

Scientific Report

ESF-GREAT Workshop Stellar analyses in the Gaia-ESO Survey: towards the first Data Release

Reference Number: 4415

Convenors: Dr. Andreas Korn & Dr. Rodolfo Smiljanic

1. Summary

The workshop took place on the 20th and 21st of September 2012 in the main lecture hall of the Schwarzschild Building at Astrophysikalisches Institut Potsdam (AIP), Potsdam, Germany. It is part of the on-going Gaia-ESO Survey (2012-2016, P.I.s: Gerry Gilmore & Sofia Randich), with emphasis on the activities of its Working Groups (WG) 10 & 11. All involved parties (“nodes”) were allowed to send two representatives. With key survey co-ordinators representing other WGs, the meeting was attended by more than 30 survey members. It turned out to be a very gender-equal meeting.

The Gaia-ESO Survey is a 300-night public spectroscopic survey that will observe more than 10^5 stars with the FLAMES multi-object fibre facility at ESO’s Very Large Telescope on Cerro Paranal in Chile. It will produce an unprecedented amount of high-quality data of stars in the main components of the Galaxy (thick and thin disks, halo, and bulge) and in open clusters of different ages (from young associations to old clusters).

Working group 10 (co-ordinators: Carlos Allende Prieto & Alejandra Recio-Blanco) deals with the analysis of the medium-resolution GIRAFFE data, while working group 11 (co-ordinators: Andreas Korn & Rodolfo Smiljanic) is concerned with the analysis of the high-resolution UVES spectra of the survey. Both working groups will deliver atmospheric parameters (effective temperature, surface gravity, microturbulent velocity, metallicity and elemental abundances) of the survey stars.

The Survey observations have been ongoing since Dec. 2011 at a rate of approximately 5 nights per month. This is an impressive rate of data accumulation. With it came the time to put to test all the infrastructure we have prepared to deal with this large spectroscopic dataset, from data reduction to the spectroscopic analyses, including the data archive facility. The first analyses of the Survey data were launched on mid-June 2012, with deadline for the results on mid-August (for WG11 with slightly different dates for WG10).

This two-day workshop was timely scheduled for about one month after the analysis deadline. Thanks to that, the nodes involved in the stellar analysis and the WG co-ordinators had a chance to discuss a number of topics: the current status and strategy of the survey; data-reduction issues; results of first tests with actual survey data, in particular as regards node-to-node differences; issues and limitations of the available codes, model atmospheres, and line lists; the methodology; and the timeline towards the 1st Data Release.

The presentations and discussions allowed an evaluation of the progress made so far and decisions regarding the time until the 1st Release of Advanced Data Products (scheduled for June 2013). They also uncovered remaining unsolved issues, in particular regarding homogenization.

2. Scientific content and discussions

The workshop was organized in various sessions covering the main topics relevant for WG 10 & 11. The programme is appended to this report.

The morning session of the first day was used to update all participants about efforts under way in the various WGs.

Gerry Gilmore started off the workshop by giving an overview of the current status of the Survey. Both the range of objects observed (including benchmark stars in cluster and the field) and the data quality achieved were presented. An effort has been made to observe examples of all the targets of the Survey, maximizing the topics that will be covered during first science. It was concluded that the current survey strategy can be retained. The survey management works satisfactorily; specific issues pertaining to individual WG have been identified and are being addressed. This concerns in particular the homogeneous data reduction for the survey which is the backbone of the work of WGs 10 & 11.

Jim Lewis and Germano Sacco, responsible for GIRAFFE and UVES data reduction, talked about remaining data-reduction issues. This was an important session for feedback and discussion among them and the analysis nodes. This workshop was a unique opportunity for this direct contact that would otherwise have been very difficult. While the data products are rapidly converging, reliable normalization remains an open issue. A better functioning archive at Cambridge, taking into account some of the suggestions made by the Nodes, was promised for the next round of analyses.

Sergey Kuposov took part from Cambridge via skype. He explained on-going efforts to add more photometric data to the file headers and improve the first-pass analysis of GIRAFFE spectra. It was agreed that first-pass parameters would also be useful for UVES spectra, as the performance of several analysis codes could be improved by inputting decent starting values.

Representatives of the three other spectrum analysis WGs were given a chance to share their experiences. Alessandro Lanzafame presented on-going work within WG 12 (Pre-main sequence stars), Ronny Blomme about WG 13 (OBA-type stars), Sophie van Eck about WG 14 (Outliers). All addressed the issue of how to move stars between WGs.

Paula Jofre talked on behalf of WG 5 (Calibrations) presenting an effort within the LUMBA node to extend the list of benchmark stars to encompass all 40 primary benchmark stars collected for the Gaia mission. Data for these stars is available, albeit not taken with the GES instruments and not in the survey format. Given that metallicity is never a parameter that can be fundamentally derived, an effort should be started to re-derive metallicities with our own tools.

Maria Bergemann gave an overview of the effort under way in the line-list sub-working group. As decided at previous meetings, all the survey nodes are required to use one single and well defined line list that is prepared and made available before the analysis commences. New line lists (v3) can be prepared for the upcoming production run.

The afternoon was spent presenting and discussing preliminary analyses of the GIRAFFE and UVES data collected in the 1st Data Analysis over the summer. Generally speaking, the results looked promising, but simultaneously raised a number of important questions: Given that different nodes produce results with varying precision and accuracy, how far can a homogenization go? Should the GIRAFFE setting HR10 and 21 be analysed together? Is the signal achieved so far sufficient for trustworthy analyses that go beyond determining stellar metallicities?

The day ended with a joint dinner at the workshop hotel outside of Potsdam.

Day 2 started with a plenary discussion on the timeline for analyses of Data Release 1 data. Two options were lively debated: to start another restricted round of test analyses immediately that could help to better define node-to-node differences; alternatively, to implement some of the issues and decisions discussed in this workshop (regarding data reduction, data archive, line-list, ...) and directly go for a full production run for the 1st Data Release. While containing some inherently larger risks, the second option was in the end opted for.

The rest of the morning was used to discuss topics specific to GIRAFFE and UVES in separate splinter sessions.

After lunch, a round of node presentations was held. A number of problems of certain software packages were uncovered that will need to be addressed. It was agreed that nodes should assist each other in improving their codes. In view of travel times to the Berlin airports and flight schedules, the afternoon session was terminated at 1500 h.

3. Results and impact

This was an important meeting during a decisive phase of the survey. The fact that we are slightly behind schedule is per se neither surprising nor disturbing. But the experience of the last few months and this meeting made clear that we need to work together more efficiently and closely. In this sense, the Gaia-ESO Survey is as much a scientific as a sociological challenge. Never before has the European stellar community (nor any other) attempted to work together on this scale, and in this way.

We defined the milestones for the nine months leading up to the 1st Data Release. This would have been extremely difficult to achieve without a face-to-face meeting. We will continue organizing meeting on a six-month basis, while at the same time making sure that communication by other means (email, wiki, telecons) continues to improve. The next meeting, an all-hands meeting, was shifted from December of this year to April 2013. By that time, there is good hope for first science results from the Survey.

We are grateful for the support we have received from the European Science Foundation through the GREAT initiative. Meeting support has proven vital for our Survey.

4. Workshop programme

Thursday - September 20th

09:00 - *Transport from Landhotel to AIP*

Session 1: Status and Review

09:25 - Welcome from SOC/LOC

09:30 - GES Overview and Update (Gerry and Sofia)

10:00 - Giraffe Data Reduction (Jim)

10:30 - UVES Data Reduction (Germano)

11:00 *Coffee Break*

11:30 - First-pass analysis (Sergey)

11:45 - The analysis in WGs 12, 13 and 14 (Ronny, Alessandro and Sophie)

12:30 - Benchmark stars (Paula)

12:45 - Line list (Maria)

13:00 *Lunch*

Session 2: Preparation towards the data release

14:30 - Giraffe Analysis Feedback (Alejandra & Carlos)

15:00 - UVES Analysis Feedback (Rodolfo & Andreas)

15:30 - Discussion: Normalization, S/N, RV, Archive interface, ...

16:00 *Coffee Break*

16:30 - Discussion: Towards advanced data release 1

18:00 *Transport to Landhotel*

19:30 *Dinner at Landhotel*

Friday - September 21st

08:30 Check-out and transport to AIP

Session 3: Parallel Discussion Sessions & Nodes feedback

09:00 - UVES-specific discussion (Room1 TBC)

09:00 - Giraffe-specific discussion (Room2 TBC)

10:30 *Coffee Break*

10:50 - Joint Discussion: UVES & Giraffe

12:30 *Lunch*

Session 4: Final Discussion

14:00 - Discussion session: Progress and Remaining Challenges

16:00 *Coffee and end of Workshop*

5. List of participants

1. Gerry Gilmore*
2. Sofia Randich
3. Andreas Korn*
4. Rodolfo Smiljanic*
5. Elena Pancino
6. Luca Sbordone
7. Sonia Duffau
8. Laura Magrini*
9. Fabbiola Marino
10. David Montes
11. Maria Bergemann*
12. Paola Jofre*
13. Vardan Adibekyan
14. Antonio Frasca
15. Thomas Masseron
16. Sophie Van Eck*
17. Alejandra Recio-Blanco*
18. Vanessa Hill
19. Carlos Allende Prieto*
20. Alessandro Lanzafame*
21. Jonay Gonzalez Hernandez
22. Hugo Taberero
23. Grazina Tautvaisiene

24. Georges Kordopatis

25. Ronny Blomme*

26. Sofia Feltzing

27. Luca Pasquini

28. Jim Lewis*

29. Germano Sacco*

31. Matthias Steffen

32. Sarunas Mikolaitis

33. Michael Weber

34. Clare Worthey

* speaker