Institute of Theoretical Physics and Astronomy
Vilnius University

GES 2015
Gaia-ESO Survey
Third Science Meeting

December 1-4, 2015
Vilnius, LITHUANIA

Book of Abstracts

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***IT – Invited Talk**

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Chair Elena Franciosini

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***IT – Invited Talk**

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8	David Montes	The Gaia-ESO Survey: calibrating the lithium-age relation with open clusters and associations
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15	Mindaugas Macijauskas	Interstellar Extinction in the Direction of the Open Cluster NGC 2244
16	Justas Zdanavičius	Interstellar extinction in the vicinity of the dark cloud LDN183 in Serpens
17	Michael R. Hayden	Chemo-kinematical cartography of the Milky Way disk with GES iDR4
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32	Mathieu Van der Swaelmen	Double and multiple-lined spectroscopic binaries in the Gaia-ESO Survey
33	Mathias Schultheis	Gaia-ESO and APOGEE Field Coordination
34	Paula Jofre	The Gaia FGK Benchmark Stars
35	Eduardas Puzeras	DESSE: a new software for a spectral line measurement
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37	Richard J. Jackson	Determining the precision of GES radial velocities and projected rotation velocities

Session I.
Galactic Surveys: Progress Status

The Gaia-ESO Survey progress update

G. Gilmore and S. Randich

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[2] INAF-Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5, I-50125, Firenze (I)

ABSTRACT

A Gaia-ESO Survey progress update will be presented, with focus on the open cluster survey.

Submitted: 7/10/2015 17:33:06
Presenter: G. Gilmore (gil@ast.cam.ac.uk)
and S. Randich (randich@arcetri.astro.it)
Contribution type: Talk
Session: Galactic Surveys: Progress Status

Gaia Mission Status

T. Prusti[1]

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ABSTRACT

Gaia mission is underway conducting its 5 year lasting survey of the sky. At the moment the commissioning period has been completed and more than a year worth of routine phase data has been collected. The status of the mission is outlined with a short explanation of some commissioning phase findings and their impact on the mission science. With a few examples extracted from the early mission data the potential of Gaia is demonstrated and the scientific expectations are summarised. The intermediate data release scenario will be presented.

Submitted: 9/9/2015 19:54:42
Presenter: T. Prusti (tprusti@cosmos.esa.int)
Contribution type: Talk
Session: Galactic Surveys: Progress Status

Overview of APOGEE results

C. Allende Prieto[1]

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ABSTRACT

The Apache Point Observatory Chemical Evolution Experiment (APOGEE) collected over half a million stellar spectra for some 150,000 stars between 2011 and 2014. The spectra span the H band (1.5-1.7 μm) with a resolving power of about 22,500 and have a signal-to-noise ratio $S/N > 100$. The data have been reduced and analyzed with automated pipelines that provide radial velocities, atmospheric parameters, and chemical abundances for up to 15 elements. The APOGEE data base was made public in January 2015 as part of the 12th release of the Sloan Digital Sky Survey, and has been used and continues to be used in dozens of research papers dealing with Galactic structure and evolution, stellar evolution and nucleosynthesis, the interstellar medium, or exoplanets. APOGEE-2 will continue gathering data with the SDSS telescope, in New Mexico, until 2020, but a copy of the APOGEE spectrograph will be installed on the Du Pont telescope at las Campanas, Chile, in 2016, to provide full-sky coverage and a complete view of the Milky Way galaxy.

Submitted: 11/24/2015 19:16:35
Presenter: C. Allende Prieto (callende@iac.es)
Contribution type: Talk
Session: Galactic Surveys: Progress Status

Session II.
Galactic Halo, Discs, and Bulge

Contribution of GC stars to the Milky Way halo: looking for second generation-like stars

A. Bragaglia[1], K.Lind[2], E. Pancino[1], S. Buder[2], P. Donati[1,3], S. Koposov[4], and A.F. Marino[6]

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[2] MPIA, Heidelberg (Germany)

[3] DIFA, Bologna Univ. (Italy)

[4] IoA Cambridge (UK)

[5] Australian National University (Australia)

ABSTRACT

The reliable identification of field halo stars born in globular clusters (GCs) is important to understand the actual contribution of GC stars to the Milky Way halo. Depending on the GC formation mechanism, the contribution may be minimal, a mere few per cent, or very important, with more than 50% (see, e.g. Gratton et al. 2012, for a review). In GES paper #12 (Lind et al. 2015) presented a star with very low [Mg/Fe] coupled with high [Al/Fe] and identified it as a probable escapee from a GC. This star has indeed the chemical signature of second-generation stars in GCs (e.g., Carretta et al. 2009). However, the star was observed only with GIRAFFE, hence we are missing a detailed chemical characterization; in particular, we are missing Na and O abundances, which should be enhanced and depleted, respectively, with respect to field stars of similar metallicity. Na and O are the most widespread and studied indicators of first and second-generation stars in GCs. They have been used e.g., by Ramirez et al.(2012) to identify two field stars as having been lost by GCs. Other possible candidate stars were found in iDR4 and we propose to observe them with UVES@VLT to obtain a complete chemical tagging. All elements involved in the (anti)correlations in GCs, i.e., C, N, O, Na, Mg, Al, K, will be measured. We will also obtain second-epoch RV, useful to see if the stars are in binary systems. I will discuss the subject, also in relation with the exploitation of GES data.

Submitted: 9/30/2015 11:15:05
Presenter: A. Bragaglia (angela.bragaglia@oabo.inaf.it)
Contribution type: Talk
Session: Galactic Halo, Discs, and Bulge

References

Carretta, E., et al. 2009, A&A, 505, 139
Gratton, R.G., et al., 2012, A&A Rev., 20, 50
Lind, K., et al., 2015, A&A, 575, L12
Ramirez, I., et al. 2012, ApJ, 757, 54

Dynamical Models of the Stellar Halo

A. A. Williams[1] and N. W. Evans[1]

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ABSTRACT

We discuss new action-based models of the stellar halo, fit using a sample of BHBs from SDSS. Our best fit model has a velocity anisotropy that becomes more radially anisotropic on moving outwards. It changes from $\beta \approx 0.4$ at Galactocentric radius of 15 kpc to ≈ 0.7 at 60 kpc. This is a gentler increase than is typically found in simulations of stellar haloes built from the mutiple accretion of smaller systems. We find the potential corresponds to an almost flat rotation curve with amplitude of ≈ 200 kms^{-1} at these distances. This implies an enclosed mass of $\approx 4.5\times1011M\odot$ within a spherical shell of radius 50 kpc. (arxiv:1508.02584)

Submitted: 9/24/2015 15:53:07
Presenter: A. Williams (aamw3@ast.cam.ac.uk)
Contribution type: Talk
Session: Galactic Halo, Discs, and Bulge

Chemical imprints of the Galctic disc formation

R. Ženovienė[1], E. Stonkutė[1], G. Tautvaišienė[1], B. Nordström[2,*and* 3]

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[3] Stellar Astrophysics Centre, Department of Physics and Astronomy, Aarhus University, Ny Munkegade 120, DK-8000 Aarhus C, Denmark

ABSTRACT

The formation and evolution of the Milky Way galaxy is one of the greatest outstanding questions of astrophysics. A combined study of kinematics and chemical composition of stars is one of the most promising tools of research in galaxy formation. The main goal in this field of research is to reconstruct the formation history of our Galaxy, to reveal the origin of the thick disc, and to find remnants of ancient mergers, which are considered as a possible contributors to the thick-disc formation. In a series of papers, we investigated the detailed chemical composition and ages of stellar kinematic groups that were identified in the Geneva-Copenhagen survey and were suggested to belong to remnants of ancient merger events in our Galaxy. Here we overview our findings in comparing kinematics, ages and detailed chemical compositions of various kinematic substructures in the Galactic disc.

Submitted: 9/28/2015 15:20:52
Presenter: R. Ženovienė (renata.zenoviene@tfai.vu.lt)
Contribution type: Talk
Session: Galactic Halo, Discs, and Bulge

Is the α-enhancement a synonymous of old age? The perspective of open clusters

Laura Magrini[1] and Sofia Randich[1]

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ABSTRACT

One of the pillars of Galactic Archaeology is the use of [α/Fe] abundance ratios as an indirect age estimator: the [α/Fe] ratio is an indication that a star formed from gas mainly enriched by Type II supernovae at the epoch when SNe Type Ia or asymptotic giant-branch stars still did not have sufficient time to enrich the interstellar medium. The first data releases of Gaia-ESO have revealed that, indeed, the [Mg/Fe] ratio correlates with age, such that α-rich stars are older. However the dispersion of [Mg/Fe] abundances is not small at any age. Old, α-rich and metal-poor stars are more common in the inner disk, while, in the outer disk, stars are on average younger and α-poor (Bergemann et al. 2014). But, are there exceptions to this behaviour? Chiappini et al. (2015) demonstrated that the α-enhancement is no guarantee that a star is actually old, finding a number of relatively young stars in the inner disc with α-enhanced abundances. With Gaia-ESO data, Magrini et al. (2014, 2015) found that among the open clusters located in the inner disc some of them have anomalous chemical patterns with a strong enhancement of [Mg/Fe], and at lower level of [O/Fe] and [Si/Fe], even if they are relatively young and metal-rich objects. The inner-disc clusters, with ages between ~0.3 to ~1.5 Gyr, and the young α-enhanced stars might belong to an evolutionary sequence of the same population, born in the inner part of the disc. The common chemical features of some of the clusters with the young α-enhanced stars might indicate peculiar conditions for the star formation near to the co-rotation. Here we present the results for the new sample of clusters analysed in iDR4, investigating the relation of their abundance ratios with age and location in the disk.

Submitted: 9/7/2015 17:57:07
Presenter: L. Magrini (laura@arcetri.astro.it)
Contribution type: Talk
Session: Galactic Halo, Discs, and Bulge

Metal-poor stars towards the Galactic bulge

A. Koch[1], A. McWilliam[2], I.B. Thompson[2], and G.W. Preston[2]

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ABSTRACT

The bulge is one of the oldest, yet very metal rich Galactic components suggesting that it experienced early, rapid chemical enrichment. Large surveys such as the GES or Apogee are beginning to unearth progressively more metal-poor stars ([Fe/H]$\lesssim -2$ dex) that are predicted to exist in models of galactic evolution, according to which the first stars did form in the bulge. Here, we present results from our endeavour to detect and characterize such stars with the Magellan/MIKE spectrograph. The chemical abundances of our candidates (at -1.5 to -2.6 dex) vastly overlap with those of halo stars and our sample also contains one CEMP-*s* and a CH-star – the first detections of such objects in the bulge. Located towards the Southern edge of the bulge, at (l, b)~(0°,-11°), the metal-poor candidates can possibly be related to its X-shaped extension. Based on kinematic considerations, we discuss whether similar claims of metal-poor star detections are true habitants of the bulge or rather halo stars passing through the central regions.

Submitted: 6/16/2015 15:27:34
Presenter: A. Koc (akoch@lsw.uni-heidelberg.de)
Contribution type: Talk
Session: Galactic Halo, Discs, and Bulge

The OCCASO Survey

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[1] Departament d'Astronomia i Meteorologia, Universitat de Barcelona ICC/IEEC, Barcelona, Spain

[2] Departamento de Astrofísica, Universidad de La Laguna, La Laguna, Spain

[3] Instituto de Astrofísica de Canarias, La Laguna, Spain

[4] Osservatorio Astronomico di Bologna, Bologna, Italy

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[6] Université de Genève, Geneve, Switzerland

ABSTRACT

Open Clusters (OCs) are crucial for studying the formation and evolution of the Galactic disk. However, the lack of a large number of OCs analysed homogeneously hampers the investigations about chemical patterns and the existence of Galactocentric radial and vertical gradients, or an age-metallicity relation. To overcome this, we have designed the OCCASO Survey, in which we provide homogeneous radial velocities, physical parameters, and individual abundances from high-resolution spectroscopy ($R > 62,000$) of Red Clump stars in 25 intermediate-age and old OCs visible from the Northern hemisphere, complementary to GES-UVES observations of old OCs. In the first data release (Casamiquela et al. 2015, in prep) we present radial velocities for 77 stars in 12 OCs, which represents 50% of the survey. To ensure the robustness of the results, we perform internal checks between the three instruments used. External comparisons have shown our accuracies are at the level of $0.2\,\mathrm{kms}^{-1}$. We also analyse physical parameters and iron abundance for these OCs using one equivalent width method (GALA; Mucciarelli et al. 2013) and one synthetic spectral fitting method (iSpec; Blanco-Cuaresma et al. 2014). Comparisons between methods show good agreement in T_{eff} and $\log g$. We have two OCs in common with GES, NGC 6705 and NGC 6633. We have compared radial velocities, physical parameters and abundances for six stars of NGC 6705. [Fe/H] abundances are put in context of the radial Galactocentric, height above the plane and age gradients.

Submitted: 9/21/2015 12:13:03
Presenter: L. Casamiquela (lcasam@am.ub.es)
Contribution type: Talk
Session: Galactic Halo, Discs, and Bulge

References

Mucciarelli, A., Pancino, E., Lovisi, L., Ferraro, F. R., Lapenna, E. 2013, ApJ, 766, 78

Blanco-Cuaresma, S., Soubiran, C., Heiter, U., Jofré, P. 2014, A&A, 569, A111

The New Milky Way Bar and Peanut Bulge

Ortwin Gerhard[1]

MPE Garching

ABSTRACT

Data from the VVV NIR survey of the inner Milky Way show that our Galaxy has a strongly peanut-shaped bulge. Extending the analysis to larger radii with other surveys shows that the long bar is aligned with the bulge out to at least 25 degrees longitude, and a superthin bar region is seen to extend to about 30 degrees. Dynamical models based on the 3D bulge density and the bulge kinematic data, updated with revised models of the disk and long bar, allow us to determine the mass in the bulge region and to put constraints on the mass-to-light ratio and IMF of the bulge stars as well as on the bar's pattern speed.

Submitted: 9/21/2015 13:32:36
Presenter: O. Gerhard (gerhard@mpe.mpg.de)
Contribution type: Talk
Session: Galactic Halo, Discs, and Bulge

Kinematics, metallicity distributions and $\alpha-$element abundances in the Galactic bulge from GES iDR4 data

A. Rojas-Arriagada[1], A. Recio-Blanco[1], V. Hill[1], P. de Laverny[1], and M. Schultheis[1]

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ABSTRACT

The Galactic bulge is a cornerstone in our understanding of galaxy formation. As the closest bulge, it is possible to study its stellar content in great detail, characterizing its kinematics and chemical abundance patterns. The Gaia ESO survey has been collecting data for an increasing number of stars in several fields, distributed along and off the bulge minor axis. In this talk, we aim at presenting results obtained from our analysis of the iDR4. This data set includes radial velocities, fundamental parameters and detailed $\alpha-$element ratios for $\sim$ 2500 red clump stars distributed in 11 southern bulge fields. We investigate the metallicity distribution function, its shape and spatial variations, to probe the presence and characteristics of the two bulge populations already claimed in several studies, and by our own results from iDR1 data. We use kinematic and photometric data to further characterize each population and to probe the nature of the red clump luminosity distribution split present in several fields. In this way, we reinforce the relationship between the metal rich population and the double red clump tracing the bulge/peanut X-shaped bulge. Alpha element ratios provide us an extra important piece of information to explore formation time scales and chemical evolution, as well as possible relations between the bulge and disk(s) populations. The structure, origin and chemodynamical evolution of the Galactic bulge is currently object of an intense debate. The Gaia-ESO survey is in this context contributing to solve the puzzle of bulge formation, towards a better understanding of this template of galactic formation.

Submitted: 9/30/2015 9:26:31
Presenter: A. Rojas-Arriagada (arojas@oca.eu)
Contribution type: Talk
Session: Galactic Halo, Discs, and Bulge

Session III.
Chemodynamical modelling

Abundance Ratios and the Chemodynamical Evolution of the Milky Way Disc

A. Just[1] and J. Rybizki[1]

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ABSTRACT

Our detailed analytic local disc model (JJ-model) quantifies the interrelation between kinematic properties (e.g. velocity dispersions and asymmetric drift), spatial parameters (scale-lengths and vertical density profiles), and properties of stellar sub-populations (age and abundance distributions). In the local JJ-model the dynamical heating (AVR, Just & Jahrei 2010), the star formation history (SFR, Just et al., 2011) and the IMF (Rybizki & Just, 2015) were determined at the solar radius of the disc based on a combination of Hipparcos data, the Catalogue of Nearby Stars and SDSS data. The radial scale lengths as function of metallicity were derived by a Jeans analysis of the asymmetric drift using RAVE data (Golubov et al., 2013). Based on local metallicity distribution functions (MDF) of α-elements the enrichment history (AMR) and the gas infall rate can be determined. The α-enhancement as function of metallicity allows a first consistency test for the AMR. In the framework of the JJ-model the local chemical enrichment model shows that significant vertical gradients for main sequence stars and red clump stars are expected in the thin disc. Any consistent radial extension of the disc evolution model should predict specific features in the different distribution functions and in their correlations. For a radial extension of the disc model large and homogeneous spectral surveys are crucial. The large and homogeneous spectral surveys SEGUE, RAVE, APOGEE and Gaia-ESO, combined with proper motions and distances (ultimately from the Gaia mission in less than 2 years from now), are linking the kinematic and chemical properties and provide the required abundance information of the stellar populations over a large range in Galactocentric radii. We use the MDFs of different elements and the α-enhancement to construct a full disc model. A major goal is to constrain possible scenarios of the inside-out growth of the thin disc and to characterise those populations, which require significant radial migration.

Submitted: 9/4/2015 10:33:08
Presenter: A. Just (just@ari.uni-heidelberg.de)
Contribution type: Talk
Session: Chemodynamical modelling

References

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Rybizki, J. & Just, A., 2015, MNRAS, 447, 3880

The Milky Way disc formation and evolution from population synthesis

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ABSTRACT

In recent years the stellar populations of the Milky Way have been investigated from large scale surveys in different ways, from pure star count analysis, to detailed studies based on spectroscopic surveys. While in the former case the data can constrain the scale height and scale length thanks to completeness, they suffer from high correlation between these two values. On the other hand, spectroscopic surveys suffer from complex selection functions which hardly allow to derive accurate density distributions. The scale length in particular has been difficult to constrain, resulting in discrepant values in the literature. Here, we investigate the thick disc characteristics by comparing model simulations with large scale data sets. The simulations are done from the population synthesis model of Besançon. We explore the parameters of the thick disc (shape, local density, age, metallicity) using a Monte Carlo Markov Chain method to constrain the model free parameters (Robin et al, 2014). Correlations between parameters are limited due to the vast spatial coverage of the used surveys (SDSS + 2MASS). We show that the thick disc was created during a long phase of formation, starting about 12 Gyr ago, finishing about 10 Gyr, during which gravitational contraction occurred, both vertically and radially. Moreover in its early phase the thick disc was flaring in the outskirts. We conclude that the thick disc has been created prior to the thin disc during a gravitational collapse phase, slowed down by turbulence related to a high star formation rate, as explained for example in Bournaud et al. (2009) or Lehnert et al. (2009). Our result does not favor a formation from an initial thin disc thickened later by merger events or by secular evolution of the thin disc. We then study the in-plane distribution of stars in the thin disc from 2MASS and show that the thin disc scale length varies as a function of age, indicating a inside out formation. Moreover we investigate the warp and flare and demonstrate that the warp amplitude is changing with time and the node angle is slightly precessing. Finally we show comparisons between the new model and spectroscopic surveys. The new model allows to correctly simulate the kinematics, the metallicity and α abundance distributions, in the solar neighbourhood, as well as in the bulge region.

Submitted: 9/17/2015 13:59:16
Presenter: A.C. Robin (annie.robin@obs-besancon.fr)
Contribution type: Talk
Session: Chemodynamical modelling

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Chemo-dynamical modelling of APOGEE

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ABSTRACT

Chemo-dynamic correlations in the Galactic disc are imprints of the formation and history of the Milky Way. Flexible, well-motivated models provide a way to understand the data and can be used to extract important physical quantities from the data. Sanders & Binney (2015) presented a dynamical distribution function for the Galactic disc that included analytic prescriptions for radial migration and for the metallicity as a function of birth time and birth radius. These models were fitted to relatively local data. We construct a mock sample of the APOGEE data from the chemo-dynamical models of Sanders & Binney (2015) that fully accounts for the survey's selection function. We show the models well reproduce this more extended dataset. We demonstrate how the models can be extended to include [α/Fe] abundances for the stars and how to model the APOGEE ([α/Fe],[Fe/H]) plane.

Submitted: 9/30/2015 21:56:23
Presenter: J. L. Sanders (jls@ast.cam.ac.uk)
Contribution type: Talk
Session: Chemodynamical modelling

References

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Constraining the IMF with chemodynamical MW-models

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ABSTRACT

We extend the vertical Milky Way disc model from Just & Jahreiß (2010) with a chemical enrichment model, using the latest yields for supernovae (Nomoto et al., 2013) and AGB-stars (Karakas, 2010). In Rybizki & Just (2015) we determined a local field star IMF from Hipparcos star counts, within the framework of our Galaxy model. We want to increase the constraint on the high-mass slope of the IMF, by modelling the chemical evolution of the thin disc. We use the spatial and stellar-type selection function to map our model abundances into the space of observables. We will compare the discriminating power of Gaia-ESO and APOGEE and also the impact of varying model parameters like the stellar feedback.

Submitted: 9/21/2015 15:40:04
Presenter: J. Rybizki (rybizki@ari.uni-heidelberg.de)
Contribution type: Talk
Session: Chemodynamical modelling

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Rybizki, J., & Just, A. 2015, MNRAS, 447, 3880

Session IV.
Kinematics and dynamics of stellar populations

N-body simulations of the gamma Velorum cluster: understanding star cluster formation through the lenses of the Gaia ESO survey

Michela Mapelli[1], Antonella Vallenari[1], Rob Jeffries[2], Germano Sacco[3], Tristan Cantat-Gaudin[1], Elena Gavagnin[1,4], Mario Spera[1], Elisa Bortolas[1,5], and et al.

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ABSTRACT

The Gaia-ESO Survey has recently unveiled the complex kinematic signature of the Gamma Velorum cluster: this cluster is composed of two kinematically distinct populations (hereafter, population A and B), showing two different velocity dispersions and a relative ~ 2 km s^{-1} radial velocity (RV) shift. In this talk, I show that the two populations of the Gamma Velorum cluster originate from two different sub-clusters, born from the same parent molecular cloud. I investigate this possibility by means of direct-summation N-body simulations. This scenario is able to reproduce not only the RV shift and the different velocity dispersions, but also the different centroid (~ 0.5 pc), the different spatial concentration and the different line-of-sight distance (~ 5 pc) of the two populations. The observed 1-2 Myr age difference between the two populations is also naturally explained by our scenario, in which the two sub-clusters formed in two slightly different star formation episodes. These simulations suggest that population B is strongly supervirial, while population A is close to virial equilibrium. I discuss the implications of our models for the formation of young star clusters and OB associations in the Milky Way. Finally, I show the results of some preliminary hydrodynamical simulations that confirm these results.

Submitted: 9/14/2015 17:44:47
Presenter: M. Mapelli (michela.mapelli@oapd.inaf.it)
Contribution type: Talk
Session: Kinematics and dynamics of stellar populations

The mass-independent dynamics of stars in the young open cluster NGC 2516

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ABSTRACT

In this contribution we demonstrate how precise Gaia-ESO survey radial velocities, along with a secure knowledge of their uncertainties, allow us to investigate the mass-dependent dynamics of stars in open clusters. Using the young cluster NGC 2516 as an example, we select members and then model their line-of-sight velocity dispersions, taking into account measurement uncertainties and binarity. For the first time in a rich cluster, we show that although there is spatial mass segregation, there is no evidence for equipartition over an order of magnitude range in mass - the velocity dispersions are independent of (or even slightly increasing with) stellar mass, but roughly consistent with virial equilibrium. The techniques discussed can be applied to many clusters observed in the Gaia-ESO survey.

Submitted: 9/9/2015 11:12:02
Presenter: R.D. Jeffries (r.d.jeffries@keele.ac.uk)
Contribution type: Talk
Session: Kinematics and dynamics of stellar populations

Massive-star clusters in the GES

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ABSTRACT

As part of the Gaia-ESO Survey, a number of massive-star clusters have been observed. A comparison with evolutionary tracks has allowed us to determine the ages of these clusters. Problems were found with the ZAMS of NGC 3293 and with the position of some of the A-type stars in the HR diagram. The radial velocities determined by WG13 have been used to check for cluster membership. Also binaries were searched for in the GES data, and estimates were made on how to convert these raw binary fractions into true ones.

Submitted: 9/20/2015 18:31:25
Presenter: R. Blomme (Ronny.Blomme@oma.be)
Contribution type: Talk
Session: Kinematics and dynamics of stellar populations

The structure of Trumpler 14 and 16 in the Carina Nebula

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INAF - Osservatorio Astronomico di Palermo

ABSTRACT

We present a study of global properties of young clusters Trumpler 14 and 16 in the Carina Nebula, based on Gaia-ESO data, down to solar-like stars. The data show considerable dynamical structure in the gaseous components of the Nebula itself, with better detail than previous studies. Member stars down to approximately one solar mass are identified. We study their distribution in space, reddening and age, which, compared with the nebular component, permits to put new constraints on the global structure and formation history of Carina clusters.

Submitted: 9/30/2015 19:20:40
Presenter: F.Damiani (damiani@astropa.unipa.it)
Contribution type: Talk
Session: Kinematics and dynamics of stellar populations

Structure and dynamics of the young cluster NGC 2264

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ABSTRACT

Understanding the dynamical evolution of young star clusters and the mechanism leading to their dispersion in the galactic field is one of the main goals of the current research in the field of star formation. Thanks to the precision of the radial velocity and the approach used for the target selection GES is a powerful machine to lead these studies, and the analysis of the GES data for the clusters Gamma Velorum, Rho Oph and Chamaeleon I unveiled a complex observational scenario, that need further investigations. However, these three clusters – despite very different – are all in the low-mass end of the cluster mass distribution. In this talk we will present the results of the analysis of the structural and dynamical properties of the young cluster NGC 2264. Located at a distance of ~800 pc, with a total population ~2000 members, including a few early type stars, and a molecular cloud with a mass of $\sim 10^4$ solar mass, NGC 2264 is one of the closest young clusters in the intermediate-mass range.

Submitted: 9/19/2015 11:43:09
Presenter: G.G. Sacco (gsacco@arcetri.inaf.it)
Contribution type: Talk
Session: Kinematics and dynamics of stellar populations

Looking for phase-space structures in star-forming regions: An MST-based methodology

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ABSTRACT

We present a method for analysing the phase-space of star-forming regions. In particular we are searching for clumpy structures in the 3D subspace formed by two position coordinates and radial velocity. The aim of the method is the detection of kinematic segregated radial velocity groups, that is, radial velocity intervals whose associated stars are spatially concentrated. To this end we define a kinematic segregation index, $\tilde{\Lambda}$(RV), based on the Minimum Spanning Tree (MST) graph algorithm, which is estimated for a set of radial velocity intervals in the region. When $\tilde{\Lambda}$(RV) is significantly greater than 1 we consider this bin represents a grouping in the phase space. We split a star-forming region in radial velocity bins and calculate the kinematic segregation index for each bin, then we obtain the spectrum of kinematic groupings, which enables a quick visualization of the kinematic behaviour of the region under study. Finally, we apply this method to a set of simulations in order to show its capabilities for the analysis of the phase space of stellar systems. We will also present some preliminary results of the application of the method to the Gamma Velorum area.

Submitted: 10/6/2015 14:41:34
Presenter: M. González (marta@iaa.es)
Contribution type: Talk
Session: Kinematics and dynamics of stellar populations

Climbing the cosmic distance ladder with stellar twins

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ABSTRACT

We recently presented a method to determine distances using stellar twins in Jofré et al. (2015) that is very accurate and model-independent. In this talk I will explain this method as well as present its application to the Gaia-ESO Survey.

Submitted: 9/17/2015 15:42:17
Presenter: P. Jofré (pjofre@ast.cam.ac.uk)
Contribution type: Talk
Session: Kinematics and dynamics of stellar populations

References

Jofré, P., Mädler, T., Gilmore, G., et al. 2015, MNRAS, 453, 1428

A new dynamical framework of the Besançon galaxy model in the era of large spectroscopic surveys

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ABSTRACT

We develop a new dynamical approach based on the Besancon galaxy model (BGM) reproducing the three-dimensional structures of the Milky Way, and keeping its predecessor scheme, based on the local dynamical self-consistency introduced by Bienayme+1987. The contributions of the triaxial bar described in Robin+2012, the two components of the thick disk introduced by Robin+2014, the central mass modeled by a Plummer sphere and the double power-law for the stellar halo (Fernandez-Trincado, in prep.), are added. The renewed dynamical version of the BGM has been constructed with the aim to model the kinematics for the above structures, according to new density laws updated from analyses the 2MASS and SDSS surveys. In this sense, a complete and realistic dynamical model of the Milky Way is currently being prepared to interprete the upcoming six-dimensional phase-space data set produced by the Gaia-ESO survey, Gaia space mission, APOGEE survey, and others.

Submitted: 9/18/2015 20:09:37

Presenter: J. G. Fernandez-Trincado (jfernandez@obs-besancon.fr)

Contribution type: Talk

Session: Kinematics and dynamics of stellar populations

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Session V.
Stellar evolution

Exploring the Chemical Evolution of Globular Clusters and their Stars

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ABSTRACT

The chemical evolution of the Milky Way is believed to be imprinted in the elemental abundance patterns of late-type stars (spectral types F to K). Due to their long lifetimes, these stars are of particular importance when it comes to studying the build-up of elements during the early times of our Galaxy. The chemical composition of the atmospheric layers of such stars is thought to resemble the gas from which they were formed. However, recent observations in globular clusters seem to contradict this assumption. The observations indicate that there are processes which can alter the surface compositions in these stars. The combined effect of processes which are responsible for an exchange of material between the star's interior and its atmosphere during the main sequence lifetime of the star, is referred to as *Atomic Diffusion*. However, the extent to which these processes alter surface abundances is still debated. In this talk I will discuss my contribution to solving this issue and the implications atomic diffusion has on Galactic archeology.

Submitted: 9/1/2015 14:18:32
Presenter: P. Gruyters (pieter.gruyters@gmail.com
Contribution type: Talk
Session: Stellar evolution

The peculiar globular cluster NGC 1851: high-resolution spectroscopy of 45 red giants

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ABSTRACT

The detailed chemical composition was determined for a sample of 45 red giant branch stars in the peculiar globular cluster NGC 1851. High-resolution spectra were obtained with the VLT UVES spectrograph in the frame- work of the Gaia-ESO Survey. The stars in our sample can be separated into two groups with a difference of 0.1 dex in the mean metallicity, 0.3 dex in the mean C/N, and no significant difference in the mean values of C+N+O. Chemical elements that are insensitive to internal stellar mixing show normal Galactic abundances of the corresponding metallicities. Scenarios of formation and evolution of this peculiar cluster are discussed.

Submitted: 10/1/2015 14:26:42
Presenter: G. Tautvaišiene (Grazina.Tautvaisiene@tfai.vu.lt)
Contribution type: Talk
Session: Stellar evolution

Lithium evolution from Pre-Main Sequence to the Spite plateau: an environmental solution to the cosmological lithium problem

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ABSTRACT

Lithium abundance derived in metal-poor main sequence stars is about three times lower than the value of primordial Li predicted by the standard Big Bang nucleosynthesis when the baryon density is taken from the CMB or the deuterium measurements. This disagreement is generally referred as the lithium problem. We here reconsider the stellar Li evolution from the pre-main sequence to the end of the main sequence phase by introducing the effects of convective overshooting and residual mass accretion. We show that ^{7}Li could be significantly depleted by convective overshooting in the pre-main sequence phase and then partially restored in the stellar atmosphere by a tail of matter accretion which follows the Li depletion phase and that could be regulated by EUV photo-evaporation. By considering the conventional nuclear burning and microscopic diffusion along the main sequence we can reproduce the Spite plateau for stars with initial mass $m_0 = 0.62 - 0.80\ M_\odot$, and the Li declining branch for lower mass dwarfs, e.g, $m_0 = 0.57 - 0.60\ M_\odot$, for a wide range of metallicities (Z=0.00001 to Z=0.0005), starting from an initial Li abundance A(Li) = 2.72. This environmental Li evolution model also offers the possibility to interpret the decrease of Li abundance in extremely metal-poor stars, the Li disparities in spectroscopic binaries and the low Li abundance in planet hosting stars.

Submitted: 9/18/2015 15:03:58
Presenter: X. Fu (xtfu@sissa.it)
Contribution type: Talk
Session: Stellar evolution

Chromospherically active field stars

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ABSTRACT

Spectroscopic stellar classification of RAVE survey revealed a large number of chromospherically active and young Milky Way nearby field dwarfs (Matijevič et al. 2012, Žerjal et al. 2013). We present general characteristics of population, fraction of activity for different stellar types and spatial distribution of these young RAVE stars in the Galaxy and compare the sample with GES field stars that show signs of chromospheric activity. We study the dependence of chromospheric activity of GES field stars on their chemical abundances since this is better determined quantity compared with RAVE values.

Submitted: 9/22/2015 0:26:55
Presenter: M. Žerjal (marusa.zerjal@fmf.uni-lj.si)
Contribution type: Talk
Session: Stellar evolution

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Session VI.
Analysis methods and technology

Large surveys of Galactic populations with the new WEAVE facility

V. Hill[1] and the WEAVE Science Team

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ABSTRACT

WEAVE at the 4m William Hershel Telecope, is the first northern wide-field and high multiplex spectroscopic facility, that will carry out large surveys of our Galaxys stellar populations starting 2018. With its low (R=5,000) and high (R=20,000) resolutions, WEAVE is ideally suited to complement Gaia in its mission to unravel the structure, evolution and formation of the Milky-Way, providing precise line-of-sight velocities down to Gaias limiting magnitudes (G≤20), and detailed stellar parameters and elemental abundances for the brighter part of Gaias reach (12<G<16), where Gaia delivers its best astrometric performances. The most prominent science cases for WEAVE indeed include unravelling the assembly history of the Galactic Halo, probing the thin and thick disc well outside of the solar vicinity, constraining the disc dynamics in its full details, WEAVE builds onto the Gaia-ESO experience in all its breadth, learning from the GES from target selection to data analysis. In this talk I will give an overview of the planned WEAVE surveys and link them to the GES surveys and experience.

Submitted: 9/30/2015 17:06:41
Presenter: V. Hill (vanessa.hill@oca.eu)
Contribution type: Talk
Session: Analysis methods and technology

The Gaia-ESO Survey: the selection function of the Milky Way field stars

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ABSTRACT

Here we present the target selection function for the Gaia-ESO public spectroscopic survey of Milky Way field stars observed with VLT/FLAMES (Gilmore et al. 2012; Randich, Gilmore & Gaia-ESO Consortium 2013). The survey was configured to target all major Galactic components (i.e., bulge, thin and thick discs, and halo), with the goal of constraining the chemical and dynamical evolution of the Milky Way. We present the methodology and considerations that drive the selection of the targets in the Milky Way fields. The detailed understanding of the survey construction, specifically the influence of target selection criteria on observed Milky Way field stars is required in order to analyse and interpret the survey data correctly (Rix & Bovy 2013).

Submitted: 9/28/2015 16:59:09
Presenter: E. Stonkutė (edita@astro.lu.se)
Contribution type: Talk
Session: Analysis methods and technology

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Randich, S., Gilmore, G., & Gaia-ESO Consortium 2013, The Messenger, 154, 47
Rix, H.-W., & Bovy, J. 2013, A&A Rev., 21, 61

Filling in the Benchmark Gap: Metal-poor Gaia Benchmark stars

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ABSTRACT

The Gaia benchmark stars are the primary set of stars to calibrate the GES and other large spectroscopic surveys. The distribution of those benchmark stars are mainly focused at either high or very low metallicities. There is currently a gap of benchmark stars in the critical metallicity regime of -2.0 < [Fe/H] < -1.0 dex. In this talk, I will present a new effort to fill this gap with references parameters for 10 metal-poor candidate benchmark stars using similar methods as for the other 34 benchmark stars. I will discuss some of the challenges that we have encountered to provide metal-poor benchmark stars and suggest solutions to these challenges.

Submitted: 9/21/2015 1:28:21
Presenter: K. Hawkins (khawkins@ast.cam.ac.uk)
Contribution type: Talk
Session: Analysis methods and technology

How different radiative transfer codes can impact the determination of stellar atmospheric parameters?

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ABSTRACT

During the past few years the astronomical community has developed new spectroscopic computer frameworks to automatically derive stellar atmospheric parameters and chemical abundances from high-resolution spectra, (e.g. SME, Valenti & Piskunov 1996; MATISSE, Recio-Blanco et al. 2006; GALA, Mucciarelli et al. 2013; FAMA, Magrini et al. 2013; iSpec, Blanco-Cuaresma et al. 2014). Each of these present different approaches to solve the same problem and most of them rely on different third party radiative transfer codes to compute synthetic spectra and/or derive abundances from equivalent widths (SPECTRUM, Gray & Corbally 1994; WIDTH, Kurucz 1993 & Sbordone et al. 2004; Turbospectrum, Alvarez et al. 1998 & Plez 2012; MOOG, Sneden et al. 2012).
We studied the agreement between different radiative transfer codes and we evaluated the impact on the determination of atmospheric parameters and chemical abundances. The analysis was performed analyzing the Gaia FGK Benchmark Stars using iSpec and a common setup (i.e. homogeneous normalization process, atomic line list, model atmosphere), ensuring that the radiative transfer code is the only variable that changes in the experiment.

Submitted: 9/15/2015 17:25:16
Presenter: Sergi Blanco-Cuaresma (Sergi.Blanco@unige.ch)
Contribution type: Talk
Session: Analysis methods and technology

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Diffuse Interstellar Bands: The Progress and Importance of the Gaia–ESO Survey

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ABSTRACT

Diffuse Interstellar Bands: The Progress and Importance of the Gaia–ESO Survey. Diffuse interstellar bands (DIBs) are numerous interstellar absorption lines observed in spectra of reddened stars. Research is focused into two different fields; chemistry (e.g. Campbell et al. (2015)) and observations, where spectroscopic surveys are playing the leading role (e.g. Kos et al. (2014), Puspitarini et al. (2015), Zasowsi et al. (2015)). The Gaia–ESO survey has a big advantage, because it delivers high quality spectra in several wavelength ranges, and covers a wide selection of different regions of the Galaxy. I will present the study of DIBs in the GIRAFFE spectra, their application to the stellar astrophysics and mapping of the DIBs in front of the clusters (Kos et al. (2015), in preparation). Open clusters are very well represented in GES and serve as a perfect environment to study DIBs on a small spatial scale. This unveils the dynamics of DIBs on ∼1 pc scale which might be tightly connected to the processes around open clusters and hot stars. I will also touch the methods of DIB extraction: a data-based approach developed purposely for DIBs and gaussian processes used together with the bayesian methods for detecting weak DIBs at low signal-to-noise.

Submitted: 9/21/2015 16:15:41
Presenter: J. Kos (jkos@physics.usyd.edu.au)
Contribution type: Talk
Session: Analysis methods and technology

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Exploring peculiar morphologies using t-SNE reduction of spectral information

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ABSTRACT

Peculiar spectra, those which we can not trivially approximate with common templates of stellar evolution models, are relatively abundant in general all-sky surveys such as the GES. They are important because the automatic evaluation of their stellar and chemical properties might turn out to be very challenging, albeit the nature of objects associated to them can be quite intriguing. We employ the novel dimensionality reduction technique t-SNE van der Maaten et al. (2008) to alleviate the discovery and overview of distinct morphological types that occur among the tens of thousands of spectra currently available in GES. The t-SNE visualisation exposes recognizable morphological groups and can also be compared with results of the recent Halpha emission study Traven et al. (2015). Based on the t-SNE projection, a very user-friendly utility called GaiaESO explorer will be presented and hopefully adopted as a discovery and examination tool for GES spectra.

Submitted: 9/17/2015 12:47:58
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Contribution type: Talk
Session: Analysis methods and technology

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Posters

New PARSEC database of alpha enhanced stellar evolutionary tracks and isochrones for Gaia

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ABSTRACT

We present a new database of alpha enhanced evolutionary tracks and isochrones, computed with PARSEC (the PAdova & TRieste Stellar Evolution Code). The new isochrones are tested against Color-Magnitude Diagrams of well studied Globular Clusters, tacking into account multiple population effects. They are also compared with observations of dwarf stars in the Solar vicinity. After these preliminary computations, we will provide the full sets of isochrones with chemical compositions suitable for Globular Clusters and Bulge stars, that will be fully implemented into galaxy simulators. We will also provide new models suitable for the analysis of unresolved stellar populations in early type galaxies.

Submitted: 9/18/2015 15:10:53
Presenter: X. Fu (xtfu@sissa.it)
Contribution type: Poster
Session: Stellar evolution

CNO abundances in low mass stars of open clusters

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ABSTRACT

Abundance determinations of CNO elements can help us better understand the internal processes in evolving stars. Observations have shown that when a star leaves the main sequence and enters the red giant branch (RGB) branch, we observe an increase of nitrogen and decrease of carbon abundances not only at the bottom of the RGB but also during its later evolution on the RGB. However, standard stellar evolution models only predict a one time dredge-up event at the bottom of the RGB branch and especially the $^{12}C/^{13}C$ ratios observed in stars do not match those predictions. There has to be a some kind extra mixing involved. We present new results of CNO and $^{12}C/^{13}C$ isotopic ratio investigations in RGB stars of two young open clusters. We compare our previous and new results of CNO and $^{12}C/^{13}C$ for stars of various turn-off masses with recently developed stellar evolution models which take into account thermohaline- and rotation-induced mixing.

Submitted: 9/30/2015 11:29:44
Presenter: A. Drazdauskas (arnas.drazdauskas@tfai.vu.lt)
Contribution type: Poster
Session: Stellar evolution

NGC 6067: a young and massive open cluster with high metallicity

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ABSTRACT

NGC 6067 is a young open cluster with an age of around 100 Ma. It is very interesting because it hosts a large population of evolved stars, including two Cepheids, representing one of the best laboratories in the Galaxy to study the evolution of intermediate-mass stars. We obtained high-resolution spectra with FEROS for the ~50 brightest stars in the cluster and combined them with archival photometry to determine the main parameters of the cluster such as age, distance, mass and size. We also derived stellar atmospheric parameters and abundances for both, the hot stars located at the top of the main sequence and the red (super)giants at the red clump.

Submitted: 11/20/2015 12:21:34
Presenter: J. Alonso (javier.alonso@ua.es)
Contribution type: Poster
Session: Stellar evolution

Dynamical Analysis of L1688 in the ρOphiuchi star-forming region

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ABSTRACT

One of the goals of Gaia ESO Large Spectroscopic Survey is to unravel the dynamical histories of young star clusters and associations, with the ultimate goal of understanding why some star forming regions emerge as bound open clusters and others disperse quickly as unbound associations into the field (e.g., Jefferies et al. 2014). The star-forming cloud L1688 is part of the ρOphiuchi molecular cloud, which is in turn one of the closest star-forming region to the Sun. Its connection to the larger Sco Cen OB association makes it an excellent place to study low mass star formation, as well as sequential star formation and possible triggering (Wilking et al. 2008). Moreover, the region is still very young and deeply embedded within its parent molecular cloud. Almost 50 confirmed members have been observed by the GAIA-ESO Large Spectroscopic Survey in the direction of L1688. In this talk I present the results of the analysis of the dynamical state of the confirmed members after accounting for the unresolved binaries (Rigliaco et al. 2015, submitted). I will show that the cluster is currently bound with a 60% probability, and that the stars have a velocity dispersion consistent with virial equilibrium, as opposed to the subvirial velocity dispersion of the pre-stellar cores. In addition, I will discuss the gradient in the radial velocity dispersion found for the stellar surface population, which supports the possibility of sequential star forming region triggered by a supernova explosion in Upper Scorpius.

Submitted: 9/21/2015 10:17:25
Presenter: E. Rigliaco (elisabetta.rigliaco@phys.ethz.ch)
Contribution type: Poster
Session: Stellar Clusters: formation and evolution

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Spectroscopic properties of young stars in the star forming region NGC6 530

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ABSTRACT

Rich young clusters associated with the parental molecular cloud, such as NGC6530, are crucial to understand the mechanisms regulating the star formation process. Gaia-ESO survey observations will cover all the region around the NGC6530 cluster, where recent star formation episodes have been identified in different spatial sites. We want to use GES data and available literature photometry to select cluster members. We will use GES spectroscopic parameters also to compare properties of Class II and Class III members in this cluster.

Submitted: 9/30/2015 14:38:13
Presenter: L. Prisinzano (loredana@astropa.inaf.it)
Contribution type: Poster
Session: Stellar Clusters: formation and evolution

A-type stars in the Gaia-ESO Survey: DR4 analysis results

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ABSTRACT

We present an overview of ongoing research work with spectra of A-type stars observed for the Gaia-ESO Survey. The spectra are observed for WG13 (OBA Star Spectrum Analyses) primarily in a number of selected Galactic (massive) young open clusters. The ROB node has so far provided astrophysical parameters (APs) and chemical abundances of A stars from FLAMES/ Giraffe and UVES spectra. We discuss the results of an analysis of 64 U520 iDR4 A-star spectra in NGC 2516, NGC 2547, NGC 6530, NGC 6633, and NGC 6705. We highlight the importance of astrophysical microturbulence (Vmic) in stellar atmosphere and spectrum modelling for determining reliable APs and abundances of A-stars. We observe maximum Vmic-values (4-5 km s^{-1}) around the mid-A type stars, which we also observe in ~200 A- and late B-type iDR3 Giraffe spectra of NGC 3293 and NGC 6705. We discuss the importance of (automatic) template continuum flux (re-)normalization of the U520 iDR4 spectra for accurate abundance measurements of six elements.

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Contribution type: Poster
Session: Stellar Clusters: formation and evolution

The Gaia-ESO Survey: membership, lithium and chromospheric activity of the of the young open clusters IC 2391, IC 2602 and IC 4665

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ABSTRACT

We conduct a comparative study of the main properties of the of the young open clusters IC 2391, IC 2602 and IC 4665, focusing on their membership, lithium abundance and level of chromospheric activity and possible accretion. We use the fundamental parameters (effective temperature, surface gravity, and radial velocity) delivered by the Gaia-ESO survey (GES) consortium in the four internal data release (iDR4) to select the members of these clusters among the UVES and GIRAFFE spectroscopic observations. First, radial velocity and color-magnitude diagram criteria are applied to determinate what objects are members or non members of the clusters. In addition, lithium abundance and chromospheric activity derived from the UVES and GIRAFFE spectra are used to establish the final classification. All this information allowed us to characterize the properties of the members and contaminant stars of these clusters and identify seven lithium-rich giants in the field of IC 2391.

Submitted: 10/1/2015 0:06:31
Presenter: D. Montes (dmontes@ucm.es)
Contribution type: Poster
Session: Stellar Clusters: formation and evolution

The Gaia-ESO Survey: calibrating the lithium-age relation with open clusters and associations

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ABSTRACT

Li depletion is strongly age-dependent but currently available data have shown a complex pattern of Li depletion on the pre- and main-sequence stars that is not yet understood. The lithium abundance observed in late-type stars depend not only of the age and the temperature but also on metallicity, mixing mechanisms, convection structure, rotation and magnetic activity. The large number of stars observed within the Gaia-ESO survey (GES) for many open clusters and associations can be used to calibrate the lithium-age relation and its dependence with other parameters that can be derived from the UVES and GIRAFFE spectroscopic observations. We present here the preliminary results of the analysis of membership and Li abundance of the young clusters and associations, as well as of the intermediate-age and old open clusters, observed until now in GES in order to conduct a comparative study.

Submitted: 10/1/2015 0:15:19
Presenter: D. Montes (dmontes@ucm.es)
Contribution type: Poster
Session: Stellar Clusters: formation and evolution

Membership and Fundamental Parameters of Open Cluster Trumpler 23

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ABSTRACT

Trumpler 23 is a relatively populous intermediate-age (∼1 Gyr) open cluster located inside the solar circle that is possibly undergoing tidal interactions Carraro et al. (2006). Its location in the fourth quadrant at R_{GC} = 6.5 kpc Bonatto & Bica (2007) makes it an interesting object, particularly in the context of the Galactic metallicity gradient. The Gaia-ESO Survey has provided the first spectroscopic data for Trumpler 23; here we use radial velocities, atmospheric parameters, and metallicities for target stars to determine membership. We find a systemic cluster velocity of -61.1 ± 1.9 km s^{-1}, and an average [Fe/H] = +0.14 ± 0.03 dex, based on 60 GIRAFFE (main-sequence) members and 14 UVES (red clump) members. We are also able to use selected members and the cluster metallicity to determine a new cluster age, distance, and reddening via isochrone fitting.

Submitted: 9/21/2015 7:04:47
Presenter: J. C. Overbeek (joverbee@indiana.edu)
Contribution type: Poster
Session: Stellar Clusters: formation and evolution

References

Carraro, G., Janes, K. A., Costa, E., & Méndez, R. A. 2006, MNRAS, 368, 1078
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The double open cluster NGC 2451

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ABSTRACT

NGC 2451 is a double cluster composed of two open clusters of similar age (50-80 Myr) located at different distances along the same line of sight. Combining the GES results with available XMM-Newton X-ray observations, we will present a preliminary membership analysis of the two clusters, and discuss their lithium patterns and activity.

Submitted: 9/21/2015 19:53:22
Presenter: E. Franciosini (francio@arcetri.astro.it)
Contribution type: Poster
Session: Chemical tagging

Chemical tagging of stellar kinematic groups

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ABSTRACT

Chemical tagging is a powerful tool that can provide clear constraints on the membership of FGK kinematic candidates to stellar kinematic groups of different ages and chemical compositions. It can be used as an alternative and/or complementary to the methods that employ kinematics, photometry or age indicators. Constraining membership to this groups is an important step to understand the star formation history in the solar neighborhood. It can be used to discern between field-like stars and coeval stars that might share a common origin. We have already applied the chemical tagging approach to constrain the membership of FGK candidate stars to the Hyades supercluster and the Ursa Major moving group. In addition, we present the preliminary results of our study of the Castor moving group. Finally, we will also explore the posible applications of this approach to GES data.

Submitted: 9/30/2015 20:37:38
Presenter: H. M. Tabernero (htabernero@ua.es)
Contribution type: Poster
Session: Galactic discs and Halo

At the interface of the disk and halo: A lesson from APOGEE

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ABSTRACT

One of the primary goals of the GES is to study the chemo-dynamical structure of the Galaxy and in particular explore the Galactic disc-halo transition region. I present here a chemical abundance distribution study in 14 elements of approximately 3200 intermediate-metallicity giant stars from the Apache Point Observatory Galactic Evolution Experiment (APOGEE) survey. From this study we learned the following (1) the α-poor halo subgroup is chemically distinct in O, Mg, S, Al, C+N, and Ni, from the α-rich halo, confirming the existence of an α-poor accreted halo population; (2) the canonical thick disc and halo are not chemically distinct in all elements indicating a smooth transition between the thick disc and halo; (3) a subsample of the α-poor stars at metallicities as low as [Fe/H] = -0.85 dex are chemically and dynamically consistent with the thin disc indicating that the thin disc may extend to lower metallicities than previously thought; and (4) the locations of the most metal-poor thin disc stars are consistent with a negative radial metallicity gradient. Finally we will discuss how the most recent results from the GES may compliment this study with APOGEE.

Submitted: 9/21/2015 18:20:39
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Contribution type: Poster
Session: Galactic Discs and Halo

Particle-based chemo-dynamical distribution function

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ABSTRACT

We present some preliminary results for our new machinery to interpret the chemo-dynamical distribution of nearby disc stars. Our machinery is somewhere in between the usual N-body simulations and the recently proposed extended distribution function model (Sanders & Binney 2015). In our machinery, we first construct a set of orbit libraries of test particles for given time-dependent non-axisymmetric gravitational potentials. Then we assign a proper weight and chemical abundances to each particle to generate a variety of chemo-dynamical distribution of nearby disc stars. Our final goals are to fit the observed distribution of velocity and chemical abundances of nearby disc stars and to better understand how the non-axisymmetric gravitational potential affects the evolution of the stellar disc.

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Presenter: K. Hattori (khattori@ast.cam.ac.uk)
Contribution type: Poster
Session: Galactic Discs and Halo

CNO elemental distribution in the Galactic discs

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ABSTRACT

We study the relationship between radial, vertical Galactic distances and carbon, nitrogen, oxygen and alpha-element abundances of FGK stars in the Galactic disc. We use a Gaia–ESO survey sample of high-resolution UVES spectra. We tag thin and thick disc populations using alpha-element abundance-to-iron ratios to study radial and vertical abundance distributions of these identified populations and derive radial and vertical CNO abundance gradients.

Submitted: 9/30/2015 16:31:55
Presenter: Š. Mikolaitis (Sarunas.Mikolaitis@tfai.vu.lt)
Contribution type: Poster
Session: Galactic Discs and Halo

Interstellar Extinction in the Direction of the Open Cluster NGC 2244

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ABSTRACT

The Rosette complex in Monoceros is a perfect laboratory for the study of star formation. This region presents an interesting scenario, in which an expanding HII region, generated by the hottest stars of the association Mon OB2, interacts with a giant molecular and dust cloud. Inside the cloud a a young open cluster NGC 2244 has been formed during a few last Myrs. Despite to numerous photometric and spectral investigations in this area, the run of interstellar extinction with distance in front of the star-forming complex and behind it is not investigated with modern methods. In the present contribution we investigate the interstellar extinction in two areas in the direction of the central part of NGC 2244 where a cavity of interstellar dust is formed by the light pressure and stellar wind of the hottest cluster stars. The study is based on photometric classification of stars in spectral and luminosity classes using CCD photometry in the Vilnius seven-color system done with the 1 m telescope of the US Naval Observatory at Flagstaff, Arizona, and the 1.8 m VATT telescope of the Vatican Observatory on Mt. Graham, Arizona. Additionally, for the same aim we use a few hundreds of red clump giants (RCGs), identified by combining the selected two-color diagrams of the infrared 2MASS, WISE and Spitzer surveys. The accuracy of photometric distances will be possible to verify with the Gaia parallaxes which are expected soon.

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Presenter: M. Macijauskas
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Contribution type: Poster
Session: Galactic discs and Halo

Interstellar extinction in the vicinity of the dark cloud LDN183 in Serpens

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ABSTRACT

The results of CCD photometry in the Vilnius system in Serpens are presented. CCD exposures of the area for 174 stars down to V ~14 mag were obtained with the wide field Maksutov-type 35/51 cm telescope of the Moltai Observatory in Lithuania. Deep photometry for 232 stars down to ~20.5 mag was done with the 1.8 m VATT telescope of the Vatican Observatory on Mt. Graham, Arizona. Two-dimensional spectral types (spectral and luminosity classes), interstellar extinctions and distances for most of the stars were determined. The interstellar extinction run with distance was investigated and the distance to the cloud was determined.

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Presenter: J. Zdanavičius (justas.zdanavicius@tfai.vu.lt)
Contribution type: Poster
Session: Galactic Discs and Halo

Chemo-kinematical cartography of the Milky Way disk with GES iDR4

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ABSTRACT

The chemodynamic structure of the Milky Way disk provides a window into the evolutionary history of the Galaxy and is a key constraint for models of galaxy formation and evolution. We present results on the chemical and kinematic structure of the Milky Way disk using a sample of more than 20,000 stars from the fourth internal data release (iDR4) of the Gaia-ESO Survey. Combined with proper motions from PPMXL, we probe the chemodynamic structure of the Milky Way disk across a range of radii ($3 < R < 13$ kpc) and heights above the plane ($0 < |z| < 3$ kpc). We also compare these results to observations of the Milky Way disk obtained by the APOGEE survey.

Submitted: 10/13/2015 11:01:23
Presenter: M. R. Hayden (mhayden@oca.eu)
Contribution type: Poster
Session: Galactic Discs and Halo

Bulk streaming motions of nearby K-M dwarfs

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ABSTRACT

We use our recent measurements of radial velocities of nearby K-M dwarfs, mainly from a spectroscopically selected sample of McCormick stars, to perform a clustering analysis of local late-type stars in the velocity space. Based solely on kinematic criteria, including additional requirements of isoperiodicity of the galactic orbits and coherent vertical orbital oscillations, we have identified 145 stars as possible candidate members of stellar kinematic groups, subgroups, and streams, both classical and those identified in the previous studies of early-type Hipparcos stars by Asiain et al. (1999) and Chereul et al. (1999). A comparison is made with the results obtained using the moving group membership identification code LACEwING by Riedel (2015).

Submitted: 11/25/2015 20:32:09
Presenter: S. Bartašiūtė (stanislava.bartasiute@ff.vu.lt)
Contribution type: Poster
Session: Galactic Discs and Halo

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Testing blind chemical tagging with the Gaia-ESO open clusters

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ABSTRACT

We took advantage of the Gaia-ESO abundances to run a blind chemical tagging exercise, using as reference the controlled environments offered by stars observed in the fields of open clusters. We first compared the list of members obtained matching the chemistry of the stars to the list of members found using radial velocities and proper motions. The use of chemistry alone is perhaps not the most efficient way of finding cluster members. In a second step, we defined the mean chemical pattern of each cluster, and ran a blind chemical tagging including these "mean clusters" and stars observed in Milky Way fields. The chemical pattern of each clusters tends to match the pattern of a good number of field stars. We discuss these results and the implied limitations on blind chemical tagging of field stars.

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Presenter: R. Smiljanic (rsmiljanic@ncac.torun.pl)
Contribution type: Poster
Session: Chemical Tagging

Study of clustering in the stellar abundances space using the Gaia-ESO survey

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ABSTRACT

The formation and evolution history of the Galaxy can be interpreted from the chemical abundances of stars borned at different times. Once the medium is enriched for losses of processed stellar masses and this gas is totally or partially mixed before birth of new stars, enrichment patterns must be observed in the study of the stars in the chemical abundances space. The aim of this study is to find structures within stellar abundances space, obtaining groups which have a similar chemo-evolutionary history, locating the stars within an evolutionary sequence, as well as a taxonomic tree, based on their chemical signatures, and also search among these groups those with peculiar chemistry. For this, we use the technique of hierarchical clustering in trees and the principal component analysis applied to the large stellar survey Gaia-ESO. In this study we found, in addition to similar chemical groups, stellar groups with peculiar chemistry. These stars with peculiar chemistry are positioned in distant regions of medium enrichment flow and must be originated from different and isolated regions of the interstellar medium which have been enriched unequally and whose gas has not been effectively mixed. Unlike the samples used previously, in this work we observe peculiar groups among the stars with lower extreme metallicity. This result confirms our view that these groups with peculiar chemistry in extreme metallicities can only be found in samples with large numbers of stars, once they are the tails of the metallicity distribution. We note that the elements used in our analysis, except for two elements, have abundances that are strongly correlated and with positive correlation, which supports the existence of a chemical enrichment flow. We observed a chemical enrichment over [X/H] for each of the elements with a profile substantially parallel between the groups, such that the increase in [Fe/H] is followed by similar growth of other abundances. The ramifications beyond the flow, which would be the peculiar chemical groups, are observed at the intersections between abundance patterns for the groups obtained by the hierarchical clustering trees. The results obtained from the principal component analysis confirm those obtained by the technique of hierarchical clustering in trees.

Submitted: 9/30/2015 23:45:19
Presenter: R. Boesso (rbsilva06@astro.ufrj.br)
Contribution type: Poster
Session: Chemical Tagging

Carbon-enriched objects within the Gaia-ESO survey

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ABSTRACT

We present the detection and chemical analysis of carbon-enriched stars so far discovered within the Gaia-ESO Survey. C-enriched candidates are identified from the analysis of a series of enhanced molecular features, measured through photometric and narrow-band spectroscopic filters. Then, the stellar parameters, C/O ratios and s-process element abundances are determined. The nature (intrinsic or extrinsic) of these carbon-enriched stars is discussed together with the agreement with s-process model predictions.

Submitted: 10/2/2015 19:20:01
Presenter: M. Van der Swaelmen
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Contribution type: Poster
Session: Chemical Tagging

Abundances of neutron-capture elements in open clusters

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ABSTRACT

Open clusters with accurate ages, galactocentric distances and chemical abundances provide new constraints for modelling the chemical evolution of the Galactic disc. We determined abundances of yttrium, zirconium, barium, lanthanum, cerium, praseodymium, neodymium, and europium in ten open clusters of different ages. Our results confirm and strengthen the suggestion that the young clusters were formed from the material more s-process enriched than the old ones.

Submitted:
Presenter: V. Bagdonas (viliusbgd@gmail.com)
Contribution type: Poster
Session: Chemical Tagging

Dynamical modelling of the Galactic bulge and long bar

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ABSTRACT

We construct dynamical models of the Milky Way's Box/Peanut bulge, using the 3D density of red clump giants measured from the VVV survey and stellar kinematics from the BRAVA and ARGOS surveys, using the Made-to-Measure method. Starting with N-body models for barred discs in different dark matter haloes we measure the total mass of the Galactic bulge to be $1.84 \pm 0.07 \times 10^{10}\,M_{\odot}$, out of which 15% to 35% is dark matter depending on the IMF. In our models the peanut shape of the Galactic bulge is not made of stars streaming along banana orbits but is mostly made of a new kind of brezel orbits that accounts for about 40% of the bulge stellar mass. We recently extended the modelling to the long bar region using extensive data from a combination of the VVV, UKIDSS and 2MASS surveys. We provide the first non-parametric dynamical model of the Galactic long bar and confirm that the Box/Peanut bulge and the long bar are consistent with forming a single buckled bar structure.

Submitted: 9/29/2015 17:33:31
Presenter: M. Portail (portail@mpe.mpg.de)
Contribution type: Poster
Session: Bulge and Inner Galaxy

The dark cloud TGU H994 P1 (LDN 1399, LDN 1400 and LDN 1402): interstellar extinction and distance

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ABSTRACT

The results of CCD photometry in the seven-colour Vilnius system for about 1000 stars down to $V = 20$ mag and their two-dimensional spectral types are used to investigate the interstellar extinction in a 1.5 square degree area in the direction of the dark cloud TGU H994 P1 (LDN 1399, LDN 1400 and LDN 1402) in Camelopardalis. Photometric classification of 18 brightest stars down $V = 12$ mag was verified by the spectra obtained with the 1.22 m telescope of the Asiago Observatory. The interstellar extinction run with distance is investigated using the results of photometry in the Vilnius system. A possible distance of 140 ± 11 pc to the TGU H994 P1 cloud seems to be acceptable. Alternative distances of the cloud are discussed. Probably the complex of the Camelopardalis clouds has a considerable depth along the line of sight, similar to that observed in the Taurus-Auriga complex. The maximum extinction A_V in the dark filaments is found to be about 6.5 mag.

Submitted: 10/13/2015 11:07:29
Presenter: M. Maskoliūnas (marius.maskoliunas@tfai.vu.lt)
Contribution type: Poster
Session: Bulge and Inner Galaxy

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CNO abundances in low mass stars of open clusters

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ABSTRACT

We explores the integrated-light characteristics of the Milky Way (MW) bulge and to what extent they match those of elliptical galaxies in the local Universe. We model composite stellar populations with realistic abundance distribution functions (ADFs), tracking the trends of individual elements as a function of overall heavy element abundance as actually observed in MW bulge stars. The resultant predictions for absorption feature strengths from the MW bulge mimic elliptical galaxies better than solar neighbourhood stars do, but the MW bulge does not match elliptical galaxies, either. Comparing bulge versus elliptical galaxies, Fe, Ti, and Mg trend about the same for both but C, Na, and Ca seem irreconcilably different.

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Presenter: B. Tang (tangbaitian@gmail.com)
Contribution type: Poster
Session: Bulge and Inner Galaxy

How well do we know the age of a given young star cluster?

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ABSTRACT

One of the key science drivers behind the *Gaia*-ESO survey is to probe the formation and subsequent dynamical evolution of young star clusters by utilising the uniformly-derived high-precision stellar kinematic data of their constituent low-mass members. In order to infer whether a given cluster will eventually disperse to populate the Galactic field or evolve into a bound open cluster, it is a prerequisite to have a robust absolute age for the cluster in question. Ages for young clusters are typically derived using theoretical pre-main-sequence (pre-MS) model isochrones based on stellar evolutionary models, however it has been demonstrated that such isochrones are unable to simultaneously fit both the high- and low-mass populations of a given cluster at a given age. Furthermore, the initial choice of evolutionary model can result in ages which differ by up to a factor of three for the same cluster.

We have homogeneously derived ages for several young (< 30 Myr) clusters and find that these can be up to a factor of two older than ages typically adopted in the current literature. Our ages were derived using a set of semi-empirical model isochrones that incorporate an empirical colour-$T_{\rm eff}$ relation and bolometric corrections based on the observed colours of low-mass Pleiades members, with theoretical corrections for the dependence on the surface gravity. Furthermore, we find that the pre-MS ages are in general agreement with both the main-sequence ages derived from the high-mass members of the same cluster as well as the age inferred from the identification of the lithium depletion boundary. The concordance between these two (or in some cases three) age estimation techniques that rely on different facets of stellar astrophysics at very different masses, is an important step towards the calibration of absolute ages for young star clusters and instills confidence in the use of any one of them in determining ages.

Submitted: 9/21/2015 23:34:04
Presenter: C. Bell (cbell@phys.ethz.ch)
Contribution type: Poster
Session: Analysis methods and technology

Identifying the best elements for chemical tagging: The impact of the number of lines on measured scatter

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ABSTRACT

The main goal of this work is to explore which elements carry the most information about the birth origin of stars and as such that are best suited for chemical tagging. We explored different techniques to minimize the effect of outlier value lines in the abundances by using Ni abundances derived for 1111 FGK type stars. We evaluated how the limited number of spectral lines can affect the final chemical abundance. Then we were able to make an efficient even footing comparison of the [X/Fe] scatter between the elements that have different number of observable spectral lines in the studied spectra. We found that the most efficient way of calculating the average abundance of elements when several spectral lines are available is to use a weighted mean (WM) where as a weight we considered the distance from the median abundance. This method can be effectively used without removing suspected outlier lines. We showed that when the same number of lines is used to determine chemical abundances, the [X/Fe] star-to-star scatter for iron group and α-capture elements is almost the same. On top of this, but at a lower level the largest scatter was observed for Al and the smallest for Cr and Ni. We recommend caution when comparing [X/Fe] scatters among elements that have a different number of spectral lines available. A meaningful comparison is necessary to identify elements that show the largest intrinsic scatter and can be thus used for chemical tagging.

Submitted: 8/19/2015 16:22:32
Presenter: V. Adibekyan (vadibekyan@astro.up.pt)
Contribution type: Poster
Session: Analysis methods and technology

References

This paper is submitted to A&A. I would like to note, that although the "Analysis methods amd technology" session is chosen (because we present a new, optimal way of deriving final abundances), our final results are related to the chemical tagging.

A pragmatic Bayesian perspective on correlation analysis: your next new tool for GES

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ABSTRACT

The Bayesian framework can be used to address the very common question of the presence of correlation in a dataset. To do so, we estimate the probability distribution of the parameter of interest, ρ, characterizing the strength of the correlation. We describe (and provide) an implementation of these ideas and concepts using `python` programming language and the `pyMC` module in a very short ($\sim$ 150 lines of code, heavily commented) and user-friendly program.

We used this tool to assess the presence of a correlation between exoplanetary surface gravity and stellar activity level as measured by the $\log(R'_{\rm HK})$ indicator. The results of the Bayesian Analysis are qualitatively similar to those obtained via p-value analysis, and support the presence of a correlation in the data. The results are more robust in their derivation and more informative, revealing interesting features such as asymmetric posterior distributions or markedly different credible intervals, and allowing for a deeper exploration.

The full understanding of what the Bayesian framework is can only be gained through the insight that comes by handling priors, assessing the convergence of Monte Carlo runs, and a multitude of other practical problems. We hope to contribute so that Bayesian analysis becomes a tool in the toolkit of researchers, and they understand by experience its advantages and limitations. We highlight the importance and usefulness of this kind of tool in the context of GES, and consider examples of usage on the data collected so far,

Submitted: 9/3/2015 15:55:52
Presenter: P. Figueira (pedro.figueira@astro.up.pt)
Contribution type: Poster
Session: Analysis methods and technology

The Broadening Function (BF) approach as a tool in the search for binaries among peculiar stars with tSNE

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ABSTRACT

The tSNE method of high-dimensional data visualization L. J. P. van der Maaten (2008) has proved itself to be extremely powerful in the morphological analysis of large astronomical datasets of spectra and photometric light curves Kirk et al. (2015), Traven et al. (2015). The routine, when applied to a large set of spectra, manages to effectively isolate stellar spectra of normal single stars from those of peculiars Traven et al. (2015), but a more detailed approach is required to isolate the individual classes among the found set of peculiar stars. Rucinski's Broadening Function method Rucinski (1992) further reduces the dimensionality of the problem, since it strips the spectra to a single broadening profile, which contains the fundamental and general properties of all of the lines in a spectrum. It is far superior than the cross-correlation technique as it yields a true linear de-convolution and more efficient in uncovering binarity and multiplicity of systems from stellar spectra. We have combined these two methods and applied them to GES data in the interest of unveiling and characterizing the population of binary stars in the set, with a particular accent on contact binaries.

Submitted: 9/21/2015 14:47:34
Presenter: A. Kochoska (a.kochoska@gmail.com)
Contribution type: Poster
Session: Analysis methods and technology

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A new approach to analyse mid-resolution spectra

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ABSTRACT

Today, numerous ground-based stellar surveys are mapping the Milky Way aiming to complement the Gaia mission and revolutionize our knowledge on Galactic stellar populations. This means that the number of stars analyzed with high-quality spectroscopic data has increased to several tens of thousands.
In this work, we show a methodology to determine the atmospheric parameters (effective temperature, surface gravity, and metallicity) for solar-type stars, covering both the high and medium resolution samples of the Gaia-ESO Survey: from GIRAFFE (R∼20000) and UVES (R∼47000) spectrographs. In our methodology, we also include the near-IR wavelength region (848.4–875.7 nm) which has been selected for other missions, such as the Gaia (Radial Velocity Spectrograph). This work is based on automatic procedures using the spectral synthesis package 'Spectroscopy Made Easy' and explores the degeneracies on the parameters as resolution degrades.

Submitted: 9/21/2015 18:18:44
Presenter: M. Tsantaki (Maria.Tsantaki@astro.up.pt)
Contribution type: Poster
Session: Analysis methods and technology

Single lined spectroscopic binary stars in the Gaia-ESO Survey

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ABSTRACT

Single-lined spectroscopic binary (SB1) is a system of a stars where only a single set of spectral lines can be observed. In the case of SB1 repeated spectroscopic observations of the same system are needed. Probability function needs to be defined in order to establish quantitative criterion for RV variability. Using morphological classification (Traven) peculiar stars with variable RVs can be identified and only normal stars taken into account in a study of SB1. I will show the study of spatial distribution of binary stars in the Galaxy which includes statistical distribution of stars in thin and thick disk and their spectral types. It can be checked if residuals from the spectral fitting of SB1 indicate the existence of secondary set of spectral lines. The most pronounced residuals are expected to be on the calcium triplet lines ($\lambda\ \lambda$ = 8498, 8542, 8662 Å).

Submitted: 9/21/2015 21:46:21
Presenter: D. Birko (danijela.birko@gmail.com)
Contribution type: Poster
Session: Analysis methods and technology

Double and multiple-lined spectroscopic binaries in the Gaia-ESO Survey

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ABSTRACT

The Gaia-ESO Survey provides a unique opportunity to investigate the distribution of multiple spectroscopic systems within our Galaxy. We developed a method based on the analysis of the cross-correlation functions (CCFs) of spectra with templates and their successive derivatives until the third order, to detect double and third-lined spectroscopic binary candidates. Indeed, the automatic pipelines in charge of the atmospheric parameters and chemical abundances determinations can lead to erroneous results in case of spectroscopic binaries; it is therefore crucial to identify them. We present here the method and the DR4 results.

Submitted: 10/2/2015 19:14:18
Presenter: M. Van der Swaelmen
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Contribution type: Poster
Session: Analysis methods and technology

Gaia-ESO and APOGEE Field Coordination

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ABSTRACT

Until now there is only a very limited number of common objects observed by GES and APOGEE making it difficult to compare stellar parameters and individual abundances. We propose to choose several common fields which will be observed by APOGEE-2 and GES, in particular some of the K2 fields with the aim to test stellar parameters and individual abundances as well as radial velocities.

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Presenter: M. Schultheis
Contribution type: Poster
Session: Analysis methods and technology

The Gaia FGK Benchmark Stars

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ABSTRACT

In this poster we present our current activities on the benchmark stars. These activities include: - the publication of 2 new papers (discussing the effective temperature and surface gravity of the benchmark stars, recommending which stars are the best for reference purposes (Heiter et al., 2015); and presenting the analysis of 10 individual chemical elements (Jofré et al., 2015)) - the status of our observing campaings to measure new angular diameters - the status of our current analysis of adding metal-poor benchmark stars - the status of spectral analysis considering 3D atmosphere models in the determination of metallicity.

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Presenter: P. Jofre (pjofre@ast.cam.ac.uk)
Contribution type: Poster
Session: Analysis methods and technology

References

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Jofré, P., Heiter, U., Soubiran, C., et al. 2015, arXiv:1507.00027

DESSE: a new software for a spectral line measurement

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ABSTRACT

Line-by-line spectral analysis is commonly done by measuring the equivalent widths (EWs) of lines. Automated EW measurement is deceptively challenging task as automated software must be able to effectively deal with multiple challenges: continuum displacement, line blending and deviations from Gaussian line profile. This work introduces four novel techniques for automated line diagnostics and measurement: (1) digital noise filtering (implemented by separate program SAGE); (2) continuum placement, blending and line form diagnostics using spectrum line inversion points; (3) blending diagnostics using line bisectors; (4) Voigt profile fitting with custom weights. A new software module (DESSE) for automated spectral line measurement (implementing previously mentioned methods) is presented.

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Presenter: E. Puzeras (Eduardas.Puzeras@tfai.vu.lt)
Contribution type: Poster
Session: Analysis methods and technology

Determining the precision of GES radial velocities and projected rotation velocities.

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ABSTRACT

We review the precision of radial velocity (RV) and projected equatorial velocity ($v \sin i$) measurements derived from GIRAFFE spectra in the Gaia-ESO survey, with particular application to targets in young open clusters. Data from ~30,000 repeat observations were analysed to determine how empirical measurement uncertainties scale with signal to noise (S/N), $v \sin i$ and stellar temperature ($T_{\rm eff}$). The empirical uncertainties can be described by scaling functions of S/N, $v \sin i$ and $T_{\rm eff}$ that define distributions of normalised uncertainty. The parameters characterising these scaling functions are derived from repeat observations for different wavelength ranges. The distributions of normalised uncertainties are distinctly non-Gaussian, having more extended tails. Results are summarised in the form of an SQL query that may be used to estimate the measurement precision of RV and $v \sin i$ values downloaded from the GES archive. Examples are given where a good knowledge of measurement precision in RV and/or $v \sin i$ is important in determining the intrinsic properties of stars and clusters from GES data.

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Session: Analysis methods and technology

Workshops and Parallel sessions

Using the GES Science Archive

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ABSTRACT

The GES Science Archive is the permanent repository of the spectra obtained as part of the Gaia-ESO Survey (GES) and 'the results of' the analyses performed on those spectra as part of the Survey. It is also the principal route to access these results through a web interface (at http://ges.roe.ac.uk) to static database releases that may be cited in publications. This talk will introduce the archive and describe how to use it. The talk will emphasise practical use of the archive to identify and retrieve copies of spectra and analyses, but it will also cover the design of the archive and discuss planned future developments.

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Spectroscopic analysis of Giraffe FGK stars

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ABSTRACT

GES, as any spectroscopic survey, relies on the success of automated techniques of spectral analysis and classification, capable to perform a robust, fast and homogeneous processing of the data and to allow an efficient scientific return. This talk will describe the analysis procedures of the spectrum analysis working group in charge of the FGK type stars parameterisation from Giraffe data (WG10). This group treats around 70% of the GES Giraffe stellar spectra, furnishing their atmospheric parameters and individual element abundances. The analysed targets belong to all the stellar Galactic populations sounded by GES and four different Giraffe spectral setups are concerned. The complexity, but also the strength, of the FGK type Giraffe spectrum analysis relies on the simultaneous application of several independent parameterisation methods to the same data. From the scientific point of view, this multi-methodological approach ensures an important internal robustness of the parameters, reducing the method-dependent uncertainties. It implies, nevertheless, a delicate homogeneization of the analysis results, that has to be evaluated through the entire parameter space. The adopted analysis and validation framework for the different internal data releases will be presented in detail.

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Ensemble measurements from iDR4 UVES data

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ABSTRACT

The Gaia-ESO Survey is well-known for its unique analysis structure and immense scientific output. Spectroscopic analysis methods have never been scrutinised or compared on a common scale so comprehensively. This yields an incredible data set that allows us to distinguish the contributions of random and systematic uncertainties for any method – providing a unique edge over all other surveys. In this talk I will describe the statistical methods used to combine the UVES iDR4 stellar parameters and chemical abundances, and I will highlight some of the causal inferences that can be made from these data. Finally, I will argue that the homogenisation procedure is a natural maturation process that all sub-fields of science must undertake at some point, and demonstrate how the Gaia-ESO Survey is leading the advancement of the field.

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