ABSTRACT: Gaia is the ESA space astrometry mission due for launch in late 2011. Its objective is to map a large part of our Galaxy and its surroundings by simultaneous, positional, radial-velocity, and multi-colour photometric measurements. During a five-year period Gaia will survey approximately one billion Galactic stars, detecting and classifying tens of thousands of extra-solar planets, large numbers of Solar-System objects, galaxies in the nearby Universe and some half a million distant quasars. It will provide stringent new tests of general relativity and measure the acceleration of the Solar System in the cosmological frame.

The data reduction for Gaia is entrusted to the Gaia Data Processing and Analysis Consortium (DPAC), involving nearly 300 scientists and engineers throughout Europe, including teams in Lund and Uppsala. The work is organised in nine Coordination Units (CU1-CU9).

We describe part of the work carried out in CU8, namely the determination of physical parameters for all stars which Gaia will observe. This includes calculating synthetic stellar spectra for algorithm development, obtaining ground-based observations for calibration and testing purposes, and improving the physics of stellar atmosphere models.

Gaia and the Determination of Astrophysical Parameters

Physical parameters for one billion stars from
spectrophotometry for V < 20, medium resolution spectroscopy for V < 16 and astrometry

Goals
Automatic determination of stellar surface temperatures to 2%, gravities to 0.3 dex, metallicities to 0.2 dex for most stars.

Simulated Gaia data: Red Photometer spectrum of M dwarf.

Red box: data sent to ground, White contour: sky-background level.
Colour coding: signal intensity.

Figure courtesy Anthony Brown (CU5)

Simulated Gaia data: Radial Velocity Spectrometer spectra of F3 giant (V=16).
S/N = 7 (final observation), S/N = 130 (summed over mission)
Figure courtesy David Katz (CU6)

Gaia Work Package Training Data provides
- synthetic stellar spectra for simulations, algorithm development and testing
- observed spectra at low and medium resolution of a set of well-studied Reference stars for algorithm and model testing
- improved stellar atmosphere models and high resolution spectra for a limited number of Benchmark stars

Synthetic stellar spectra:
Part of the MARCS library calculated at Uppsala

Benchmark stars:
Line profiles for α Cen A (Figure by L. Bigot)

For more information on Gaia, visit http://www.rssd.esa.int/gaia