

AsteroFLAG Collaboration
Summary of the 1st ISSI Workshop
Jan 8 – 12 2007, Bern, Switzerland



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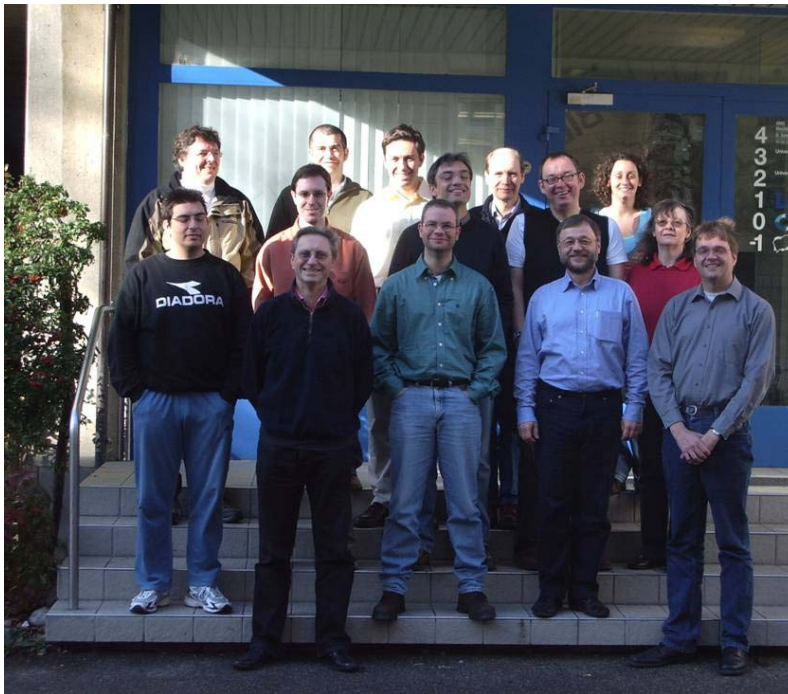
Summary:

This is an executive summary of the 1st ISSI workshop. Here, I draw together the main conclusions of the workshop. These conclusions included thoughts on the scope and potential of asteroFLAG, in particular for helping with preparations for the Kepler Asteroseismology Investigation (KAI), testing analysis of existing ground-based data, and for providing additional support for members of the group who are part of the COROT Data Analysis Team. I summarize the aims that were defined for the first asteroFLAG hare-and-hounds exercises. And finally I include a matrix table of “areas of interest” of members present at the workshop. This table should be expanded to include entries for all members who could not be present in Bern.

Present at the workshop:

Thierry Appourchaux (IAS/Orsay)
Jerome Ballot (MPA/Garching)
Bill Chaplin (Birmingham)
Orlagh Creevey (NCAR/Boulder)
Yvonne Elsworth (Birmingham)
Stephen Fletcher (Birmingham)
Rafa García (CEA/Saclay)

Günter Houdek (IoA/Cambridge)
Sebastian Jiménez-Reyes (IAC/Tenerife)
Hans Kjeldsen (Aarhus)
Roger New (Sheffield Hallam)
David Salabert (NSO/Tucson)
Sergio Sousa (Porto)
Thierry Toutain (Oslo& Birmingham)



A group of suspicious looking individuals mingle outside ISSI

Introduction

We had an extremely enjoyable, and productive, week in Bern. The program comprised a mix of presentations and discussion sessions, covering important areas of relevance to the asteroFLAG collaboration. Many thanks to Thierry Appourchaux, Hans Kjeldsen, Orlagh Creevey, Rafa García, Thierry Toutain and Günter Houdek for giving talks.

Archive of presentations and summary slides

An archive of presentations given at the workshop, together with notes summarising the main points of each presentation, and the discussions that arose from them, is being made available on the asteroFLAG website. My thanks go to Yvonne Elsworth, who is organising this material.

The documents will be placed in the password protected part of the website to restrict access to members of the group. Password information will be distributed by WJC to the group members by e-mail.

Main Points from the workshop

Overarching aim of the group

- To help inform analysis for making asteroseismic inference, in particular on Main Sequence stars;
- To test various aspects of the analysis, from extraction of information on the mode parameters, through to inferences drawn on the fundamental stellar parameters;
- Hare-and-hounds exercises on artificial data will be a major part of our work.

The Kepler Asteroseismology Investigation (KAI)

Hans Kjeldsen gave an in-depth presentation on Kepler. The goals of Kepler asteroseismology are to provide support for studies of extra-solar planetary systems through categorization of the parent stars, and to perform in-depth asteroseismic investigations on a number of stars. The Kepler Asteroseismology Investigation (KAI) is being managed by Kepler Co-Is Jørgen Christensen-Dalsgaard, Tim Brown, Ron Gilliland and Hans Kjeldsen. The details on how the wider Kepler Asteroseismic Science Consortium (KASC) will be set up are still to be confirmed, but the intention is that the KAI will invite scientists (including members of asteroFLAG) to participate in the KASC, and that there will be an open policy for the *asteroseismic* data. A broad membership is anticipated, from the US, Europe and Australia. Details are given in Hans's presentation, and Yvonne's accompanying notes (see the online archive).

We identified clear opportunities where the asteroFLAG hare-and-hounds exercises could be used to help, for example on informing choices that will be made on selection of asteroseismic targets (*e.g.*, what are the large and small frequency spacing detection limits in different parts of the HR diagram?). The selection of targets will be the first important goal for the KAI and the working groups that will be comprised of KASC members.

Support for ground-based observations

Our discussions recognised that there is a great opportunity for asteroFLAG to get involved not only in helping to test analysis of the available ground-based data, but also in actually analysing those data. It was noted that there is potentially still much to exploit from the ground-based data. For example, it was felt that the recent extensive multi-site campaign on Procyon would provide an exciting, and timely, place to start: we would set the simulation of these data as a priority in this area.

COROT

Several members of the asteroFLAG group are leading members of the COROT Data Analysis Team (DAT). Thierry Appourchaux gave an in-depth presentation on the work of the DAT, and the extensive hare-and-hounds work that has been undertaken to prepare for analysis of the COROT data. To fix initial goals for the asteroFLAG hare and hounds (see below) we discussed at length what had been learned from the COROT exercises. We noted in particular the problems associated with extraction of the angle of inclination and the rotational splitting, and the problem of tagging the angular degrees of modes (as discussed by Rafa García).

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It was also noted that our activities could of course be extended to testing analysis of the other satellite data.

Initial goals for the hare-and-hounds exercise

Re: the Kepler Asteroseismology Investigation (KAI)

1. The first datasets will be made by the hares to simulate multi-year, Kepler-like observations of several Main Sequence targets.
2. The first goal will be to test extraction of the large and small frequency spacings, in particular the detection limit, as a function of visible magnitude, on different parts of the Main Sequence. Fixing age and radius will be a vital element of the work done in support of the extra-solar planet searches, and the spacing data will be a key here. Our first goal also avoids duplication of work from COROT.
3. The next goal will be to test extraction of the rotational frequency splittings, and angle of inclination, from peak-bagging analysis in the frequency power spectrum. Knowledge acquired from the COROT hare and hounds will be vital here. Since the Kepler datasets will be much longer than their COROT counterparts, there is the potential for obtaining more accurate and precise measures of inclination and rotational splitting.
4. To allow members to properly test and validate their fitting, we shall be making available multiple datasets on some of the stars—for example, for different apparent magnitudes, angles of inclination, different rotation rates, with and without the effects of near-surface activity on the modes *etc.*
5. The hares will also release “traditional” stellar data (*e.g.*, measures of colour, parallax, apparent magnitude, metallicity *etc.*) to accompany each time series.

Some notes on practicalities

- The hares are aiming to have the first releases of data in the time-frame late February to early March.
- The format for the data was agreed at the workshop (see summary discussion slides of WJC in the workshop archive). Data releases will come with a full, comprehensive set of explanatory notes. Information on the format in which results should be returned to WJC will be given in the dataset release.
- Timescales for return of results will be given in the dataset release.

Re: the ground-based data

1. The hares will also be making available timeseries to mimic ground-based observations.
2. It was decided that a high priority should be simulation of the recent multi-site campaign on Procyon. This will be the first set the hares will make (release date: some time in March).

Some notes on practicalities

- The release of data will again be accompanied by comprehensive notes. These data will be sampled on an irregular cadence, and there will be estimates of uncertainties on each Doppler velocity residual.

Areas of interest of members

Those present at the workshop noted in which of the areas of the asteroFLAG activities they would see themselves participating. The table in the appendix is a “matrix” of member’s interests.

Action on members not present in Bern—would you please let me know in which of the areas you see yourself participating (please do suggest any other areas missing from the table). Many thanks!

Acknowledgements

On behalf of the group I would like to thank all those at ISSI, in particular Vittorio Manno, Brigitte Fasler, Saliba Saliba, for their help and hospitality. This work was also supported by the European Helio- and Asteroseismology Network (HELAS), a major international collaboration funded by the European Commission’s Sixth Framework Programme.

Finally, a big thank-you to all participants for their contributions to what was, I think, a very productive week.

Notes on Table Headings

1. Large/small spacing: the first goal of the hare and hounds exercise, to test extraction of the large and small frequency spacings.
2. Peak bagging: fitting multi-parameter models to describe the modes, usually in the frequency domain. Here, I have highlighted the fact that we wish to concentrate initially on looking at results on extraction of the inclination and rotational splittings.
3. The hares are making the artificial data.
4. Peak tagging: identifying the angular degrees, l , of the modes; and labelling the modes by n (Orlagh has been working with Jørgen and Travis Metcalfe on use of techniques for labelling that make use of genetic algorithms).
5. Application of techniques that have been used to analyse stellar data
6. Alternatives to peak bagging [see also (5)].
7. What can one usefully extract from short datasets? Relevant in particular to the ground-based data [see also (5) and (6)].
8. Tests of inversion techniques on the seismic data.
9. Use of the information extracted on the modes to make inference on the stellar parameters.
10. Bill will take on the role of analysing the results of the first tasks in the hare-and-hound exercise. He will also be responsible for producing posters and other publicity material for the group. Yvonne has kindly agreed to act as 'Company Secretary' (*e.g.*, she has taken responsibility for producing notes on the presentations and discussions from the workshop).