

# Report on the ESTA/CoRoT Thematic Session

8<sup>th</sup> CoRoT Week - Toulouse - 2005-05-25 (16:30-18:00)

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## 1 Agenda

During the 8<sup>th</sup> CoRoT Week a meeting on the evolution and seismic tools activity (ESTA), was organised in order to discuss what has been done since our last meeting (in Granada) and to plan the work for the next six months. The proposed agenda included the following points/topics;

- (i) Report on the reference grids: one grid (A) from CESAM is available for download (models and frequencies) and data on a grid from CLES will be made available in the near future. Discussion on the data made available and what additional data may be necessary/useful.
- (ii) Report on the models comparison (*Task 1*) - models from ASTEC, CESAM, CLES, FRANEC and TGEC are being used to initiate the comparison. The preliminary results are presented as a poster and the key aspects of these will be discussed in the meeting. Discussion on how to proceed these comparisons.
- (iii) Report on the start of a comparison of the frequencies (with codes ADIPLS, FILOU, GRACO and POSC) using a set of representative models (in stellar mass and age) from the CESAM grid. No results are yet available.
- (iv) Discussion on the proposed model comparison of specific “observational” cases (*Task 2*) and on the model and frequency comparison of specific pulsators (*Task 3*) in order to establish the best course of action for developing those tasks.
- (v) Planning of possible working meetings to take place over the next six months (prior to the next CoRoT Week) involving the code developers with the key objective of completing *Task 1*.

## 2 Summary of the meeting

We have started with a brief description of the grid made available at the web site for ESTA. Evolutionary tracks, selected models and their frequencies of oscillations are already available. Further input has been requested from everyone on what may be useful regarding the reference grids and the data made available.

A brief report was presented on the preliminary results of *Task 1*. In this discussion we have tried to identify the key aspects coming out of this comparison and the implications for the follow up work necessary to complete this task.

The agenda had been prepared in order to use this meeting for organising the activities for the next six months. As people present at this session indicated they would prefer to concentrate on the discussion of the preliminary results for *Task 1*, most of the time has been dedicated to analyse the most relevant aspects of the comparison done in *Task 1*. The planning and development of the activities up to December 2005 (remaining points of the agenda) will be negotiated/establish in the weeks following this meeting.

## 3 Major points raised in the meeting and some comments

Some points raised during the meeting and comments:

- In order to clarify some of the numerical difficulties it has been proposed to simplify the physics of the models as much as possible in order to be sure that the physics we are using is the same.
- After a discussion on how overshoot is implemented in the codes it become clear that it is difficult to compare this aspect of the physics as the codes will not easily allow a comparison using exactly the same

representation of overshoot. Consequently we may need to avoid in *Task 1* a comparison of models with overshoot as the differences may be dominated by the use of different formulations/implementations of the temperature stratification in the overshoot regions.

- One of the outcomes of *Task 1* is the need to compare evolutionary tracks and not only models at a specific age. It has been agreed that we should try to compare how the structure evolves for some of the targets starting at the ZAMS, by selecting specific values of  $X_c$  at which the full structure of the models will be compared.
- There is a very important aspect we should discuss further in order to define/set what are “acceptable differences” in the global parameters between different codes and in the model differences. This definition may not be easy/definite (or scientifically valid!) but it has been agreed that it is necessary to clarify what are the limits for considering that two models are consistent.
- It has been noted that a more detailed analysis is required on how convective borders are treated in both space and time integrations. This seems to be the origin of some of the significant differences between codes found in *Task 1*.
- It has been argued that it is important for the model comparison effort that a publication on the reference grids and the comparison of these with other grids is prepared and published as soon as possible.
- A point has been raised on the need to look more carefully to the time step used for the main sequence evolution and its effect of the value of  $X_c$ . A detailed comparison should be prepared on how different prescription for the time step affect the way  $X_c$  changes with age.

#### 4 Proposed plan/calendar for the next six months

- To complete *Task 1* before the next CoRoT Week [by October 2005]. Further iterations are still needed for some of the codes and some items of the model differences should be clarified. One necessary step is to adjust the physics to make sure all codes are using exactly the same set of physics. Care must be taken on how the borders of convective zones are followed and its effects on how the chemical composition changes with time.
- To produce preliminary results [by December 2005] on:
  - Comparison of evolutionary tracks - priority must now be given to the comparison of different evolutionary tracks and comparison of specific models (main sequence) for each track at particular values of  $X_c$ . Pre-main sequence evolution should be addressed separately between codes where such a phase is implemented.
  - Comparison of the frequencies for the reference grid - representative models (in stellar mass and age) will be identified in order to compare the frequencies. Some of the items to address in such a comparison should include the sensitivity of the results to the mesh at which the model is given as well as the boundary condition used by each oscillation code.
- To initiate the following activities [beginning September 2005]
  - *Task 2*: to initiate this task, sets of stellar parameters will be asked from different model builders. After the full set of “observational” cases is defined, models from other model builders will be requested. A full identified set of cases and some preliminary results on fitting models should be ready by the next CoRoT Week [December 2005].
  - *Task 3*: it is important that *Task 1* is “satisfactorily” finished before we proceed with this task. But it should be initiated as soon as possible.
- To organise working meetings (ideally two) in the fall. These should be workshops for a small group of code developers and people involved in the models comparison. A detailed working plan (and priorities) must be established for each workshop and the details of the organisation will be discussed with the sites proposing to host these workshops. Two proposals have been received for hosting these workshops: Nice (dates to be defined) and Aarhus (15-30 October 2005).