

GROUND-BASED OBSERVATIONS FOR GAIA (GBOG)

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Abstract. This contribution gives an overview of the ground-based observing efforts organized to collect the auxiliary data mandatory for the calibrations and tests of the Gaia data processing.

1 Introduction

Gaia is an ambitious space astrometry mission of ESA the main objective of which is to map the sky in astrometry down to $V=20$ mag with unprecedented accuracy. Additionally, photometry of all objects and spectroscopy down to $V=17$ will be obtained. The final catalogue will include distances, motions and astrophysical parameters of one billion stars, a fundamental dataset for unravelling the structure, formation and evolution of our Milky Way. The challenging task of the data processing is under the responsibility of 320 scientists from 15 countries organised in the DPAC consortium: a major project for the European astronomical community (Mignard et al. 2008).

The Gaia data processing requires reference data in photometry and spectroscopy in order to tie the instrumental system to physical units. The GBOG Working Group is responsible for the coordination of the joint ground-based observing efforts to collect the auxiliary data mandatory for Gaia's calibrations.

2 The major on-going observations

- For the spectrophotometric calibration of the RP-BP and G bands, it is planned to collect the absolute fluxes of 250 spectrophotometric standard stars at 1% accuracy within 330-1050 nm. The targets will be monitored for variability. The facilities used are : REM/ROSS+REMIR, TNG/DOLORES, San Pedro Martir 1.5m/LARUCA, CAHA 2.2-m/CAFOS, Loiano 1.52m/BFOSC, ESO-NTT/EFOSC2 (Large Programme).
- For the radial velocity calibration, it is planned to qualify 1000 reference stars to fix the zero point of radial velocities and to validate a method of calibration with asteroids. This implies to gather ~ 3500 RV measurements (Crifo et al., 2008). The observing programmes, supported by PNG and PNPS, are conducted on OHP/SOPHIE and TBL/NARVAL for the Northern part. An agreement was obtained with Geneva Observatory for the Southern part on the Swiss 1.2-m Leonard Euler telescope / CORALIE, with support from AS-Gaia.

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- The calibration of the classification / parametrization algorithms needs to establish a grid of reference stars for astrophysical parameter determination across the HR diagram. The corresponding spectra at high and low resolution will also be used to correct synthetic spectra. A part of the programme is made on TBL/NARVAL with support of PNPS, while a Large Programme is to be submitted on ESO-NTT/EFOSC2.
- Calibration fields are built at the Ecliptic Poles for the in-orbit test of the data processing. It is requested to assemble astrometry, photometry and spectroscopy in 1 sq. deg around each ecliptic pole. The imaging part is done on CFHT/Megaprime and ESO-MPI 2.2m/WFI, while some spectroscopy is planned on VLT/FLAMES.

3 Other on-going or foreseen observing programmes for Gaia

- Benchmark stars for critical tests of stellar atmosphere models (ESO 3.6m/HARPS, TNG/SARG)
- Library of solar analogs for Solar System studies (VLT/UVES)
- Primary standards for the flux calibration of RVS spectra 847-874 nm (La Palma 2.5m INT/IDS)
- Time-series photometry of specific classes of variable stars (network already in place)
- Spectroscopy of asteroids (TNG/DOLORES)
- ICRF link with the European VLBI Network (Bourda et al., 2008)
- Optical tracking of the satellite (network to be organised)

4 General considerations

New observations are needed because no pre-existing dataset fulfills the Gaia requirements in terms of homogeneity, precision, sky coverage, magnitude range and spectral interval.

Most of the observations must be done right now because the calibration data must be ready when the data processing will start in 2012.

All data and resulting libraries will be made available to the astronomical community and will offer excellent possibilities for various research programmes.

The GBOG observing programmes are mostly long term ones : follow-up observations will continue during the mission to ensure the stability (photometric or spectroscopic) of the sources. It implies that facilities will be needed until 2017.

The GBOG observing programmes face the problem of being in competition, for the allocation of telescope time, with programmes that are more directly scientifically related.

The GBOG observing programmes have already started with a good support of national facilities but there are still some difficulties covering the southern hemisphere.

The GBOG WG is mandated to coordinate observing programmes required to support the Gaia mission. Follow-up ground based observations resulting from Gaia science alerts are not included under this mandate.

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