Short Visit Grant ☒ or Exchange Visit Grant ☐

(please tick the relevant box)

Scientific Report

The scientific report (WORD or PDF file – maximum of eight A4 pages) should be submitted online <u>within one month of the event</u>. It will be published on the ESF website.

<u>*Proposal Title*</u>*:*   ***Automated spectral analysis of FGK stars for the Gaia-ESO survey***

<u>*Application Reference N°*</u>*:*   6358

1)   Purpose of the visit

The goal of this short visit was to work on the automated spectral analysis of the FGK stars that are observed by the Gaia-ESO Survey (GES) with the FLAMES/GIRAFFE and UVES spectrograph. The Porto and Nice groups are among the delivers of the stellar atmospheric parameters and chemical abundances for GES.

The other goal of this visit was to define some common projects for the scientific exploitation of the Gaia-ESO Survey.

2)   Description of the work carried out during the visit

Our group at the Observatoire de la Côte d'Azur in Nice and the one of the Centro de Astrofísica da Universidade do Porto are one of the very few groups in Europe with large expertises on automatic estimations of stellar atmospheric parameters and individual chemical abundances from high-resolution stellar spectra. This expertise allowed both groups to provide a major contribution to the Gaia ESO Survey.

For instance, the Nice group contributes to the atmospheric parameters and chemical deliveries for the WG10 and 11 of the GES consortium. It also has the shared responsibility of the WG10 (A. Recio-Blanco) and includes 3 builders of GES (A. Recio-Blanco, V. Hill and P. de Laverny).

On the other side, the Porto group mostly contributes to the WG11 deliveries (atmospheric parameters and individual chemical abundances). Moreover, the Porto group has started to test its methodology in order to contribute to WG10 and one member of the group is a builder of GES (S. Sousa).

The Nice and Porto groups presently use very different technics for these automatic parameterizations and one of the main goal of the visit was to compare these methods and their associated results in order to optimize our procedures. In short, we have discussed in detail the performances of three different methods we have already developed for the Gaia RVS data treatment : the MATISSE algorithm (Recio-Blanco et al. 2006), a kD-tree method (GAUGUIN) and a pattern-recognition method, DEGAS (Bijaoui, Recio-Blanco et al. 2011) with those of the Porto group based on equivalent width methods (Sousa et al., 2008). The detailed performances of the these methods for GES spectra (including the IR Calcium Triplet region, the wavelength domain of the Gaia/RVS), as a function of the quality of the spectra and the parameter degeneracy has been explored. This has eased the selection of the best results for each type of star.

On another hand, we have also compared our methods owing to the extensive analysis of ESO/HARPS spectra already performed by the Porto group (Sousa et al., 2008, 2011a, 2011b; Adibekyan et al., 2012; Tsantaki et al., 2013) and our group (AMBRE project; de Pascale et al., 2014, submitted to A&A). Our analysis of about 100,000 HARPS spectra has been discussed and compared with the about 1,000 similar HARPS spectra analyzed by the Porto group.

Our discussions were also related to the scientific exploitation of the recent releases of the Gaia-ESO Survey. We have recently published two papers on the GES/DR1 data related to the Galactic thin and thick discs (Recio-Blanco et al., 2014 and Mikolaitis et al., 2014). These results were discussed and compared to the works performed by the Porto group using a sample of HARPS spectra concerning disc stars located in the solar neighborhood (Adibekyan et al., 2013). As a consequence of these discussions, we defined new projects for the characterisation of the Galactic thick disk that will be based on the future releases of the Gaia-ESO Survey. These projects will be performed owing to the collaboration that now exists between Porto and Nice.

Finally, I also presented a seminar at the Centro de Astrofísica da Universidade do Porto attended by several researchers, students and postdocs. This talk was entitled "The AMBRE Project "

3)   Description of the main results obtained

See above

4)   Future collaboration with host institution (if applicable)

The collaboration between our group in Nice and the Centro de Astrofisica da Universidade do Porto is now very well established owing to this visit. Our common

plans for the spectral analysis and scientific exploitation of GES are now well defined. That guarantees a strong collaboration between both groups for at least the whole duration of the Gaia-ESO Survey.

5) **Projected publications / articles resulting or to result from the grant** *(ESF must be acknowledged in publications resulting from the grantee's work in relation with the grant)*

As mentioned previously, the visit granted by GREAT allowed us, in particular, to prepare the scientific exploitation of the future data releases of the Gaia ESO Survey. As a consequence, we expect that at least one common paper on the scientific exploitation of the GES Giraffe data for the Galactic discs will be published in 2014. The preparation of such an article has already started between both groups. The ESF will be acknowledged in the corresponding paper.

6) **Other comments (if any)**

I thank ESF/GREAT for this financial support.