TWP-S-640 « Radial Velocity Zero point »
G. Jasniewicz (coo.)

Team members :
F. Bouchy, F. Crifo, A. Doressoundiram, D. Hestroffer, D. Katz, A. Siebert, C. Soubiran, S. Udry, T. Zwitter

- **Main objectives of TWP640**
- **Working plan for Cycle 2 for our Work Packages**
- **U. Bastian's proposal for the barycentric velocity correction**
- **Talk by F. Crifo focused on specific points**

TWP-S-640-00000
Radial Velocity Zero Point

The RVS is an integral field spectrograph with no entrance slit and no on-board wavelength calibration lamp :
Wavelength scale and the Radial Velocity (RV) zero-point have to be derived from reference sources.

Our main task :
Search for Spectroscopic RV (SRV) reference sources for the RV-zero point

among stars : GWP-S-640-02000
among asteroids : GWP-S-640-03000

SRV ≠ Kinematic RV (KRV) ; see review by Lindegren & Dravins 2003
⇒ To assess the [KRV of asteroids *versus* SRV of stars] consistency

Other task:
For stars : to develop tools for the SRV → KRV transformation (GWP-S-640-04000)

WP-640-02000 (Stars)
Working plan for Cycle 2

Coo.: C. Soubiran

► **OBSERVATIONS (Cycle 2 & all next ones, till launch and after...)**

Observations already performed at the OHP (F)
with the Elodie spectro.
Cf Talk prepared by F. Crifo & C. Soubiran

Other observations are planned :
- OHP + Sophie spectro.
- TBL + Narval S

spectro. *(covering the RVS wavelength range)*

Discussions for observing time are in progress with :
- ESO (FEROS spectro.)
- Observatoire de Genève (CORALIE)
- BACKUP observations at the OHP !!

► **Specification & Design of a DATABASE (in common with CU8)**

Development of this database is in progress. Goals : to prepare and archive observations, to prepare good lists of RVS reference sources : priority 1 (0.3kms^{-1}) ; priority 2 (see RAVE).
Cf Talk prepared by A. Siebert & F. Crifo

WP-640-02000 (Stars)
Working plan for Cycle 2

Coo.: C. Soubiran

► **Requirements Document for establishing the LIST OF RV-STANDARDS**

- **What/Why the required precision**
- **Spatial coverage & density of stars**
- **Astrophysical criteria (absorption lines...)**
- **Number of standards (the more the calibration will be reliable, the less the Spectroscopic Global Iterative Solution -SGIS- will need many standards)**

About 2500 such stars have so far been selected in our working group for ground-based observations. About 1000 could be sufficient in nominal conditions (very good stability of the RVS : thermic, electronic, etc...)

Cf Talk by F. Crifo

WP-640-03000 (Asteroids)
Working plan for Cycle 2

► **OBSERVATIONS (Cycle 2 and next ones)**

- Observations of asteroids already performed at Asiago (Zwitter et al. 2006), and at the OHP (F) with the Elodie spectro.
Cf next talk prepared by D. Hestroffer & F. Crifo
- **Other observations are planned** :
TBL + Narval *(covering the RVS wavelength range)*

To check : ● KRV *versus* SRV consistency for asteroids
effects of size, proper motion, phase,…, on spectra
● [SRV of asteroids] *vs* [SRV of stars] consistency for the RV-zero-point

WP-640-03000 (Asteroids)
Working plan for Cycle 2 & 3

► **CALCULATION**

- **IMCEE (Institut de Mécanique Céleste & de Calcul des Ephémérides) will deliver on their WEB server ephemerides** with very precise KRV for bright asteroids (6<V<10) for the tests stage

- **Does CU6 need a specific interface with CU4 (Solar System Obj.) ?**
Probably IMCEE will supply a webservice for CU6 and CU4 as for CU3 (interoperability mode)

query/reply (JAVA code) : CU6 ⟶ IMCCE ⟶ CU6

Output : KRV (Bar.Vel.Corr. included) + Corrections (shape, phase, etc...), to be compared with observations.

WP-640-03000 (Asteroids)
Working plan for Cycle 2 & 3

follows…

► **SIMULATION (Cycle 2/ Cycle 3)** ; Cf Talk by P. Sartoretti
To define our requirements concerning RVS observations of moving objects (*the asteroids*) in the FoV : expected S/N of spectra depending on proper motion, size, phase (asteroids will never been observed at opposition), etc…
→ to be transmitted to GWP-M-604-10000
"Simulations/Test & auxiliary data management"

WP-640-04000 (Astrophysical zero point)
Working plan for Cycle 2

► **SOFTWARE REQUIREMENT & DESIGN**

To specify and design a software product which allows (at the best) to derive a kinematic velocity for the stars observed with the RVS.
Deliverable : SRD + SDD (Cf Table 6 in CU6 Structure & SDP)
This software will use all GAIA measurements
From APs [RVS, CU8 + (2.5yr later) Photometry + (2.5yr later) Astrometry]

+ *available theoretical models of stellar atmospheres*

To search for all significant effects to be taken into account :
- gravitationnal redshift (i.e 30kms^{-1} for white dwarfs) ;
- blue redshift due to convective cells (i.e 1kms^{-1} for F dwarfs) ;
- etc…

→ ***Training course for a Master II student***

TWP-S-640-00000
Barycentric Velocity Correction (BVC) interface between CU3 and CU6 proposed by U. Bastian

For the same FoV transit of the same star, there are 2 telemetry packets :
- Astro star telemetry packet (SM/AF/RP/BP)
- RVS telemetry packet

⇒ BCV must be temporarily stored in order to be attached to the RVS output records

Proposal : *the Initial Data Treatment could produce a table giving the BCV as function of time for the two RVS FoV centres (and not for each individual obs.)*

The BCV would consist in 2 parts :
- *BCV files themselves*
- *BVC Index File pointing to the BVC Files and giving their respective time intervals of validity*

TWP-S-640-00000
Barycentric Velocity Correction (BVC) interface between CU3 and CU6 proposed by U. Bastian

follows...

According to Bastian, this solution would be the best in all aspects :
- computational effort
- data organization
- data volume (6MB and 1 MB for the BVC Files and BVC Index File resp. for the full-mission size)

The rms precision would be ~ 0.05 kms^{-1}.

Recall : For a ***solar-type star***, the expected single transit precision is ~1 kms^{-1} and ~15 kms^{-1} for V~13 and V~16 resp. Required precision for the RV reference sources : ≤ 0.3 kms^{-1}.

Anwers from D. Hestroffer, T. Zwitter, etc…

Is it OK for the CU6 ?