SF2A 2007
J. Bouvier, A. Chalabaev, C. Charbonnel (eds)

THE GAIA WORK PACKAGE ON FINAL LUMINOSITY, AGE AND MASS ESTIMATOR (GWP : FLAME)

B. Pichon[1]

Abstract. Inside the CU8 (Coordination Unit 8) of the DPAC (Data Processing and Analysis Consortium) of the GAIA mission, the goal of the FLAME work package is to determine the intrinsic luminosities, ages and masses of the stars (single or binaries) observed by Gaia.

1 Introduction

The goal of the Gaia mission (ESA) is to observe about 10^9 stars, measuring positions, proper motions and, more relevant for this poster, parallaxes and magnitudes. The data processing of the huge amount of data is in charge by the DPAC (Data Processing and Analysis Consortium, François Mignard, Chair). The work of this consortium was divided into 9 CUs (Coordination Unit). The objective of CU8 is to classify and determine astrophysical parameters for all of the sources which Gaia observes. Inside this CU, many GWPs (Gaia Work Package) has been identified : the present FLAME group is one of the groups in charge to provide complete software components (written in Java as decided by ESA) to the CNES for the DPAC.

2 The FLAME group

The FLAME group will estimate the ages and masses of stars (single or binaries) based on their astrophysical parameters (effective temperature, logarithm of the surface gravity, metallicity ... as delivered by other groups of the CU8), parallaxes (as delivered by CU3 Core Processing. in charge of the entire processing chain going from the raw telemetry to the astrometric core solution) and apparent G-band magnitudes (as delivered by CU5 in charge of the photometric processing). The reference of this work is GWP-S-825 within CU8. This work was split into three algorithms (to be gradually delivered to CNES and to DPAC). At present, this group is chaired by Yveline Lebreton (Rennes) with Fréderic Thévenin (Nice, co-chair of CU8) as advisor. The actual work of FLAME group was performed by Bernard Pichon (algorithms, programming, software engineering) and Florence Martel (programming and quality control) with the help of Anne-Marie Janotto (CNES at Toulouse).

3 The first algorithm

The first algorithm derives the intrinsic stellar G-band magnitude, bolometric luminosity and, also, the (photospheric) radius (needed by CU6, in charge of the spectroscopic reduction). At now, the first version of this first algorithm was delivered to CNRS on April 07 and its second version (data read/written within files) will be delivered on October 07. We point out that bolometric corrections are not yet available to us, so the algorithm is not fully operational.

4 The two other algorithms

The second algorithm will estimate age and mass for single stars from their bolometric luminosity, effective temperature and metallicity. It will be based on the inversion of stellar evolutionary tracks. The third algorithm is the extension of the second algorithm to stars in binary systems (where masses are already determined). In both cases, helium content will be determined. Note that the stellar evolutionary tracks libraries, as needed for the two algorithms, were provided by the Padovia group.

[1] Dept. Cassiopée, UMR 6202 du CNRS, Observatoire de la Côte d'Azur à Nice, BP 4229, 06304 Nice Cedex 4

© Société Francaise d'Astronomie et d'Astrophysique (SF2A) 2007

5 Parallel work related to FLAME

New models of atmospheres (from MARCS models) will be implemented in CESAM and will provide the outer boundary conditions for internal structure models. CESAM (the stellar structure and evolutionary code that we use) is also upgraded to include radiative forces and some transport processes related to the stellar rotation. An algorithm for isochron calculation is also being prepared.

6 Other information

The copy of the poster, as shown at the SF2A meeting, and other information can be retrieved from this URL : http://www.oca.eu/pichon/FLAME/index.htm More details concerning the Gaia mission may be found at the following URL : http://www.rssd.esa.int/index.php?project=Gaia

7 Acknowledgments

The present work was done in collaboration with Florence Martel (engineer) with the help of useful discussions with Fréderic Thévenin and Yveline Lebreton.