTED

Submitted by **ALVAREZ BAENA, Natalia** <nataliaalvarezbaena98@gmail.com> on **Wednesday 19 November 2025**

Abstract ID : **15**

High-resolution spectroscopy of planet hosting stars

Content

The remarkable progress achieved in exoplanet research over the past years has revealed an extraordinary diversity in planetary systems. The properties of exoplanets - and of planetary systems as a whole - are deeply linked to those of their host stars. It has become evident that accurately and precisely characterizing a planet requires knowing its star with equally high accuracy and precision.

In this talk, I will give an overview of how comprehensive characterization of exoplanet-hosting stars —spanning astrophysical parameters, elemental abundances, and kinematical properties —is essential for constraining models of planet formation and evolution. I will also discuss how stellar composition can correlate with planetary properties and provide valuable clues for reconstructing planetary migration histories.

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Presenter: BIAZZO, Katia (INAF - Astronomical Observatory of Rome)

Status: SUBMITTED

Submitted by **BIAZZO, Katia** <katia.biazzo@inaf.it> on **Wednesday 19 November 2025**

Abstract ID : **16**

Isochrone Discrepancies and Line-of-Sight Distortion: Interpreting Open Cluster Age and Structure

Content

tbd

Author: Dr FU, Xiaoting (Purple Mountain Observatory, Chinese Academy of Sciences)

Presenter: Dr FU, Xiaoting (Purple Mountain Observatory, Chinese Academy of Sciences)

Status: SUBMITTED

Submitted by **Dr FU, Xiaoting** <xiaoting.fu@pmo.ac.cn> on **Thursday 20 November 2025**

Abstract ID : **17**

Star cluster formation and evolution from parsec to Galactic scales: insights from the Perseus complex

Content

In this talk, I will present the results of a series of recent studies carried out by our group to investigate the star cluster population in the Perseus complex. We used Gaia data in synergy with spectroscopic surveys to fully characterize the structure, internal kinematics, and chemistry of the complex. The region hosts two large hierarchical structures (named LISCA I and II), and a large star-forming region (W3/W4/W5). I will first present their properties, focusing on individual star clusters and groups before zooming out and presenting the evolution of the whole complex in a Galactic framework. In this last part, I will discuss the critical role of spiral arm perturbations.

Author: DELLA CROCE, Alessandro (Indiana University Bloomington)

Presenter: DELLA CROCE, Alessandro (Indiana University Bloomington)

Status: SUBMITTED

Submitted by **DELLA CROCE, Alessandro** <alessandro.dellacroce@inaf.it> on **Thursday 20 November 2025**

Abstract ID : **18**

LRPayne for WEAVE and 4MOST

Content

The Stellar Populations Astrophysics (SPA) survey has played a significant role in advancing our understanding of open cluster populations through high-quality spectroscopic observations and detailed chemical and dynamical analyses. Owing to its relatively modest sample size, the spectroscopic analysis within SPA was conducted largely by hand, allowing for meticulous but non-scalable derivations of stellar parameters and abundances. The forthcoming large-scale spectroscopic facilities, WEAVE and 4MOST, represent the natural successors to SPA, offering orders-of-magnitude increases in sample size and sky coverage. These next-generation surveys will deliver spectra for millions of stars, enabling transformative studies of Galactic structure, evolution, and chemical enrichment. However, the associated data volume necessitates the development of robust, automated, and computationally efficient analysis frameworks.

In this contribution, I introduce LRPayne, a machine-learning spectral modelling tool optimized for low-resolution survey data. LRPayne provides fast and accurate interpolation within high-dimensional spectral label spaces, enabling the homogeneous and precise estimation of stellar atmospheric parameters and abundances across very large datasets. I will discuss the methodology, validation on benchmark samples, and its anticipated performance on WEAVE and 4MOST data.

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Status: SUBMITTED

Submitted by **VERNEKAR, Nagaraj** <nagarajbadarinarayan.vernekar@phd.unipd.it> on **Thursday 20 November 2025**

Abstract ID : **19**

A new catalog of Open Cluster Ages constrained by spectroscopic metallicity

Content

Precise OC age determination via isochrone fitting depends heavily on the priors used. In this work, we aim to produce an updated catalog of OC parameters by constraining the age determination via newly available spectroscopic measurements of metallicity, improving upon the precision of existing catalogs. Using high-quality astrometry from Gaia DR3, we derive new cluster memberships via Machine Learning-based clustering algorithms (such as AstroLink). We compile metallicity measurements from multiple ground-based spectroscopic surveys (e.g., Gaia-ESO, GALAH DR3, OCCAM) and Gaia GSP-Spec into a uniform scale. We demonstrate the difference between the metallicity scales of different surveys in the context of open clusters. We also show the effect of prior selection on parameter inferrence. The ages of 320 clusters are determined using an updated, ML-accelerated Bayesian isochrone-fitting code, adopting a multiband approach that incorporates Gaia synthetic photometry. This work results in a robust sample of OCs with precisely determined parameters and uncertainties.

Author: KALLIMANIS, Ioannis Nektarios (Istituto Nazionale di Astrofisica (INAF))

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Status: SUBMITTED

Submitted by **KALLIMANIS, Ioannis Nektarios** <ioannis.kallimanis@inaf.it> on **Friday 21 November 2025**

Abstract ID : **20**

WEAVE and SP_Ace

Content

We will present the first test of WEAVE data analysed with the Contributed Software SP_Ace

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Presenter: BOECHE, Corrado (INAF, OAPD)

Status: SUBMITTED

Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Friday 21 November 2025**

Abstract ID : **21**

Something on 4MOST commissioning

Content

TBD - Ricardo will tell us something on 4MOST commissioning (not SPV, which will not be started yet)

Author: CARRERA, Ricardo (INAF-OAS Bologna)

Presenter: CARRERA, Ricardo (INAF-OAS Bologna)

Status: SUBMITTED

Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Tuesday 25 November 2025**

Abstract ID : **22**

Tracing star cluster formation and early-evolution through stellar kinematics

Content

The process of cluster(ed) star formation has major implications for many fundamental astrophysical areas of research including the star formation process itself, the early interplay between stellar and gas dynamics, the possible formation of gravitational wave sources and the dynamical properties of young star clusters. Cluster formation has also key implications for our understanding of the assembly process of galaxies in a cosmological context, as star clusters may play an important role in the formation of galactic substructures and their partial or total dissolution contributes to the overall mass budget and stellar population properties of the hosts.

Despite their relevance, the processes of cluster assembly and dissolution are still poorly constrained. Early gas expulsion, stellar evolution, tidal interactions and stellar encounters are believed to play a key role both in the initial assembly and in the evolution of star clusters. However, the precise impact of these processes on primordial cluster properties and their long-term evolution remains elusive, mainly because of challenges in obtaining a detailed characterization of the internal cluster kinematics, which requires high-quality (possibly 3D) velocity information for statistically significant samples of cluster members.

The Gaia mission has definitely opened a new window to study cluster formation and evolution.
In this context, I will present recent results on cluster dynamical evolution, based on Gaia DR3 and large spectroscopic surveys data for virtually the entire sample of known open clusters in the Galaxy.
Particular emphasis is given to the characterization of cluster expansion/contraction and rotation properties.
The large available kinematic sample provides the unprecedented opportunity to follow star clusters'evolution and to robustly constrain the timescales during which expansion/contraction and rotation play a prominent role on the overall kinematics.
Interestingly, we find a clear trend with time both in terms of fraction of clusters showing evidence of significant contraction/expansion and/or rotation and in terms of the amplitudes of such kinematic patterns. A comparison with a set of *N*-body simulations of young star clusters shows that the observed kinematic properties are in general qualitative agreement with what expected for systems undergoing violent relaxation and evolving toward a final viral equilibrium state. However, we also note that additional processes likely associated with residual gas expulsion and mass loss due to stellar evolution also play a non-negligible role.

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Submitted by **DALESSANDRO, Emanuele** <emanuele.dalessandro@inaf.it> on **Tuesday 25 November 2025**

Abstract ID : **23**

The chemically peculiar old, inner-disc open cluster UBC 1052

Content

We present a detailed high-resolution spectroscopic study of UBC 1052, a 2 Gyr old inner-disc open cluster (OC). Located at a Galactocentric radius $R_{\rm GC} = 6.1$ kpc, UBC 1052 stands out because it has the largest height above the Galactic mid-plane (Z = 340 pc) and it is the oldest cluster among the inner-disc OCs studied spectroscopically at high resolution (HR) to date.
We used VLT/FLAMES to obtain UVES optical spectra (R $\sim$ 47,000) of four of its red-clump (RC) members ($G \sim 14$ mag), from which we derived high-precision radial velocities and chemical abundances for 23 chemical elements. A strictly line-by-line differential analysis was carried out using a reference RC star and a solar analogue in the open cluster M67, achieving an average precision in [X/H] of $\simeq 0.06$ dex for each UBC 1052 RC star.
The four RC stars have fully compatible chemical abundances, providing definitive confirmation of UBC 1052 as a real open cluster. It has a slightly super-solar metallicity ([Fe/H] $= +0.06 \pm 0.01$ dex) and, with abundance dispersions < 0.03 dex among the four stars for most of the studied elements, we give conservative limits for chemical inhomogeneities at $\simeq 0.05$ dex for these species. The detailed chemical abundance pattern of the cluster shows some peculiarities (e.g. in [Ce/Nd], [Ba/Zr], and [Nd/Y]) that appear to be unique in the current census of OCs studied at HR. Its relatively low metallicity for its $R_{\rm GC}$ suggests it as a rare candidate for an inward-migrated OC. We find a mean cluster radial velocity of $v_{\rm r} = 34.0 \pm 0.6$ km/s, a low orbit eccentricity of e = 0.07, and a large maximum Z at its $R_{\rm GC}$ of $Z_{\rm max}$ = 540 pc.
Our high-precision differential analysis of UBC 1052 is a valuable addition to the HR spectroscopic sample of OCs in the inner Galactic disc, a region which is still poorly sampled.

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Submitted by **DONADA OLIU, Judit** <jdonada@fqa.ub.edu> on **Tuesday 25 November 2025**

Abstract ID : **24**

Classical Cepheids in the Galactic thin disk: abundance gradients through NLTE spectral analysis

Content

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Submitted by **NUNNARI, Antonino** <antonino.nunnari@inaf.it> on **Wednesday 26 November 2025**

Abstract ID : **25**

Tracing n-capture elements with GCs using the Gaia-ESO data

Content

Globular clusters (GCs) are important stellar objects for understanding the formation and evolution of our Galaxy, providing crucial constraints to the chemical evolution and assembly history of the Galactic halo. Although there have been many individual efforts to characterise GCs in terms of heavy elements chemically, there is a lack of a global analysis with a homogeneous method. I present the most extensive study of neutron-capture elements in GCs using the Gaia-ESO survey data to provide clues about the contribution of different stellar processes and events, such as supernovae, AGB stars, or neutron star mergers. I show, from the observational point of view, the neutron-capture elements (Y, Zr, Ba, La, Ce, Pr, Nd, and Eu) distribution within GCs, as well as the relative contributions of s- and r-process to the chemical abundances in this objects.

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Abstract ID : **26**

Making Variable Stars Stand Still: an RR Lyrae Single-Phase Spectroscopic Survey

Content

on line presentation

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Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Thursday 4 December 2025**

Abstract ID : **27**

RR Lyr in the open cluster Trumpler 5

Content

on line presentation

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Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Thursday 4 December 2025**

Abstract ID : **28**

Spectroscopy of Cepheids

Content

on line presentation
TO BE CONFIRMED

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Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Thursday 4 December 2025**

Abstract ID : **29**

Characterization of stars with asteroseismology and implication for clusters

Content

n/a

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Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Thursday 4 December 2025**

Abstract ID : **30**

Spectroscopy study of RR Lyrae stars to constrain the early formation and evolution of the Milky Way

Content

n/a

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Status: SUBMITTED

Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Thursday 4 December 2025**

Abstract ID : **31**

Open clusters in the outer disc studied with GTC/MEGARA: Auner 1 and Berkeley 102

Content

presentation on line

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Status: SUBMITTED

Submitted by **BRAGAGLIA, Angela** <angela.bragaglia@inaf.it> on **Friday 5 December 2025**

Abstract ID : **32**

Helium Cosmic Conspiracy

Content

Nowadays it is assumed that helium is the second most abundant element in our Universe, representing around 25% of the total baryonic matter. However, despite its importance, direct measurements of this element are anything but a trivial effort, as if a cosmic conspiracy was plotting against us. We adopted an updated definition of the Population Ratio parameter, R, that is, accordingly to the current evolutionary models, linear from the metal-poor to the metal-rich regime. Moreover, we also performed homogeneous and accurate estimates of the population ratio in a mixed sample of nearby dwarf galaxies and Galactic globular clusters (GGCs). This is the first time that primordial helium is investigated in dwarf galaxies. These stellar systems are considered the most important building blocks for giant galaxy formation in a Λ-Cold Dark Matter cosmology.
In this project we also provided a new estimate of the R parameter that includes AGB stars, R', which is a solid validation of the R parameter because it is independent of the uncertainties affecting the identification of RGB and AGB stars. In order to estimate the primordial helium abundance, we explored stellar evolutionary models constructed by assuming: α-enhanced chemical mixture, three different helium abundances and a broad range of iron abundances ranging from -2.50 to -0.08 dex. The R parameter was estimated using central He burning (Horizontal Branch) and Hydrogen-shell burning (Red Giant Branch) structures.
Moreover, we performed homogeneous and accurate counts for RGB, HB and AGB stars using optical photometry collected with ground and spaced based telescopes for Galactic Globular clusters and for Local Group dwarf galaxies. From our data set we obtained R and R'values and we compared them with theoretical predictions to retrieve an estimate of the helium content of these systems.

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