The Belgian participants in the COROT experiment

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ABSTRACT

We present the Belgian scientists involved in asteroseismological work and more specifically the teams of Liège and Leuven.

1. The Belgian Asteroseismology Group

The Belgian participation in the COROT experiment has been recently confirmed and it would be appropriate to present the Belgian astronomers involved in asteroseismological work. C. Aerts already did such a presentation for the COROT Scientific Council in May of this year. Since then, the size of the Belgian Asteroseismology Group has increased. The members come from different institutes of the country and are listed in Tab. 1.

2. The team of Liège

The members of the Institute of Astrophysics and Geophysics of Liège (IAGL) working in asteroseismology or in related domains are presented in Tab. 2. A. Noels is the head of the team. She works on stellar evolution and stability and on the dynamical and chemical evolution of the globular clusters. The next four names are staff researchers. P. Magain is working on dynamical and chemical evolution of globular clusters, spectroscopy of metal-poor stars and image processing. C. Neuforge is presently at Los Alamos National Laboratory where she is working on stellar evolution and stability and in helio-seismology. She will be back in Liège at the end of this year. R. Scuflaire is interested in stellar evolution and stability. A. Thoul is working on dynamical and chemical evolution of globular clusters. The last four names are PhD students. F. Bancken is modelling the Galaxy, M. Briquet is studying Slowly Pulsating B Stars, M.-A. Dupret has written a stellar pulsation code and G. Parmentier is working on dynamical and chemical evolution of globular clusters.

Table 3 shows how the members of the Liège group see their future implication in the different themes of the COROT experiment. The numbers in parentheses after each name give the percentage of time each

Member	Institute
Conny AERTS	Katholieke Universiteit Leuven
Torben ARENTOFT	Vrije Universiteit Brussel
Maryline BRIQUET	Université de Liège
Jan CUYPERS	Royal Observatory of Belgium
Peter DE CAT	Katholieke Universiteit Leuven
Joris DE RIDDER	Katholieke Universiteit Leuven
Marc-Antoine DUPRET	Université de Liège
Laurent EYER	Katholieke Universiteit Leuven
Lars FREYHAMMER	Vrije Universiteit Brussel
Emmanuel JEHIN	Université de Liège
Martin KNUDSEN	Vrije Universiteit Brussel
Katrien KOLENBERG	Katholieke Universiteit Leuven
Patricia LAMPENS	Royal Observatory of Belgium
Pierre MAGAIN	Université de Liège
Corinne NEUFORGE	Université de Liège
Arlette NOELS	Université de Liège
Geneviève PARMENTIER	Université de Liège
Tinne REYNIERS	Katholieke Universiteit Leuven
Richard SCUFLAIRE	Université de Liège
Chris STERKEN	Vrije Universiteit Brussel
Anne THOUL	Université de Liège
Katrien UYTTERHOEVEN	Katholieke Universiteit Leuven
Christoffel WAELKENS	Katholieke Universiteit Leuven
Bart WILLEMS	Katholieke Universiteit Leuven

Table 1: The Belgian Asteroseismology Group (BAG)

one hopes to dedicate to the theme. The main contributions of the group will go to the first three themes: excitation and amplitudes of the modes, effect of moderate and fast rotation and constraints in terms of stellar internal structure. The group has two main projects in relation with the COROT experiment. The first one is related to stability and excitation mechanisms in variable stars. At the heart of the project, there is the code developed by M.-A. Dupret to compute nonradial, nonadiabatic pulsations of stellar models. The second one is related to the use of nonperturbative methods in the computation of the effects of rotation on stellar oscillations. M. Briquet and C. Neuforge have committed themselves into two different approaches. These projects will be briefly presented in other communications during this meeting. Of course, the ultimate goal of both projects is to obtain constraints on stellar models. Our stellar evolution code is presently undergoing a serious updating. R. Scuflaire is deeply involved in this task. He will receive the help of C. Neuforge in a near future and of the whole team for specific points.

Head of the team:	Arlette NOELS
Staff researchers:	Pierre MAGAIN, Corinne NEUFORGE, Richard SCUFLAIRE, Anne THOUL
PhD students:	Fabrice BANCKEN, Maryline BRIQUET, Marc-Antoine DUPRET, Geneviève PARMENTIER

Table 2: The team of Liège

COROT SWG theme	Project	Scientists
Excitation and amplitudes of the modes	Stellar stability	M.-A. Dupret (50) A. Noels (10), R. Scuflaire (10)
Effect of moderate and fast rotation	nonperturbative methods	M. Briquet (30) M.-A. Dupret (10), C. Neuforge (20) A. Noels (10) R. Scuflaire (10)
Constraints in terms of stellar internal structure	Update and maintenance of the evolution code	F. Bancken (10) M.-A. Dupret (10), C. Neuforge (20) A. Noels (10), R. Scuflaire (30) A. Thoul (10)
Chemical inhomogeneity	Origin of chemical composition anomalies and diffusion phenomena	C. Neuforge (10) G. Parmentier (10), A. Thoul (10)
Data analysis	Obtaining periods from the light curves	M. Briquet (30) P. Magain (10)
Characterization of the targets	Additional ground-based observations	P. Magain (10)
The estimated contributions of IAGL would amount to 320 % distributed over 9 researchers.		

Table 3: Implication of the IAGL team in the themes of the Seismology Working Group

3. Pulsating star research in Leuven

In Leuven, there is a very active group of pulsating star researchers. The head and driving force of the group is **Conny Aerts**, who is doing research on Slowly Pulsating B stars, β Cephei stars, γ Dor stars, Be stars and LBVs.

Currently, she has four PhD students: Peter De Cat, Joris De Ridder, Katrien Kolenberg and Katrien Uytterhoeven each of them doing observational research. Tinne Reyniers, a PhD student of professor emeritus P. Smeyers, represents the theoretical division in Leuven.

Peter De Cat:
He is analysing an impressive database of high-resolution high signal-to-noise spectroscopic data of some carefully selected southern slowly pulsating B stars. In addition he also analyses the Geneva and Hipparcos photometry for each of his targets. As many reliable frequencies as possible will be squeezed out of his datasets, in a detailed frequency analysis. Afterwards, the active pulsation modes will be identified with the moment method and the method of photometric amplitudes. From an asteroseismological point of view, these stars are very interesting because they show g-modes which penetrate deep into the star. The most promising targets of his dataset will be selected for a very long term monitoring project to disentangle the entire frequency spectrum.

Joris De Ridder:
He is studying how to interpret line profile variations (lpv) of nonradial pulsating stars. To do so, he wrote a computer code to model these lpv's, which not only includes the velocity field but also more subtle variations like temperature and intensity variations and surface distortions. The modelling is largely completed and is ready to be applied to 'real' stars. Improving the mode identification techniques for ground-based data is another project of his, in which he collaborates with statisticians. The aim is to find uncertainty regions for the pulsational parameters.

Katrien Kolenberg:
She is studying RR Lyrae stars, in particular the prototype RR Lyrae itself. She analysed the best spectroscopic data set ever measured for this star, which led to the discovery, for the first time, of a frequency multiplet in spectroscopic data. The main question she tries to answer is: where does the Blazkho effect come from? She expects her dataset will be able to make progress in distinguishing between the competing 'nonlinear resonance' and 'oblique pulsator' models.

Tinne Reyniers:
She is doing a theoretical study of tidal perturbations of free oscillations in components of close binaries. The theoretical modelling is largely completed, and will be first applied to polytropic stellar models. Once this is finished, the theory can be applied to more advanced stellar models so that it can be introduced in the battlefield of 'real' observational data.

Katrien Uytterhoeven:
She is collecting and analyzing high-resolution spectroscopical data of rapid rotating β Cephei stars in double or multiple systems. Currently, her favorites are κ Scorpii, λ Scorpii and β Centauri. After a detailed frequency analysis, an attempt for mode identification will be made. She will also look in her data for possible pulsational motion - orbital motion interaction. She is constructing an overview of the knowledge of pulsating stars in close binaries.

We also mention, of course, the director of our institute: **Christoffel Waelkens** who is still keenly interested in pulsating star research, despite his overloaded daily schedule.

I would like to end with two post-docs, the first one being **Laurent Eyer**, a Hipparcos disciple, who remained the last two years as a post-doc in our institute and became a little bit Belgian. Currently, his interests are mainly concentrated on γ Doradus stars. Besides Laurent, **Bart Willems** graduated recently in Leuven. He is specialised in the study of dynamic tides in close binaries. He has a post-doctoral position in Milton Keynes but still closely collaborates with the research group in Leuven.