COROT/SWG Milestone 2000 - Foreword

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1. Introduction

the responsability of SWG could be summarized the following way: It has to prepare the optimal scientific interpretation of the COROT data, in terms of the Seismology Core Program. This Core Program (defined in the document DR1:COR-SP-0-83-PROJ, (17/12/97) also made available at http://www.astrsp-mrs.fr/projets/corot/sismo-stel.html) is strongly focussed on convection, rotation, core overshooting, or, more generally, transport mecanisms, including transport of chemical species, for stars around the main sequence phase. To do so, one of the tasks of the SWG is to identify the weak points in the (theoretical, numerical, observationnal) arsenal available to analyse and interpret the data, and to promote the investigation of these points. Since the COROT Kick-off Meeting (Nice, 98), the work of the SWG has been organized very much in this spirit and this Milestone meeting brings a good picture of the situation. It also provides an opportunity to plan which orientation might be needed for further work.

2. From the Kick-off meeting to the Milestone meeting - "taking care of the weak points"

A first phase of the activity of the SWG has been initiated at the COROT Kick-off Meeting (Nice 1998), where several weak points have been identified and defined as prioritary thema for the SWG, under the labels:

-"Estimation of the amplitudes of the solar-like oscillations in stars"

-"Effect of moderate and fast rotation"

-"constraints in terms of stellar structure"

-"chemical inhomogeneity"

-"data analysis"

-"characterisation of the targets" (in coordination with the Ground-Based Observations Working Group, Chair. C. Catala).

These different thema do, of course, have their own scientific interest, but, as already commented, these different thema were mostly considered as weak points to be investigated with emergency.

In the case of amplitude estimations for instance, the point was to try to obtain a better confidence in the estimations of the expected amplitudes of solar-like oscillations for stars other than the Sun. The importance of this point is obvious, because of its dimensionning role for COROT and other space missions.

The same goes for the effect of moderate and fast rotation; it was critical to have relyable theoretical and numerical tools to take into account these effects, and even more critical to know the limit of validity of these tools.

In a similar way, the problem of modes identification and its influence on the inversion studies was considered as urgent to explore.

As a result, several works have been initiated to produce, or test the necessary tools and techniques. The COROT/SWG/Milestone meeting brings a good picture of the situation.

Let us first address the excitation of the solar-like oscillations and the estimation of their amplitudes. In addition to progresses on the theoretical side reported at this workshop (see Samadi et al., these proceedings), the hopes and efforts put in the ground-based observations began to be rewarded. More and more ground-based observations tend to confirm that solar-like oscillations exist in other stars, with amplitudes roughly comparable to predictions (Martic et al. 1999, Barban et al. 1999, Bedding et al. 2001). This new situation is very encouraging.

Considering the treatment of moderate and fast rotation, the talk by M.-J. Goupil (these proceedings) gives a clear presentation of the application limits of the different techniques developed sofar to take into account rotation in the modeling of oscillations. Perturbative methods have been pushed to their limits. This already allows us to consider the seismic analysis of stars, with significantly high rotation rates. Nonperturbative approaches are on their way to give acces to even more extreeme cases (see Neuforge et al. and references therein, these proceedings; Rieutord, these proceedings).

The interpretation in terms of internal structure, as stressed by G. Berthomieu (these proceedings) requires improvement of both stellar evolution modeling and the inversion techniques. The latter, mostly developed for the Sun, have to be adapted to the stellar cases. We heard about works in progress on several aspects of the modeling: turbulent convection (see Kupka, also Kupka & Montgomery, these proceedings), diffusion of chemical species (see Turcotte & Hui-Bon-Hoa, these proceedings). The modeling of the oscillations is also being improved (Dupret & Scuflaire, these proceedings) and the testing of techniques to extract the seismic information is in progress, as described by J. Provost (these proceedings).

Techniques have been proposed (see Roxburgh, these proceedings) to tackle important features of the internal stellar structure, without individual identification of the detected modes.

"Why should we worry about chemical inhomogeneities in stars ?" asks M. Rieutord, before defending convincingly that it probably represents a key-aspect of the understanding of the structure and evolution of any real star, and that COROT data will bring a unique opportunity to address this point.

The data analysis techniques also have to be adapted and tested for the case of expected COROT data. Here again, Hare and Hounds exercices are on their way, as described by T. Appourchaux (these proceedings, see also C. Barban, these proceedings).

The characterization of the targets also can take advantage of the development of several tools presented here (e.g. F, Kupka and T. Lueftinger, or U. Heiter, these proceedings) and of the huge work achieved by the GBOWG, as described by C. Catala (these proceedings).

3. How should we proceed further ?

While the previously described activity of the SWG has to go on for several aspects of it, it already brought significant results, as commented previously. This allows us to look further in the preparation of the Seismology Core Program. We now have to organize the practical achievement of this program, considering the specific set of objects which might be observed with COROT. The different aspects of this scientific program have to be reconsidered in details and the optimum observational scenario has to be selected.

Acknowledgments

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