The catalog of radial velocity standard stars for the RVS: status and progress of observations

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Abstract

A new full-sky catalog of Radial Velocity standard stars is being built for validation of the Radial Velocity Zero Point of the RVS on board of Gaia. After a careful selection of 1420 candidates matching well defined criteria, we are now observing all of them to verify that they are stable enough over several years to be qualified as reference stars. We present the status of this long-term observing programme on three spectrographs: SOPHIE, NARVAL and CORALIE, complemented by the ELODIE and HARPS archives. Because each instrument has its own zero-point, we are observing simultaneously 6 standards and asteroids to homogenise the radial velocity measurements. We can already estimate that ~8% of the candidates have been rejected because of variations larger than the requested level of 300 m/s.

Selection of candidates

The selection of 1420 star candidates, fully described in Crifo et al. (SF2A 2008, 2009), is performed from the following catalogues: Nidever et al. 2002 (based on velocimetry), Nordström et al. 2004 (based on CORALIE), Famaey et al. 2005 (based on CORALIE), IAU RV-standards (from website of IAU Commission 30).

Observations

The observations, combined with previous measurements in the above catalogues and spectroscopic archives, indicate whether a given candidate is stable enough to be qualified as a standard.

Used spectrographs: SOPHIE (OHP), NARVAL (TBL), CORALIE (La Silla, Euler swiss telescope).
Spectroscopic archives: ELODIE (OHP), HARPS (ESO)

The candidate stars will be followed until 2017 (end of Gaia mission). One or two new measurements per star are needed BEFORE launch, depending on available data, and one more during the mission.

Do RV vary significantly with time?

We have derived the RV variation for each star that has at least two RV measurements. This variation is the difference between the maximum and minimum velocities and its distribution is displayed in Figure 3. 75% of those stars present a scatter in radial velocity smaller than 100 m/s. About 8% of stars exhibit a variation of more than 300 m/s. This result is consistent with the possible fraction of variable stars found in Figure 2.

How to calibrate the RVS?

Need to initiate the calibration law and define the RV zero point from a large sample of well known and stable reference stars, observed from the ground in advance of the mission.

Conclusions

A full-sky catalogue of radial velocity standards, much denser than the IAU RV-standards, is in preparation. It will define the RV zero-point of the Gaia-RVS. It will also be used to initialize the iterative procedure of data reduction.

The follow-up of those 1420 star candidates (plus asteroids) has started in 2006 and will continue until the end of the mission in 2017.

2569 new measurements are released so far from the ongoing ground-based Large Program on SOPHIE, CORALIE and NARVAL, complemented by the ELODIE and HARPS data archives.

A first version of the catalog will soon be made available.