# Related activities

We report here on the “other” activities which, although not strictly related to the DPAC efforts, are intimately related to the scientific nature of the Italian involvement in the Gaia mission. These activities have to do for the most part with the several scientific initiatives that directly or indirectly relate to Gaia and offer the opportunity to present to the general scientific community worldwide the importance of the Italian effort for the Gaia mission. These activities are given high visibility in the ASI contract to the extent that they must not just be mentioned in the PR’s but meeting contributions and actual science articles constitute contract deliverables.

## **THE DPAC WG Ground-Based Observations for Gaia (GBOG)**

The main activities of GBOG are to coordinate ground-based activities in DPAC, to interact at a higher level with the observing institutions (for example ESO), to disseminate information between different CUs concerning observation and data analysis techniques. From Italy there are two CU representatives in GBOG (Altavilla for CU5 and Clementini for CU7). However, in the reporting period, there has been no meeting or telecom of the GBOG group.

## **THE DPAC CU9 (Catalog Access)**

**Project description.** CU9 is the last DPAC coordination unit, in charge of the design and implementation of the Gaia archive. The SDP was completed in December 2013 (GAIA-C9-PL-ESAC-WOM-086). The Italian team is participating to the CU9 effort with Marrese, Giuffrida, Marinoni, Vallenari, Sordo, and Pancino.

**WP 947 – Cluster Validation (Vallenari)**

The tests to validate Gaia data in cluster regions, and the provisions for the treatment of the relevant reference catalogues from the literature were collected into three documents (AV-012, AV-013, AV-014).

Two tests to verify the quality of the TGAS data both on proper motions and parallaxes were developed. The tests were delivered and integrated at ESAC. They were first tested on simulated data, finally they were used to assess the quality of a preliminary release of TGAS. A third test to verify the completeness of the data is developed, and tested on HST data. The test will soon be integrated at ESAC. A report on svn was prepared

(GAIA-C9-SP-OPM-FA-067).

**WP 957 - Auxiliary data (Pancino)**

At the Leiden plenary DPAC meeting, E. Pancino formally handed over the management of this task to R. Sordo. All the information needed for preparing the Auxiliary Data release contextually with Gaia DR1 was handed over in the form of: *“A census of DPAC auxiliary data projects for CU9”* (GAIA-C9-TN-OABO-EP-013), the preparation of the Auxiliary Data Model for the CU9 archive and the definition of the relevant data types.

**CU9 activities** (Vallenari, Marrese, Spagna, Giuffrida, Marinoni, Cantat-Gaudin, Pancino, Smart).

Open clusters as tests for Gaia data. The algorithms for TGAS testing were developed. Tristan Cantat, supported by non-ASI funds was actively involved in the work. The algorithms involving tests on TGAS proper motions and parallaxes were integrated in the Gaia system and tested on simulated and real data from a preliminary TGAS solution. Auxiliary data for TGAS tests were collected from literature search. Two TN (TGC-01 and AV-016) describing the auxiliary data and the TGAS tests are on SVN.

Auxiliary data on globulars for the tests on the first data release positions were collected.

One borsa was begun in 2015 under the GENIUS FP7 program in collaboration with the Teramo Observatory to develop intra catalog access tools for the Gaia archive. The National Coordinator was Smart and the local Coordinator Buonanno (OATe).

## **THE PARTICIPATION IN THE “GREAT” INITIATIVE**

**Project description.** GREAT (Gaia Research for European Astronomy Training) is a pan European science driven research infrastructure which will facilitate, through focused interaction on a European scale, the fullest exploitation of the ESA Gaia 'cornerstone' astronomy mission, enabling the European astronomy community to provide answers to the key challenges in our understanding of the Galaxy and Universe. The GREAT ITN project ended on 28 February 2015.

Pancino participated to the preparation of a new ITN fund request, in the Horizon 2020 framework and the Marie Curie Initial Training Network action, entitled *“Gaia – ITN”*, which foresees the participation of INAF as a main node, with two ESR in Padova and Bologna. The deadline for the presentation of the proposal to ERC was 13 January 2016. Unfortunately, the proposal was immediately below the cutoff line and was rejected.

As a development of the former GREAT ESF, a COST Action Proposal OC-2016-1-20726 "GAIA astrometry Innovation Network: Exploring the Universe" was successfully submitted to the COST Open Call OC-2016-1 by Walton on April 2016. Clementini, Marconi, … participated as Secondary Proposers on behalf of other Italian Colleagues both in DPAC (e.g. Ripepi, Musella, Leccia) and outside DPAC.

The Italian community is participating (in particular: interest has been expressed by Bragaglia, also on behalf of Altavilla, Bellazzini, Montegriffo, Pancino in Bologna and many more in other Institutes).

Bragaglia participated as Secondary Proposer to the COST Action Proposal OC-2016-1-20726 " GAIA Astrometry Innovation Network: Exploring the Universe" submitted to the COST Open Call OC-2016-1 (April 2016).

**Participation to Conferences and Meetings**

* Clementini was member of the jury of the GREAT-ITN PhD student Lovro Palaversa (Geneva University Observatory) whose thesis defense took place on November 9, 2015.

**People: Fellowships and exchange visits**

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## **THE Gaia ESO Survey (GES)**

**Project description.** Among the GREAT projects, the Gaia-ESO Survey (GES) was designed during 2010, was accepted by ESO in 2011, and the actual observations started on 31 December 2011. ESO assigned 300 nights to GES in 5 years (at a rate of approximately 6 nights per month), to gather high- and medium resolution spectra with FLAMES of ~100,000 stars belonging to all Galactic components: halo, bulge, thin and think disc, and open clusters of all ages. GES data will complement Gaia by obtaining precise radial velocities of faint (V > 17 mag) stars in the same spectral region covered by Gaia RVS, in a blue spectral region useful for chemical analysis (and in other regions for the open clusters), and by providing astrophysical parameters and precise abundances of elements other than iron and the alpha-elements in various spectral ranges. Recently the ESO Survey Review Panel formally awarded the GES consortium with the last 60 nights plus 40 nights of compensation time, to complete the survey observations in the next 1-2 years.

**GES Activities**. Randich is co-PI of the GES proposal. Micela and Vallenari are members of the GES steering committee, while Bragaglia, Pancino and Lanzafame are leading three key working groups, which are WG4 “*Cluster stars target selection*”, WG5 “*Calibrators and standards*”, WG12 “*Pre-Main Sequence spectrum analyses*”, respectively.

Between July and December 2015, operations proceeded in routine mode, in terms of observations preparation and data analysis. Several new science verification papers have been drafted or submitted to A&A, and a few others were accepted. The internal fourth data release GESiDR2iDR4 or iDR4 was completed and is going to be made available to the survey co-investigators through the ESO and WFAU portals, and will constitute the basis for the next public GES release this Summer.

* The GES all-hands meeting was held in Vilnius on 1-5 December, and Randch, Bragaglia, Pancino, and Vallenari participated to it.
* Bragaglia, Randich, Sordo and Vallenari contributed to the activities of WG10 and WG11 (spectrum analysis of FGK stars, both in clusters and in the field) and Lanzafame to the WG10, WG11, and the coordination of WG12 activities. The spectra taken up to July 2014 have been analyzed using different methods tailored to the different kind of targets. A second data release of reduced spectra acquired from 31.122011 to 31.12.2013 has been released by ESO.
* Bragaglia, Lanzafame, Pancino, Randich, Sordo, Vallenari participated in the preparation of many of technical and scientific papers based on GES activity.
* Several telecons were organized/attended by all team members.

## **SUPPORTING “APACHE” AND “HARPS-NORTH” EXTRASOLAR PLANETS PROJECTS**

The Global Architecture of Planetary Systems (GAPS) programme with HARPS-N at TNG has been extended by INAF until the end of AOT32 (February 2016). The radial-velocity survey of a sample of bright M dwarfs monitored by APACHE which are going to be observed very frequently by Gaia is one of the key GAPS programme elements. The first important result emerging from the survey is the detection of a Super Earth companion (8 MEarth) to a nearby M1 Dwarf with a period of 13 days (Affer et al., in preparation).

An additional significant signal in the radial-velocity time series with a period of some 30 days was interpreted as due to stellar activity thanks to the fundamental support of the APACHE photometric data.

Another target part of the APACHE survey began being monitored with HARPS-N when the K2 space telescope uncovered three transiting Super Earths orbiting around it, the third companion situated at the margin of the Habitable Zone of the star. The object is now part of a collaboration agreement between GAPS and the GTO programme to secure intensive monitoring (hundreds of observations) with the objective of determining the masses and thereby, in combination with the radius estimates, the composition of the three planets.

## **THE PARTICIPATION TO THE WEAVE PROJECT**

Participants: Vallenari, Randich, Lanzafame, Frasca, Bragaglia, Bellazzini, Smart, Lattanzi

Project description. WEAVE is a new wide-field spectroscopy facility proposed for the prime focus of the 4.2m William Herschel Telescope. The facility comprises a new 2 degree field of view prime focus corrector with a 1000-multiplex fibre positioner, a small number of individually deployable integral field units, and a large single integral field unit. The IFUs and the MOS fibres can be used to feed a dual-beam spectrograph that will provide full coverage of the majority of the visible spectrum in a single exposure at a spectral resolution of ~5000 or modest wavelength coverage in both arms at a resolution ~20000.

The instrument is expected to provide spectroscopic sampling of the fainter end of the Gaia astrometric catalogue, chemical labelling of stars to V~17, and dedicated follow up of substantial numbers of sources from the medium deep LOFAR surveys.

Project status. The instrument is expected to be on-sky by end 2017 early 2018. The project is now fully funded by the WEAVE Consortium, and fully on track.

Weave science case on open clusters was revised including Spanish contribution on the study of young associations.

Target clusters young, intermediate age and old were selected, their color-magnitude diagrams and data were collected to produce a survey plan document. In each field a preliminary and provisional target selection was operated. The list of targets was sent to the WEAVE Science Team. The configuration tool for fibre positioning was run to assess the degree of feasibility of the proposed targets, since positioning about 1000 fibres is an dense and centrally concentrated field is far from trivial.

Vallenari as Italian executive participate to the monthly teleconf of the WEAVE projects, coordinating the Italian participation. As member of the Science Team, she coordinates the open clusters survey. Vallenari prepared all the documentation for the Science Review, with the collaboration of Bragaglia, Frasca, Lanzafame, Randich. A meeting of the Italian community participating to WEAVE was organized by Vallenari in Rome (31 May 2016) and Vallenari, Bragaglia, Frasca presented talks.