The Spectroscopic Global Iterative Solution:

The wavelength calibration

1. The SGIS archaeology
2. The current work on SGIS
3. The perspectives of SGIS

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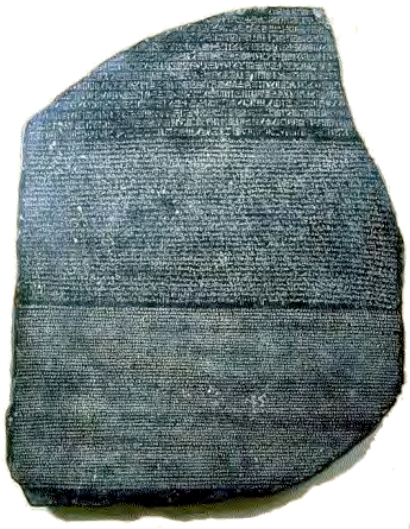
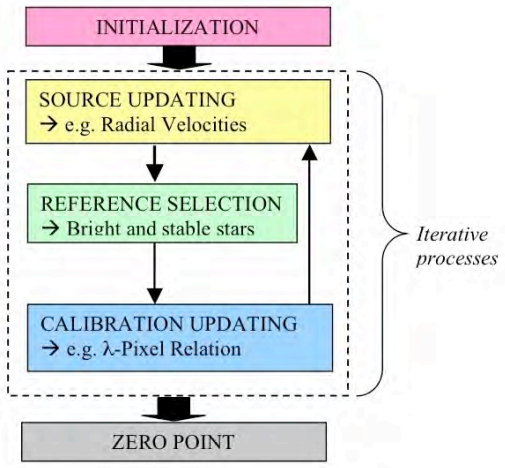
1.The SGIS archaeology





- SGIS concept introduced in **GEPI-GAIA-RVS-TN-016-1**

- Iterative phases of SGIS
  - **Source Updating phase:** Derivation of the RV of the sources
  - **Reference Selection phase:** Qualify a source (or not) as a reference
  - **Calibration updating phase:** Calibrate the RVS spectral disp. law

- Prototype implemented

- First campaign of test = "Non-divergence" tests
  - True spectral dispersion law as starting point
  - Observation of the behaviour of the prototype

- The source of the divergence has been identified!

- The choice of the centroid estimator has influence over the convergence properties of the prototype of SGIS
  - More details in **GAIA-C6-TN-AG-001-01**

- Study and Development of a new centroiding method
  - Use a profile fitting method (cross-correlation like)

- Implementation of a prototype with centroids randomly determined according to a Gaussian distribution centred on the true value
  - Characterize the convergence properties of SGIS

2. The current Work on SGIS

❑Double cross-correlation method:

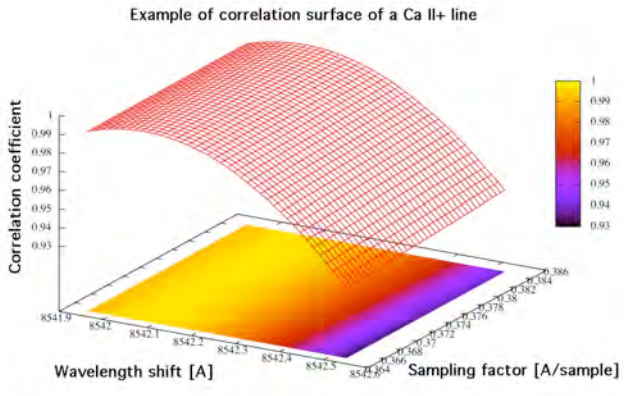
For each line in the spectrum

➢Calibration of the observed line using $\lambda = a \times sample + b$ *(1)*

where *a* is a sampling factor and *b* a wavelength shift

➢Correlation between the calibrated observed line and a synthetic line ➡ Correlation coefficient

➢Correlation coefficient as a function of *(a,b)* ➡ Correlation surface



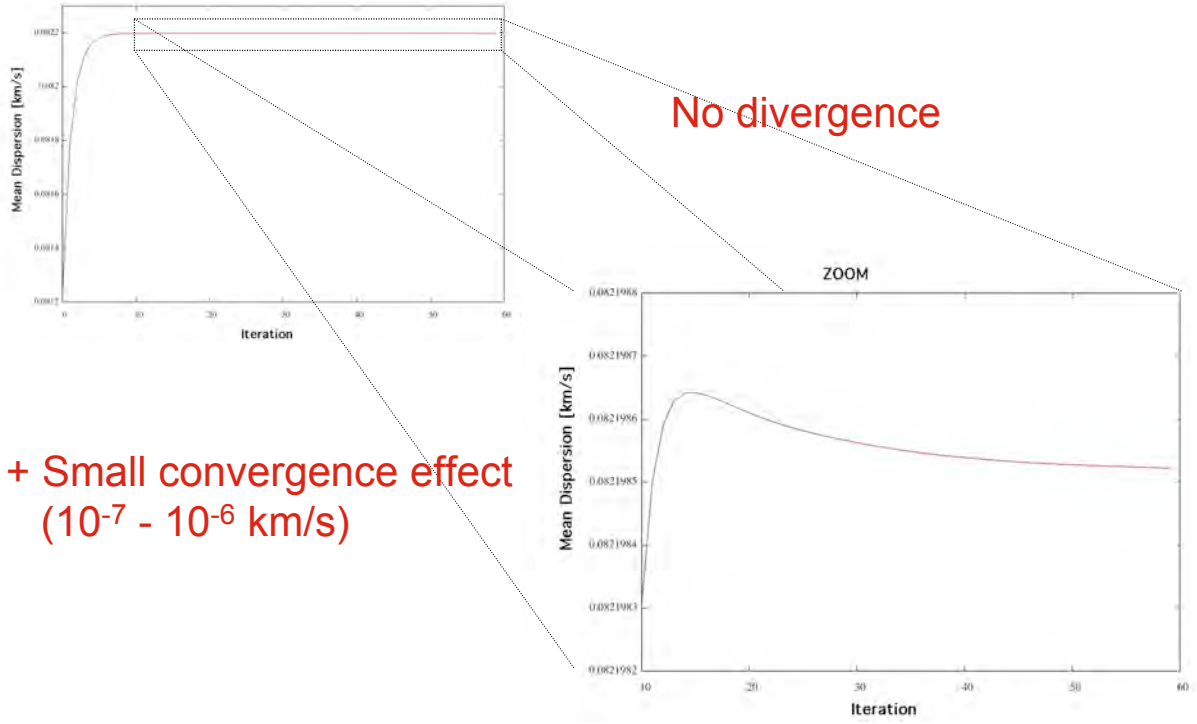
➡ maximization of the surface

➡ best match observed/synthetic

➡ best *(a,b)* parameters

➡ access to *(sample,λ)* using *(1)*

- Prototype with “unbiased centroiding method”
- Result of non-divergence test



3. The perspectives of SGIS

❑**MSSL**

➢Discussion with M. Cropper and MSSL team
Integration of the SGIS works in the RVS calibration plan

➢Preparation of the cycle 2 (**GAIA-C6-SP-OPM-DK-003-1**)
- ➢Software requirement (3 Nov. 2006)
- ➢Software Design (1 Dec. 2006)
- ➢ …

❑**October 2007:** end of my thesis

➢March-April 2007➔ October 2007: thesis writing
➥Cycle 3 (mid-May 2007): 1 FTE➔0.5 FTE on SGIS

➢After October 2007: ?

❑ **Cycle 2:** Integration at CNES:

➢Prototype with “unbiased centroiding estimator” has been chosen

➢Update the prototype:
- ➢Integration of the Gaia ToolBox, Gaia Database
- ➢Design 3 of Gaia
- ➢Integration of other software (e.g. radial velocity)

➢Work with C. Delle Luche (GEPI)

❑Study of convergence of the prototype

- ➢Not initialize the spectral dispersion law with true values
- ➢Observe the behaviour of the prototype over iterations
- ➢Valid the convergence

❑Optimisation of the new estimator

- ➢Optimisation of the method
  - ➡Test on 1000 spectra
    - Mean error about 10 m/s for each line
    - About 30 min. (too long!!!)
- ➢Integration of the method in a prototype of SGIS
- ➢Test this prototype on simulated data