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THE GAIA-RVS STANDARDS: A NEW FULL-SKY LIST OF 1420 STARS WITH RELIABLE RADIAL VELOCITIES

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Abstract. The Gaia-RVS is a integral-field spectrograph with no calibration device onboard. The instrument will be self-calibrated through the reduction procedure; but it needs a list of well-know stars to define the zero-point and to initiate the iterative reduction process. The IAU RV-standards are not numerous enough (some 140 objects; whereas some 1500 are needed), and many are too bright for the RVS. A new list has been defined, with criteria adapted to the RVS capabilities: magnitude and spectral range, no double stars, no variables, "clean" environment up to 80 arcsec, uniform sky coverage. The stars were taken from a few existing good lists, and each one needs to be reobserved at least 2 times before launch (2012), and also during the mission (end 2018). The list is now ready, and the reobservations are going on at high rate. This list should be released in a near future, so that everyone can use it, and eventually improve it.

1 The need for ground-based standards, and reference star selection

The RVS is designed mainly for measuring radial velocities of the brightest Gaia targets. Such a device had been missing on HIPPARCOS; however, due mainly to weight problems, it must be extremely light, and hence contains NO onboard calibration device for this slitless spectrograph. The wavelength calibration has to come from target stars for which the radial velocity is already known from ground- based measurements with a much higher accuracy. The expected final accuracy on the RVS stars is 1 to 15 km/s, depending on magnitude and spectral type.

Bright asteroids are the best references, as their velocity can be calculated theoretically with great accuracy; but they are not numerous enough and not well distributed on the sky; therefore stars have to be used too. These reference stars must be selected with care and verify a list of requirements, among them RV-stability within 100 m/s at the end, non-multiplicity, and lack of disturbing neighbours within the selection window (80 arc-sec), FGKM non-variable stars, etc... All these stars must have already several measurements available in the literature, and are all taken from the Hipparcos Catalogue for homogeneity reason. They are selected within the 3 following published lists: Nidever et al. (2002); Nordström et al. (2004; mostly CORAVEL data); Famaey et al. (2005; CORAVEL data). A list of 1420 stars (hereafter g8 list) well distributed over the sky is now defined, and each star must be reobserved at least 2 times before launch, and then during the mission, in order to insure that they are stable.

2 Status of ground observations

Three spectrographs are used: Sophie at OHP and Narval at Pic du Midi for the northern stars; and Coralie at La Silla (swiss Euler Telescope) for the southern ones. In addition, most spectra contained at OHP in the

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Elodie archive are also available. Figure 1 left shows the sharing between the spectrographs. Some stars are in common between the various spectrographs. Bright asteroids are systematically observed during each observing run. The Narval spectrograph is of special interest, as it is the only one covering the RVS spectral interval (847 - 874 nm): a same spectrum over the total available interval is reduced with 2 different procedures, the first using the Elodie-Sophie spectral interval (390 - 690 nm), and the second one over the RVS interval (see figure 2, right). As the spectral lines included are not the same, a small difference is expected, and is presently investigated.

In conclusion, the observations are going well, but need to be continuated at the present rate.

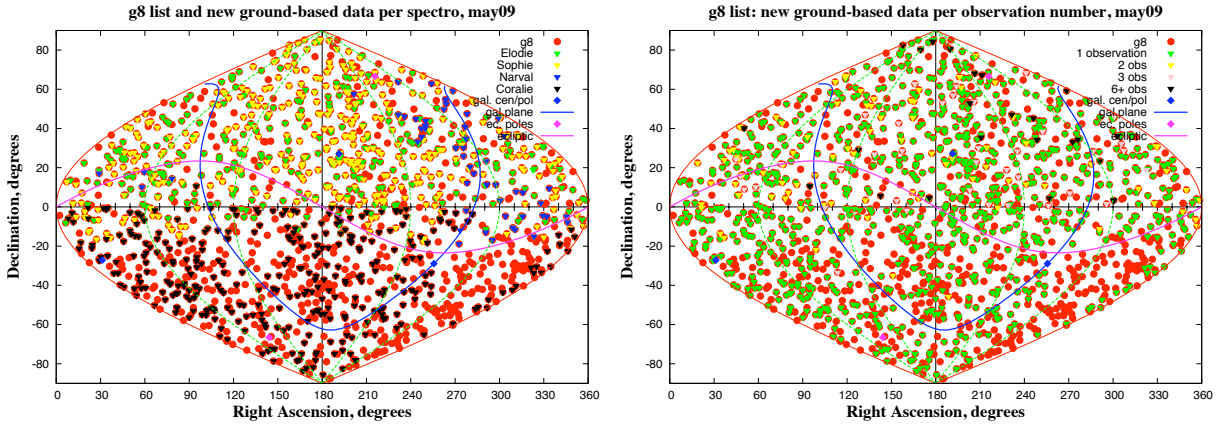

Fig. 1. Maps of reobservations. **Left** : Share-out of the stars between the spectrographs. **Right**: Number of reobervations per star with a SAME spectrograph. Red dots indicate stars not yet reobserved in May 2009.

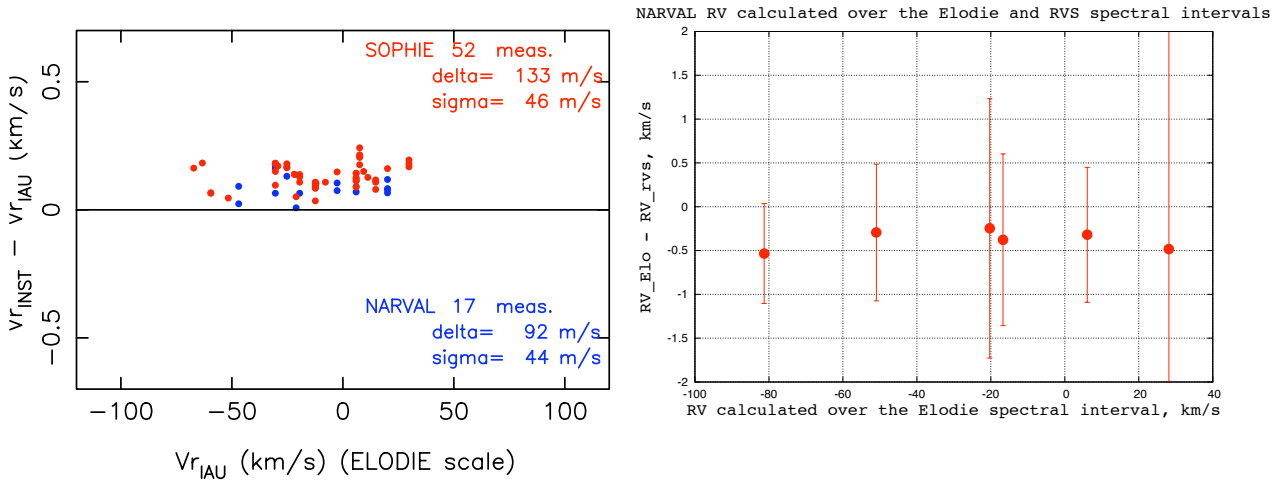

Fig. 2. Left : Comparison of RVs obtained by SOPHIE and NARVAL for several IAU standards, with the IAU value. **Right**: RV derived from the same NARVAL spectra over the Elodie and RVS spectral intervals; very preliminary values.

References

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