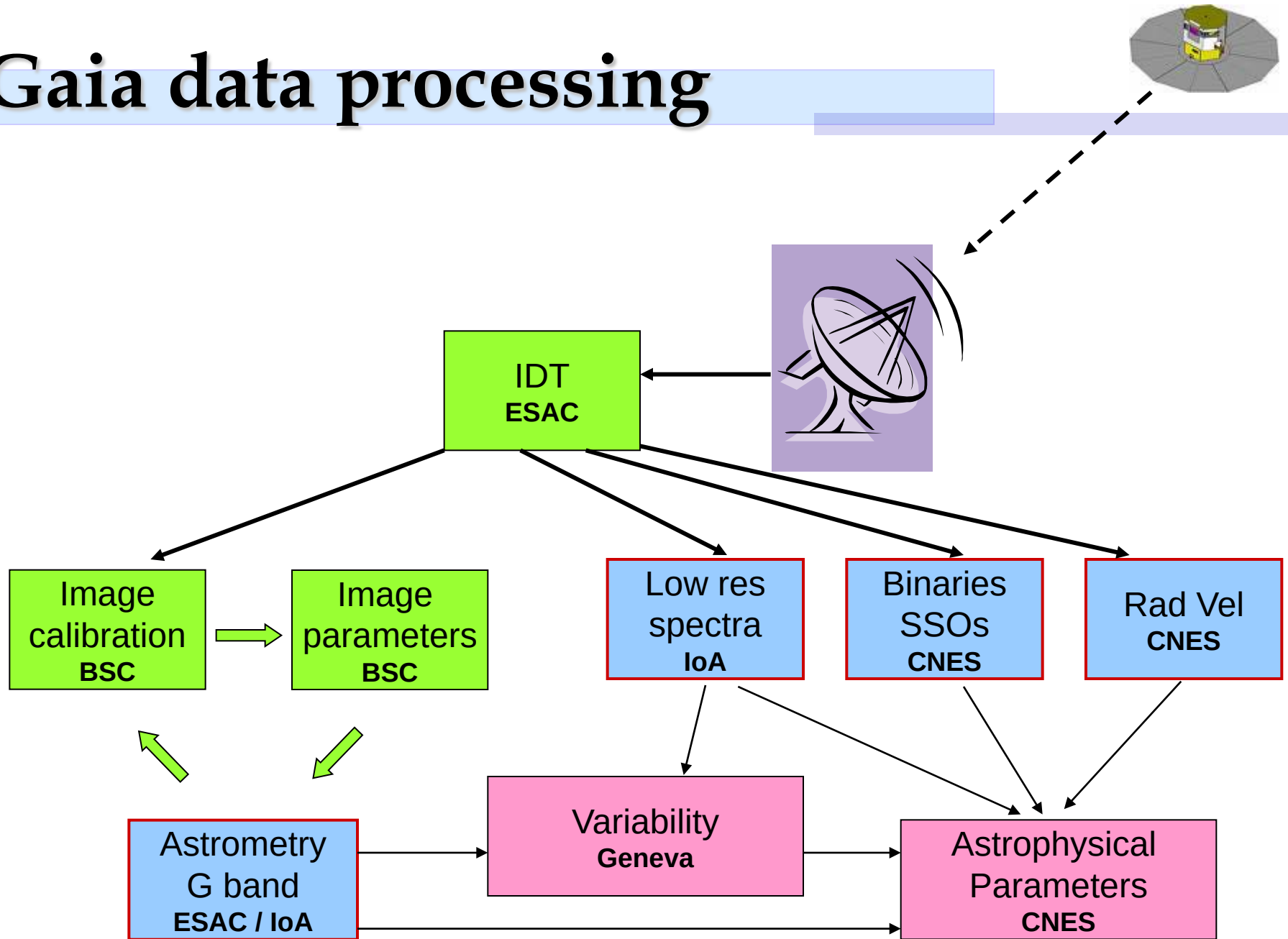


La reducción de datos de Gaia: Estado actual

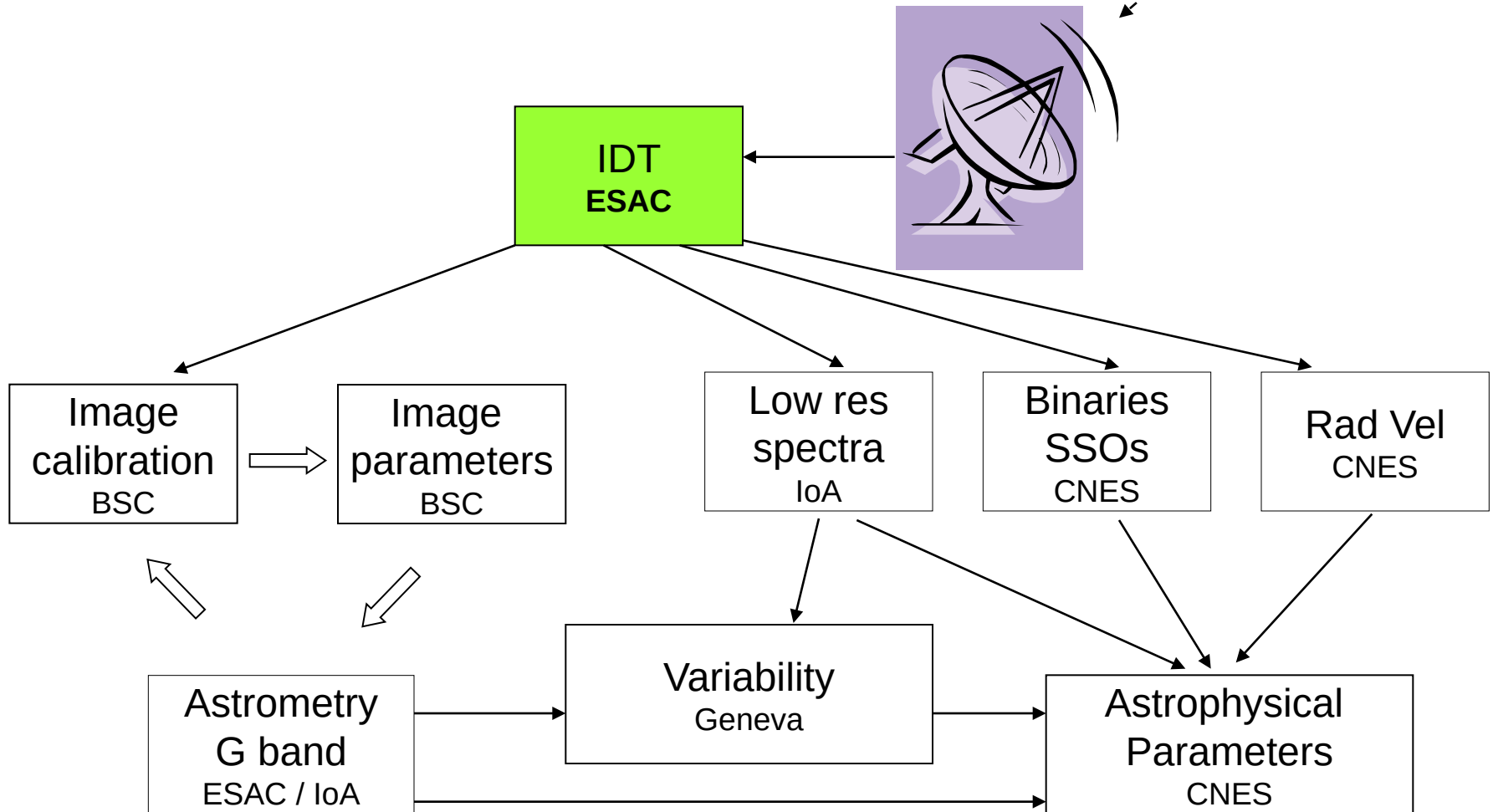
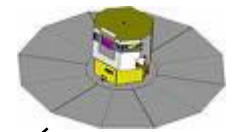
**Institut d'Estudis Espacials de Catalunya
&
Institut de Ciències del Cosmos – Universitat de Barcelona**

C. Fabricius

Gaia data processing



Astrometry

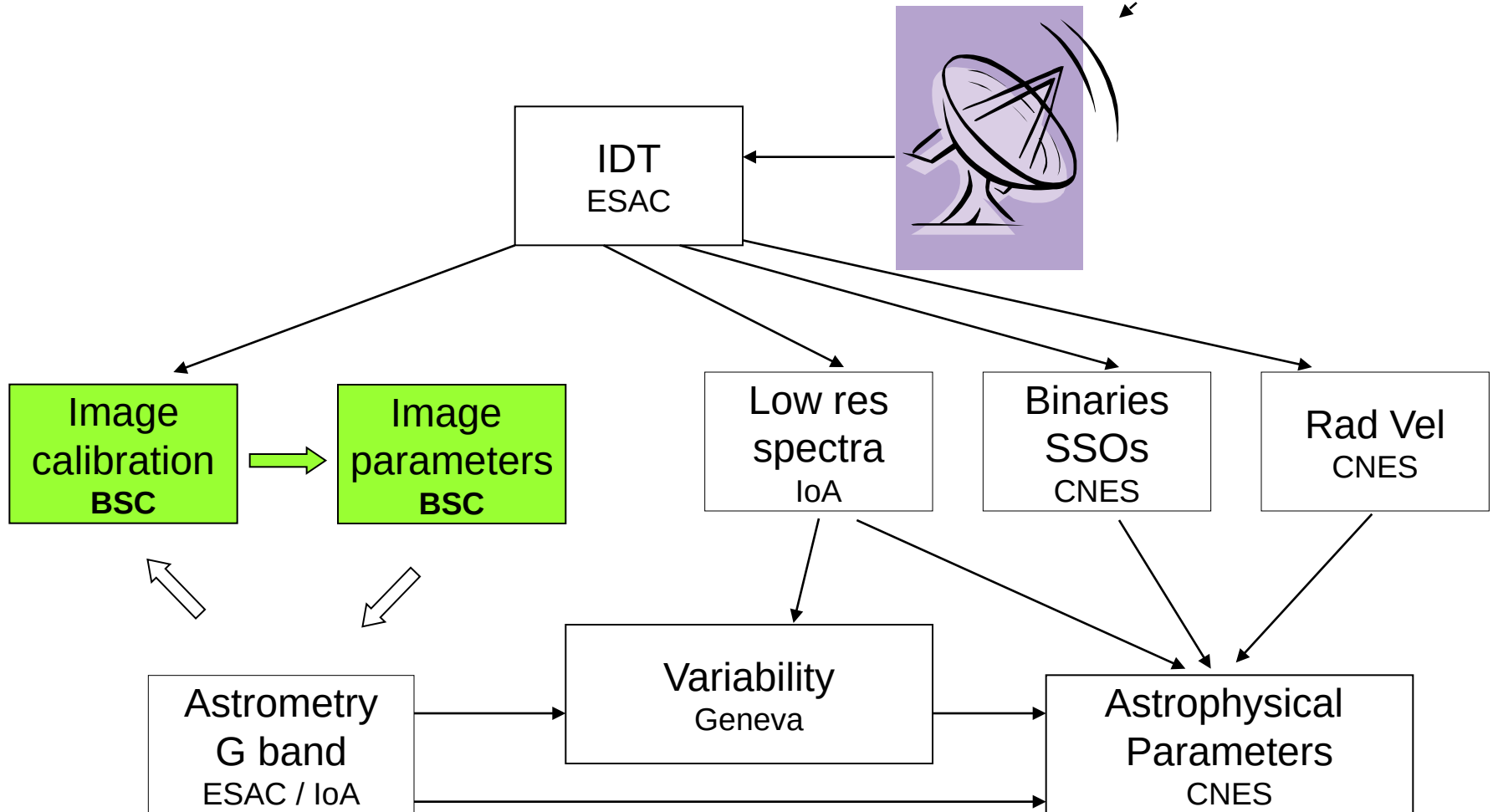
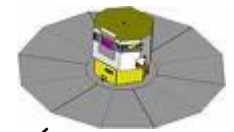


Astrometry

- IDT: Initial Data Treatment
 - Numerous tasks
 - Reconstructing on board decisions
 - A first attitude reconstruction
 - Identification of transits
 - Reformatting all observations
 - A first colour determination
 - Background & bias determination
 - First image parameters: transit times, fluxes
 - Must run as soon as data arrives
 - Software is working
 - Some features missing and some fine tuning still to be done
 - Must be ready one year from now
 - Validation essential



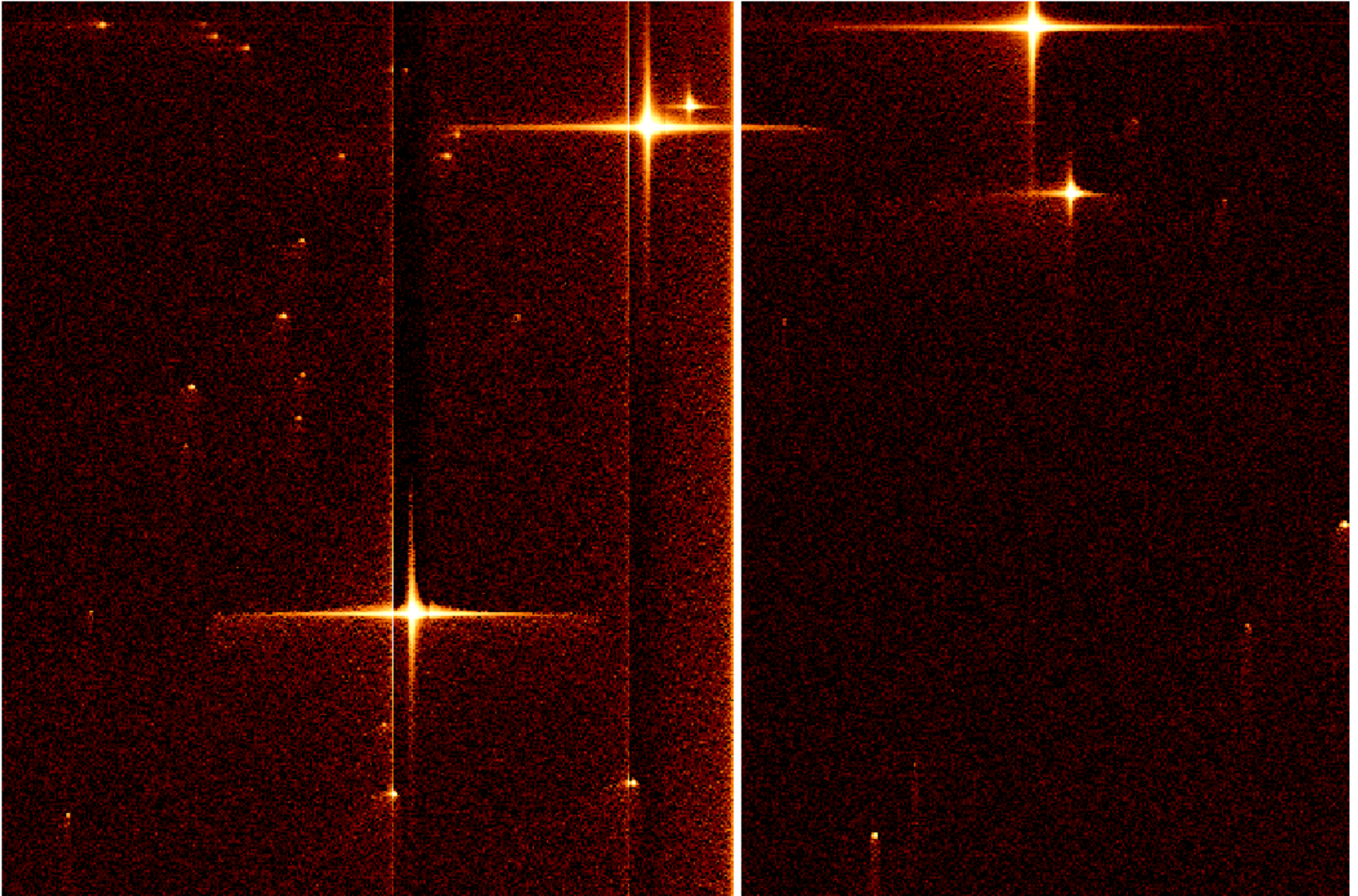
Astrometry



Astrometry

- Image calibrations
 - PSF
 - Model exists
 - Testing of calibration in progress
 - Non-linear distortions
 - Model exists
 - Calibration in development
- Image parameter re-determination
 - Framework largely in place
 - Testing ongoing

Simulated image

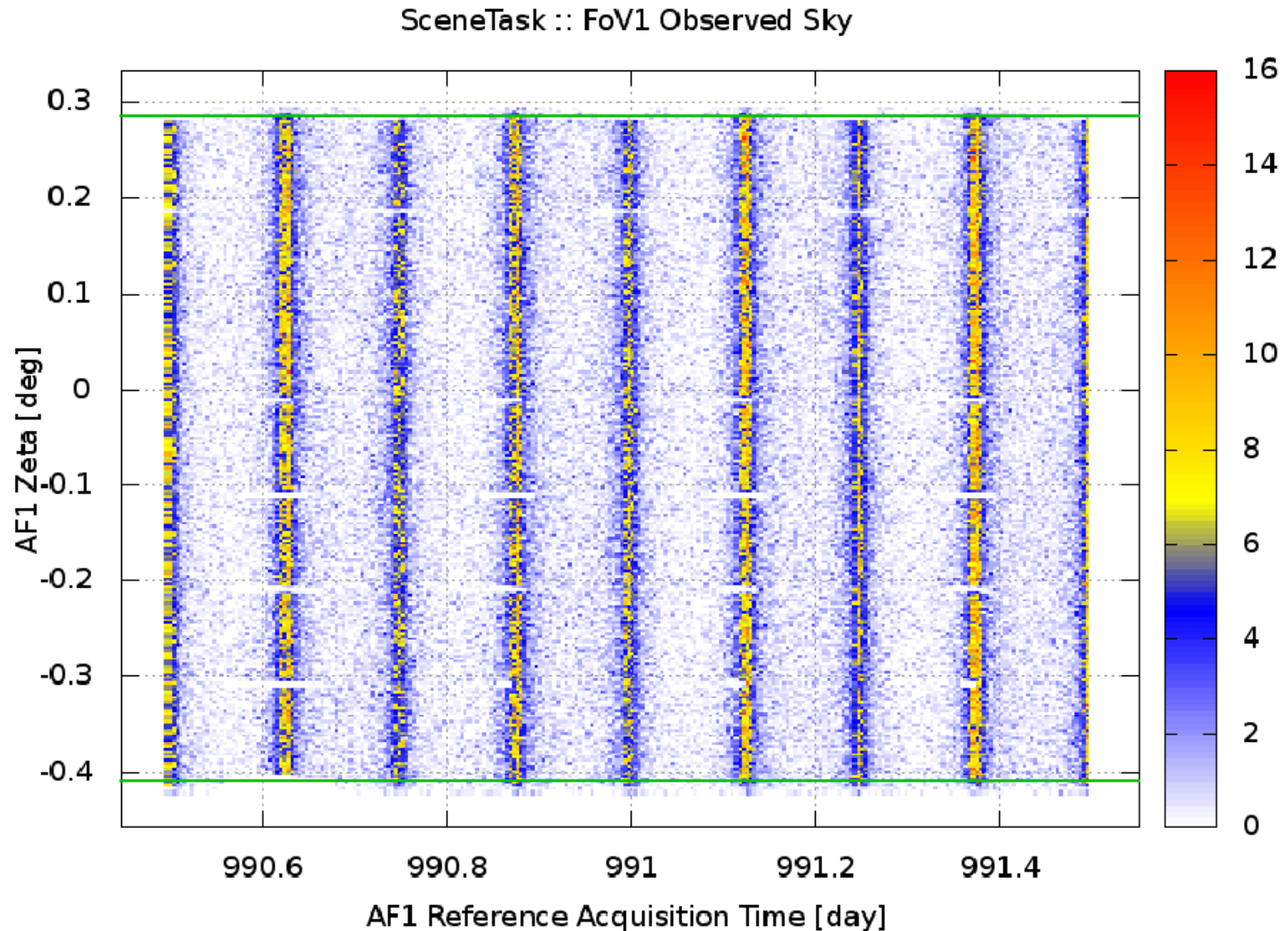


M. Davidson, IfA

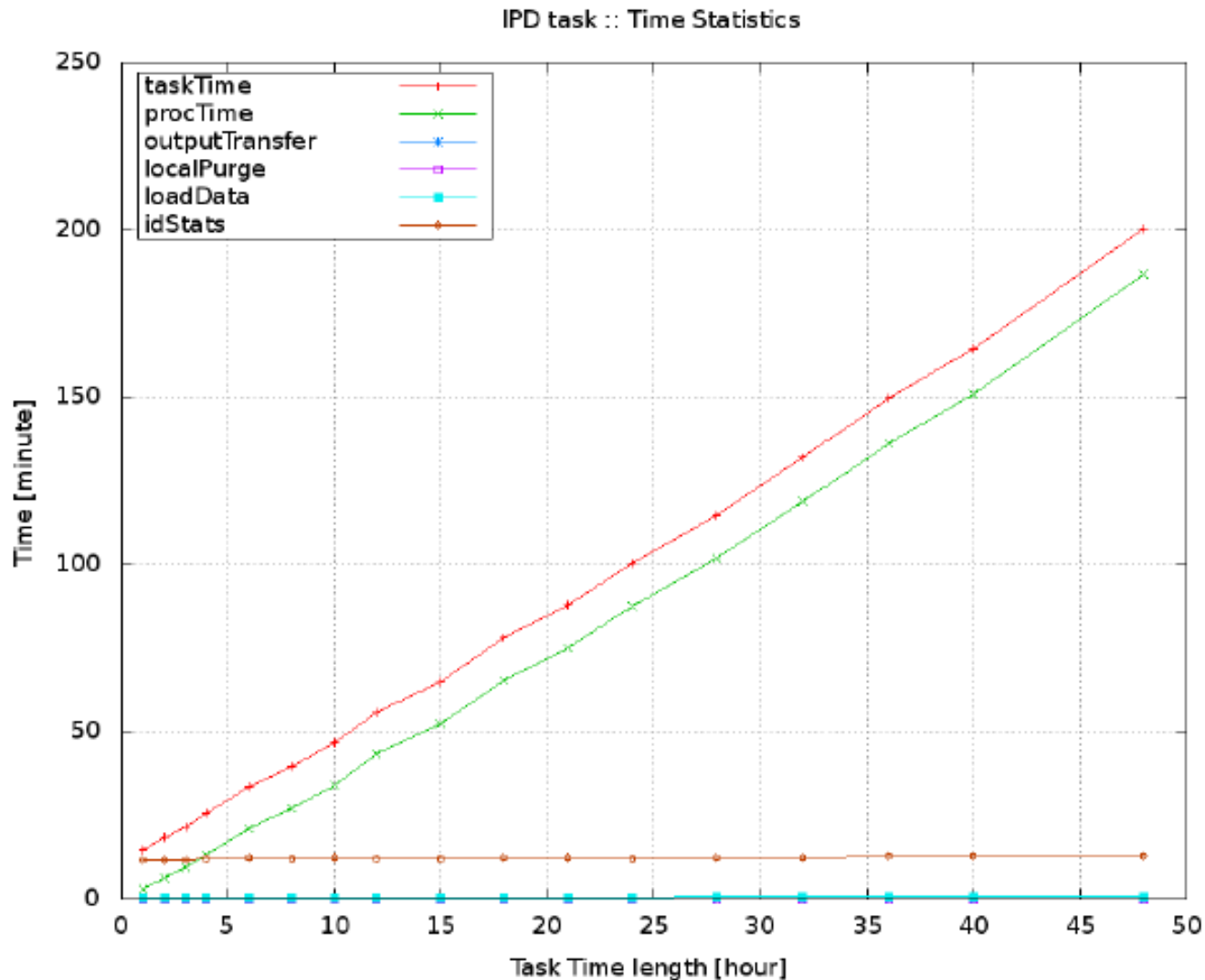
Re-processing of images

- Runs at BSC
- Uses
 - Updated PSF, colours, CCD calibrations
 - Illumination history for the CCDs
- Processes
 - Astrometric field images
 - Some 10^{12} images at end of mission
 - Repeated every 6 months
- Largely in place and tested
 - Small scale test
 - Some features missing and some fine tuning still to be done

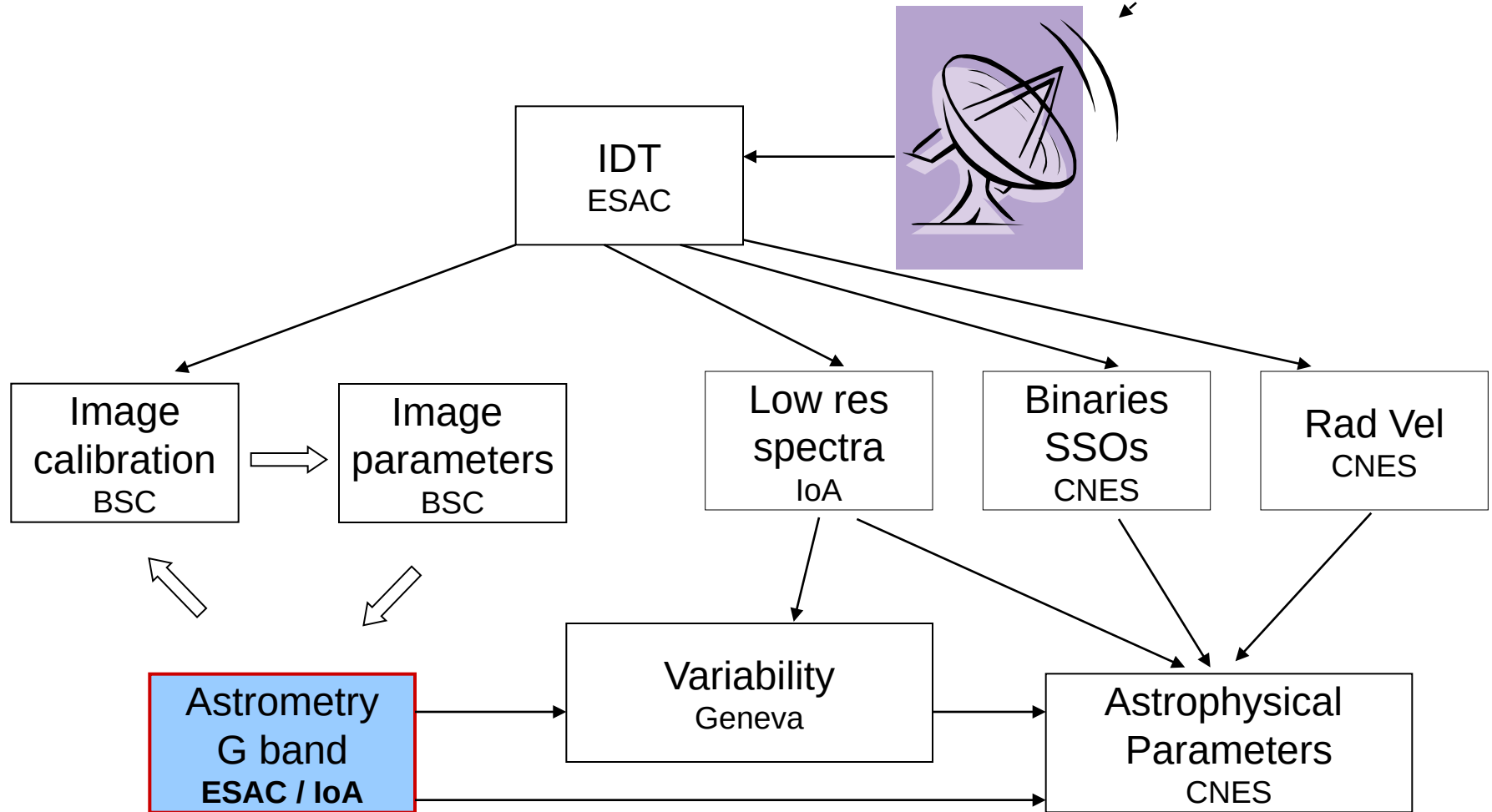
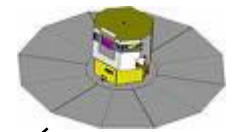
Illumination history



Scalability test, Image processing



Global astrometry



Global astrometry

- Iteratively solving
 - **Position, proper motions, parallax** for primary sources
 - **Attitude**: orientation of telescopes a.f.o. time
 - **Calibrations**: geometry of focal plane
- Must iterate also with the image analysis
- Methods developed
- Testing in progress
 - Promising results

Testing astrometry

Astronomy & Astrophysics manuscript no. agis
August 16, 2011

© ESO 2011

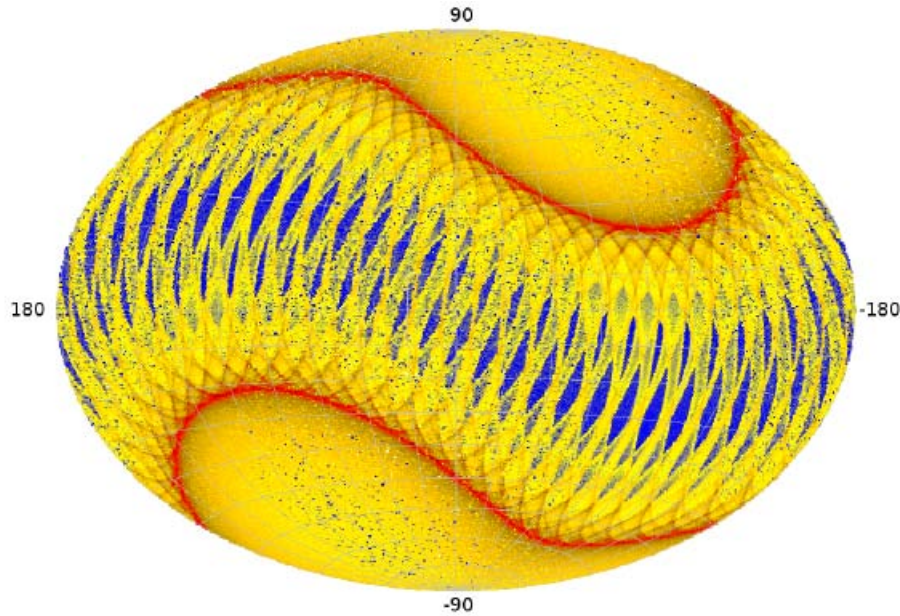
The astrometric core solution for the Gaia mission

Overview of models, algorithms and software implementation

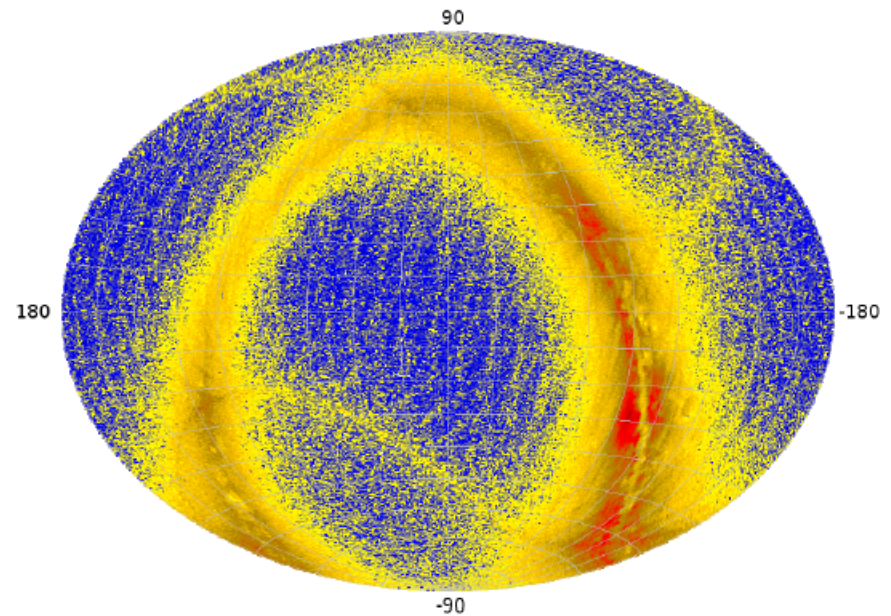
L. Lindegren¹, U. Lammers², D. Hobbs¹, W. O'Mullane², U. Bastian³, and J. Hernandez²

- Simulations from BSC: 2.3 mill sources, 5 years
- Well behaved image parameters
- Well behaved attitude
- Realistic galaxy model
- Realistic noise

Sky distribution

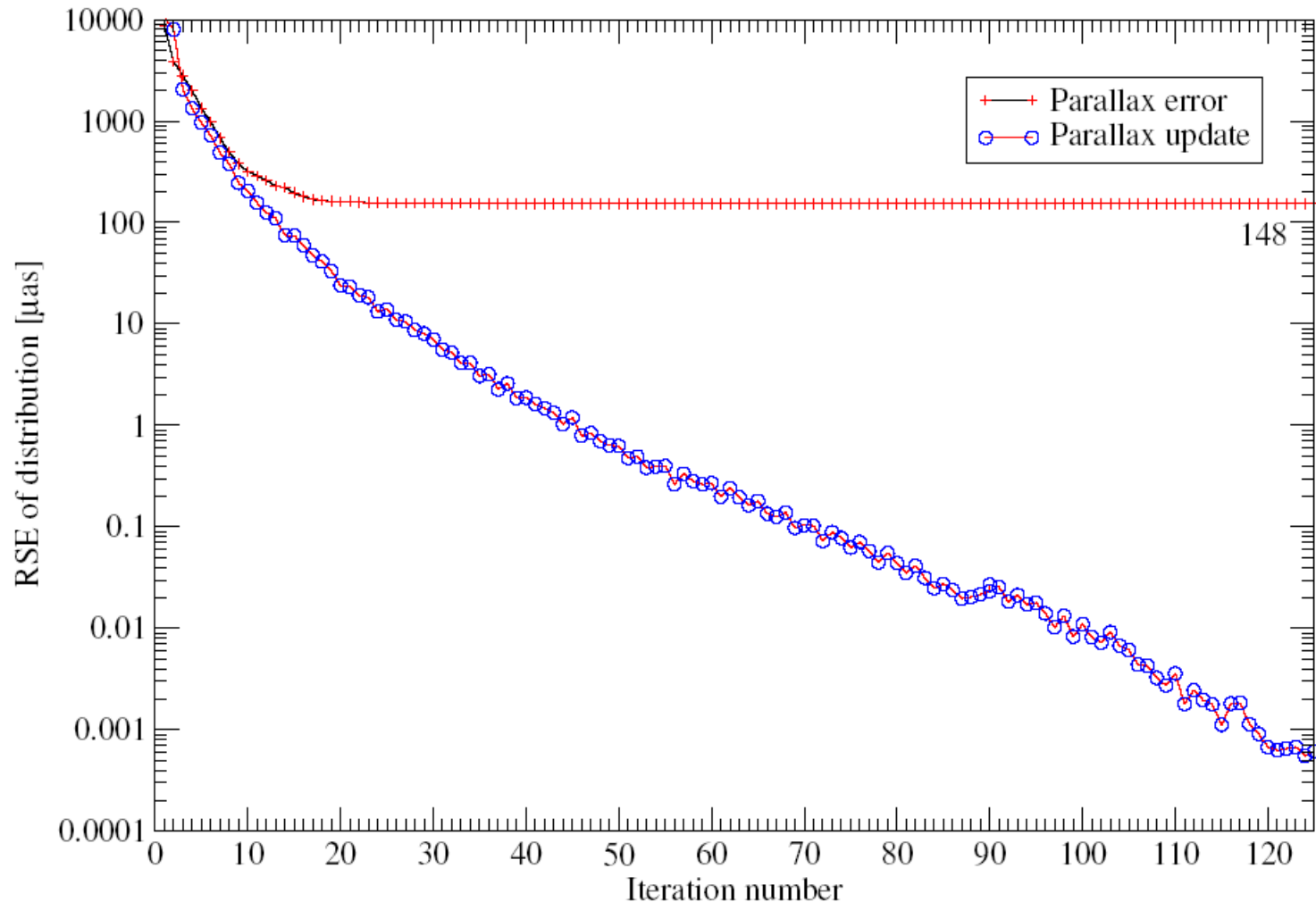


Transits per source: 40-200



Number of transits

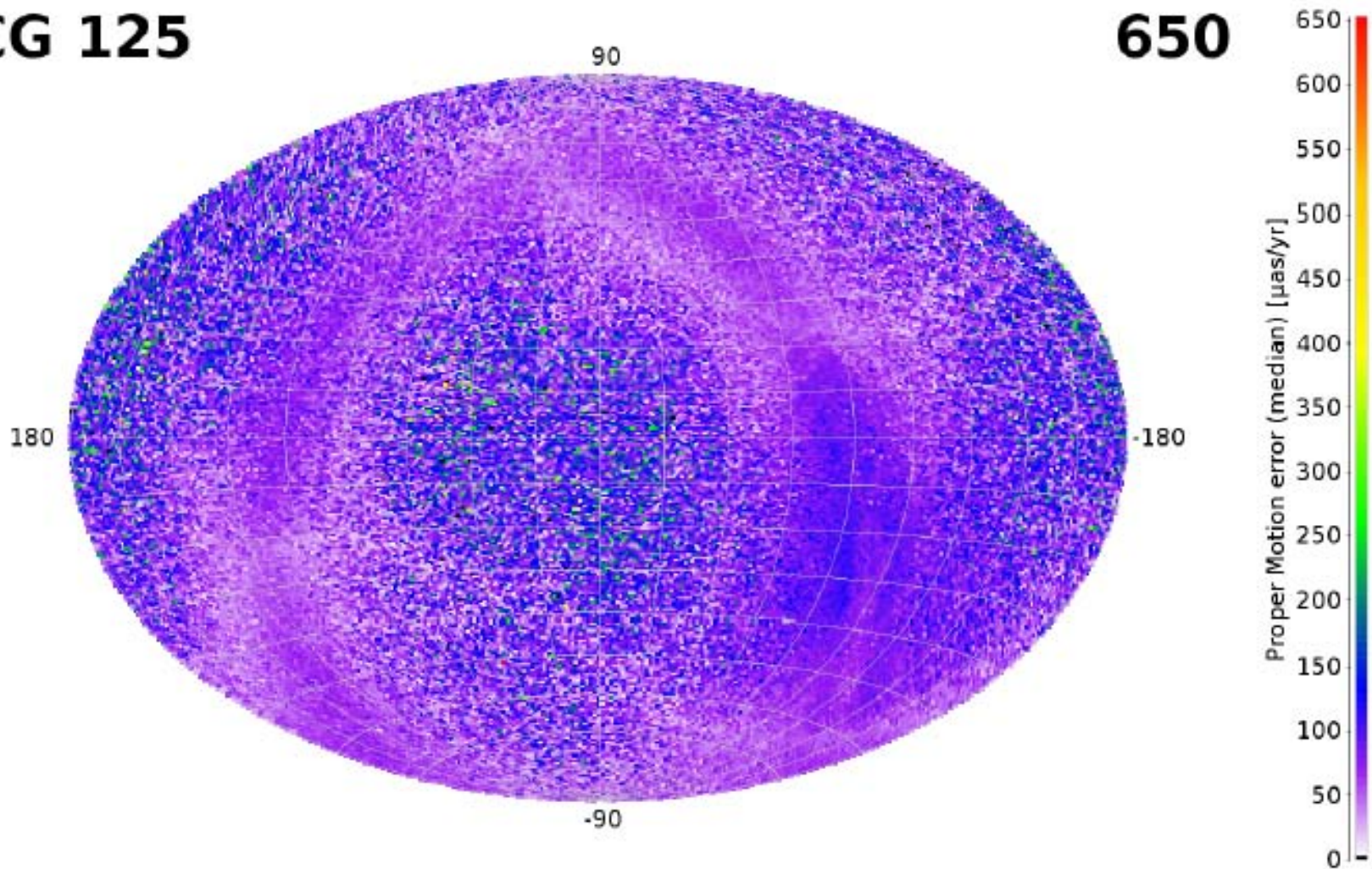
Many iterations needed



Proper motion errors, 125 iterations

CG 125

650

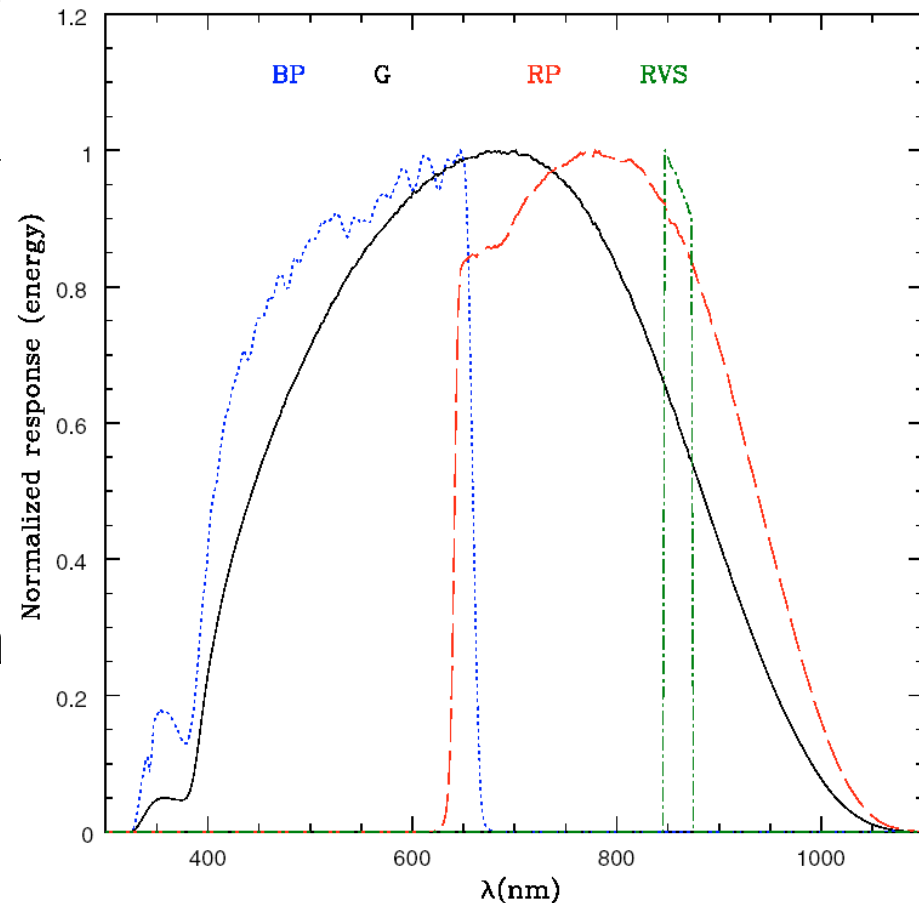


Result of test

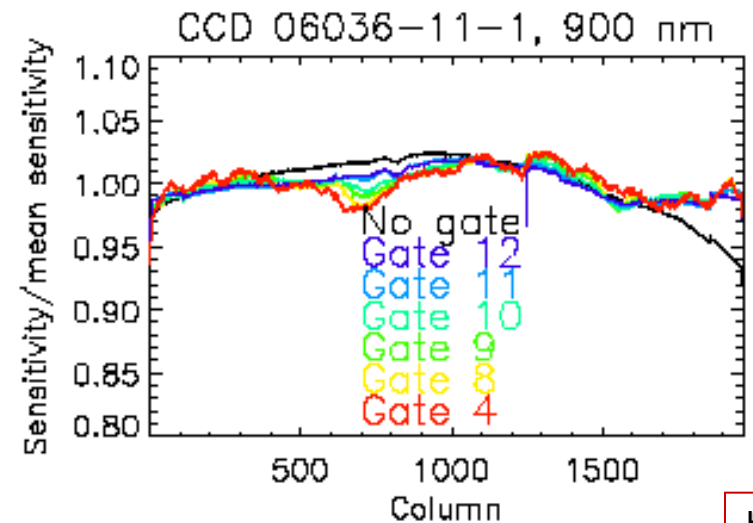
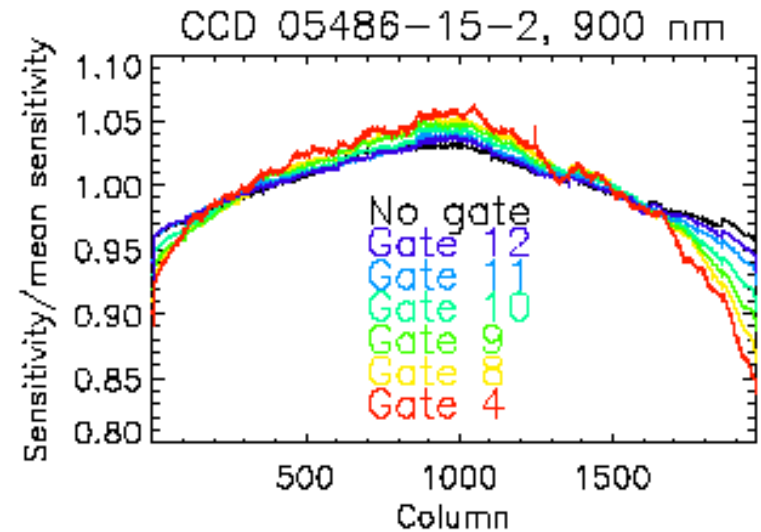
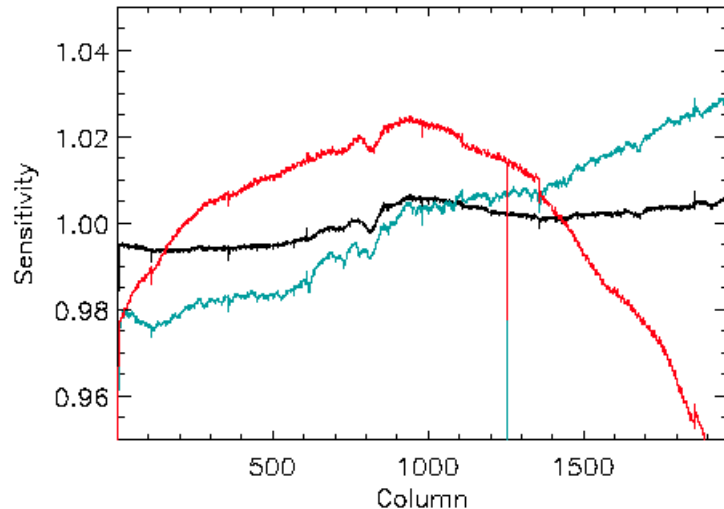
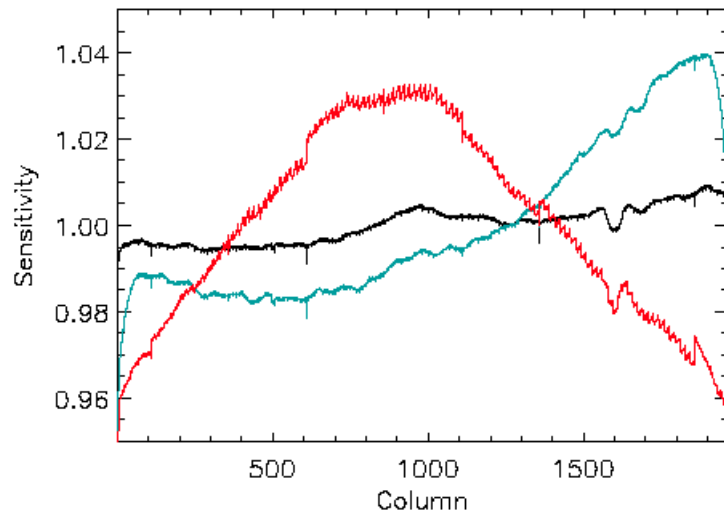
Magnitude range	No. stars	RSE of error [μas and $\mu\text{as yr}^{-1}$]				
		α^*	δ	ϖ	μ_{α^*}	μ_{δ}
$G < 13$	18 253	11.3	11.3	11.7	7.5	6.5
$13 \leq G < 15$	70 355	15.2	13.9	17.5	10.6	9.0
$15 \leq G < 16$	88 116	22.3	19.5	26.9	15.6	13.4
$16 \leq G < 17$	151 639	32.6	28.4	40.6	23.1	19.9
$17 \leq G < 18$	272 424	51.2	44.2	64.2	36.0	31.2
$18 \leq G < 19$	489 253	85.1	72.0	106.8	60.2	51.5
$19 \leq G$	1 166 182	170.0	141.2	210.6	120.2	101.0
all G	2 256 222	118.6	99.8	148.3	83.7	71.3

Broad band photometry

- G band fluxes
 - Works with amplitudes from PSF fitting
 - Software rather advanced
 - Tests of pipeline ongoing
 - Early availability
- BP & RP integrated spectra
 - Simple aperture photometry
 - Small aperture!
 - Easy, but not very robust
 - Processed like the G fluxes

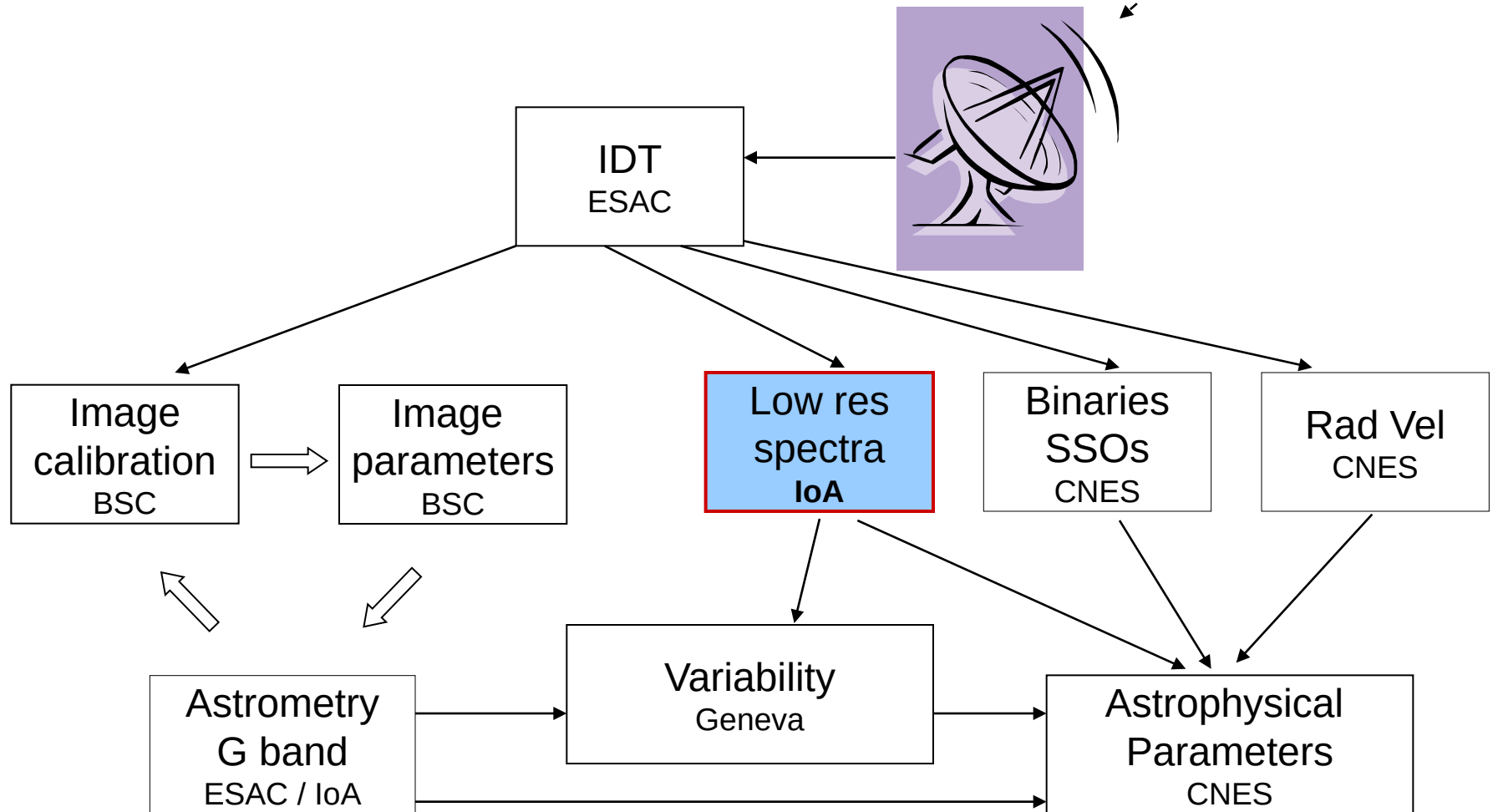
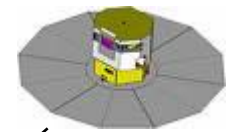


CRNU for two AF CCDs

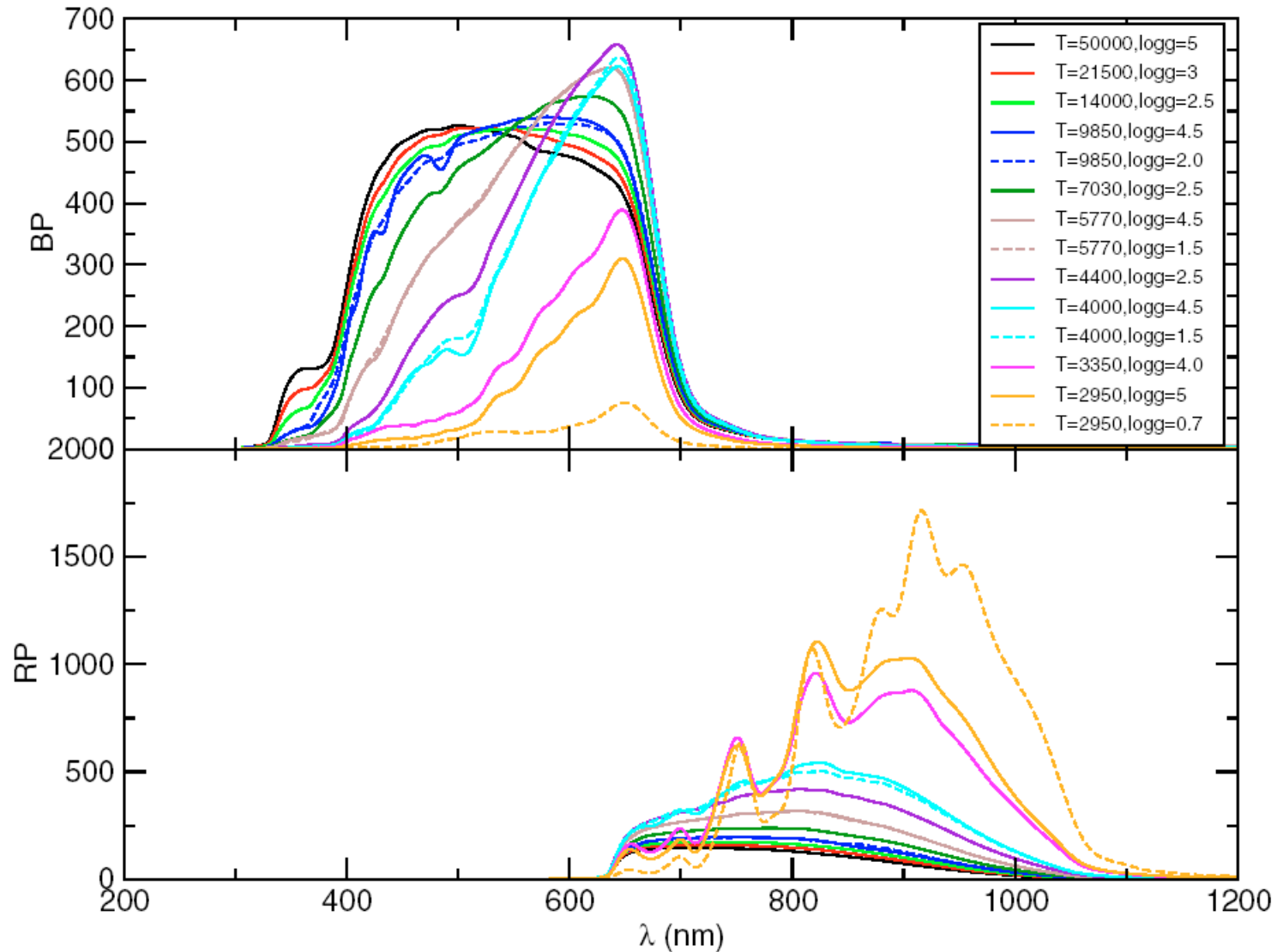


HV-003

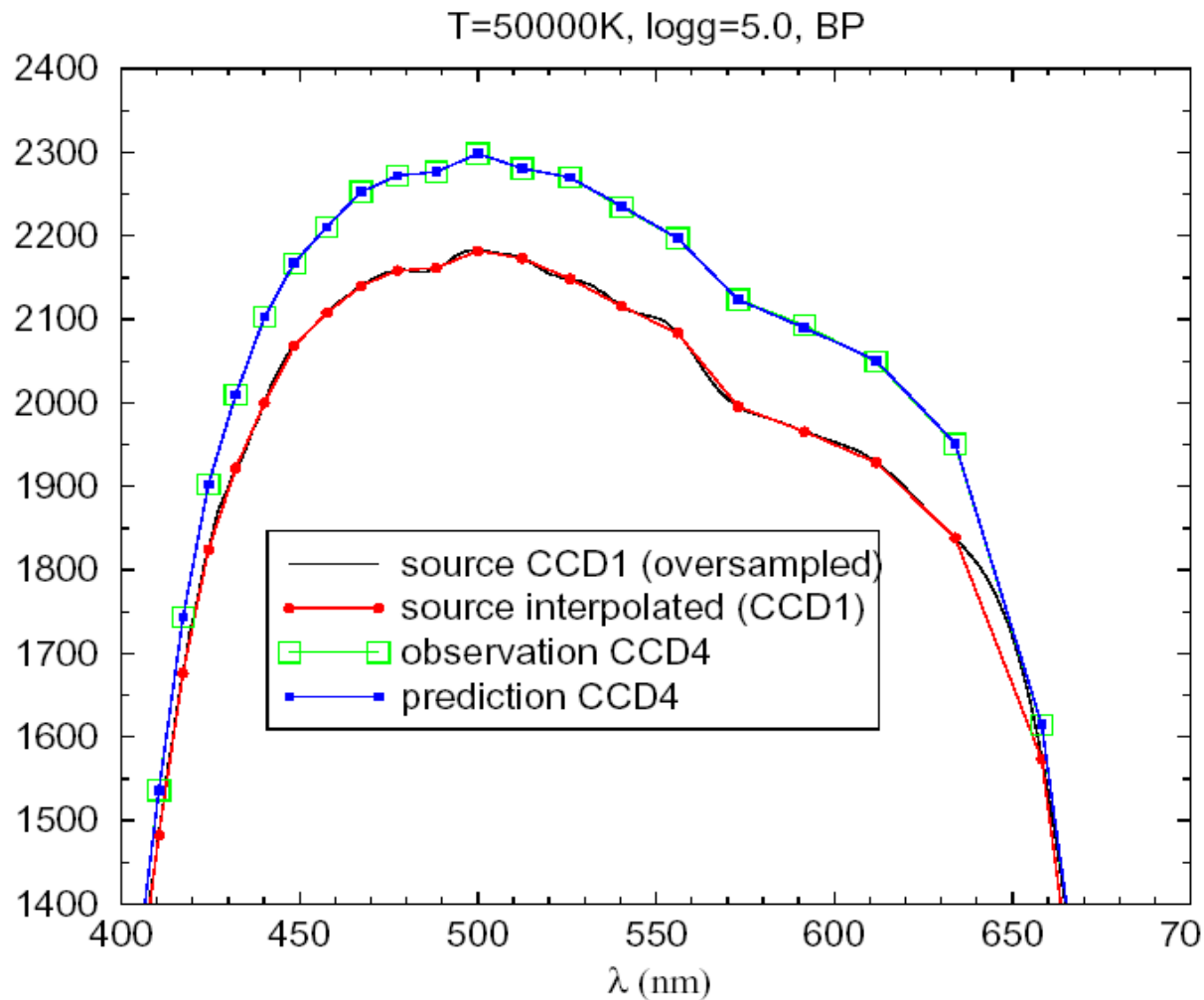
Gaia data processing



Low dispersion spectra BP/RP



Dispersion variations



Low dispersion spectra: BP/RP

- Processing includes:
 - Effective wavenumbers for PSF calibration
 - Early availability
 - Apprx 8 pseudo bands (spectrum shape) for PSF calibration
 - Early availability
 - Mean spectra from “simple” combination of observations
 - Not so early availability
 - Many modules developed and tested
 - Reconstruction of spectra (TBC)
 - Late mission
 - Challenging problem
 - Depends on available resources