Report of the 2nd SpaceInn Workshop

Deliverable D4.3

March 11-13, 2015

Freiburg, Germany

SpaceInn Grant Agreement no: 312844
SOC: Dr. Markus Roth (KIS), Dr. R.A. García (SAp, CEA-Saclay)
Workshop Website:
http://www.spaceinn.eu/events/spaceinn-global-helioseismology-team-meeting/

Collaborative Project funded by the European Union under
THEME [SPA.2012.2.1-01]
Exploitation of space science and exploration data

Scientific Rationale

The SpaceInn activities aim to enhance use of the existing and incoming data collected from space-based and ground-based helio- and asteroseismic instruments. The activities are organized in terms of the following topics: data access, scientific expertise, and coordination actions.

The 2nd Global Helioseismology Team meeting was focusing on reviewing the status of the development of the deliverables and to decide on their final set-up. The new solar activity proxy is ready, the final selection of parameters was made. The peak-bagging algorithm is in the final development stages and will become publicly available by the end of the year. The data sets to be combined were finally selected. In addition the meeting offered the possibility to collect the current knowledge on how to determine mode parameters and to discuss systematic effects.

The topics discussed in the various sessions comprised:

- Review of actions
- Presentations on activity and variation
- Progress on low-frequency analyses
- Development of a new simple code for fitting helioseismic data
- Progress on combining data of different instruments
- New global helioseismic techniques

Figure 1: Group photo of the Workshop participants

Scientific Program

The Workshop was held from Wednesday (March 11, 2015) afternoon until Friday (March 13, 2015) noon. The focus was on discussiong the upcoming work on the deliverables and the needs of the scientific community.

Wednesday, March 11, 2015

14:00 Welcome – R. Garcia & M. Roth

Review of actions
14:10 Review of Activities – R. Garcia
14:20 SpaceInn Deliverable 4.2 (S_ph) – D. Salabert
14:50 Discussion on the latest and next SpaceInn deliverables

15:30 Coffee

Presentations on activity and variation

16:00 Activity cycle seen by GOLF – D. Salabert

16:30 Changes of the Solar Rotation as Seen by Some 20 years of GONG, MDI & HMI Observations – S. Korzennik

18:00 End

Thursday, March 12, 2015

Progress on low-frequency analyses

9:00 New approaches to low-frequency BiSON analysis and tests on extracting solar-cycle variability – J. Kuszlewicz

9:20 Statistical searches of low-frequency helioseismic data – A.M. Broomhall

9:40 The Envelope Spectrum – R. Kiefer

Development of a new simple code for fitting helioseismic data

10:00 Solar fitting Code – E. Corsaro

10:20 Effect of line profile asymmetry in peak profiles on GONG frequencies – Shushanta Tripathy

10:40 Coffee

Progress on combining data of different instruments

11:00 Status of combining data of different instruments – A.M. Broomhall

11:20 Fitting of intensity-velocity cross spectrum using GONG and HMI oscillation data – Shushanta Tripathy

11:40 Discussion on fitting code, data combination / work distribution
– Bayesian, MLE, parametric, three-dimensional fitting
– Low-degree modes
– Instruments and data for combination

12:30 Lunch at KIS

14:00 Working session
– Data Combination
– Fitting codes
– Low-frequency analysis
– S_ph paper

15:30 Coffee

16:00 Continuation and/or summary of work session
– Discussion on low-frequency analyses
– Discussion on activity and variation

18:30 Self-paying dinner in the Mexican restaurant “Enchilada”

Friday, March 13, 2015

<u>New global helioseismic techniques</u>

9:00 Cross-spectral analysis for measuring meridional flow and rotation – A. Schad
9:20 Comments on global helioseismology – Jesper Schou
9:40 Discussion on new techniques

10:30 Coffee

11:00 Discussion on the frequency of updating (every 3-4 months)
12:30 End of Workshop / Brezels

Oral Presentations:

All oral presentations of the Workshop can be found via the central web site of the meeting:

http://www.spaceinn.eu/events/spaceinn-global-helioseismology-team-meeting/

List of Participants:

1. Anne-Marie Broomhall, University of Warwick, UK
2. Enrico Corsaro, CEA Saclay, Paris, France
3. Antonio Ferriz-Mas, University of Vigo, Spain
4. Rafael Garcia, CEA Saclay, Paris, France
5. Wiebke Herzberg, Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany
6. Frank Hill, National Solar Observatory, Tucson, USA
7. René Kiefer, Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany
8. Sylvain Korzennik, Center for Astrophysics, Harvard, USA
9. James Kuszlewicz, University of Birmingham, USA
10. John Leibacher, National Solar Observatory, Tucson, USA
11. Eric Michel, Observatoire de Paris, France
12. Kaori Nagashima, Max-Planck-Institut für Sonnensystemforschung, Göttingen, Germany
13. Pere L. Palle, Instituto de Astrofisica de Canarias, LaLaguna, Tenerife, Spain
14. Markus Roth, Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany
15. David Salabert, CEA Saclay, Paris, France
16. Ariane Schad, Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany
17. Jesper Schou, Max-Planck-Institut für Sonnensystemforschung, Göttingen, Germany
18. Michael Thompson, University Cooperation for Atmospheric Research, Boulder, USA
19. Sushanta Tripathy, National Solar Observatory, Tucson, USA
20. Oskar von der Lühe, Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany

Conclusions:

The overall review of the activities carried out in the past was very positive. All deliverables are on track. The activity proxy will become a standard data product to be made available to the community. This index would be of particular interest for asteroseismology, too. Scientifically this allows the research community to study the various sources of variability of the photometric and velocity time series. This, e.g., could be carried out by statistical analyses of the asteroseismic proxy in relation to other activity proxies (sunspot number, radio flux, Ca H&K index, …).

The fitting code to be made publicly available will be based on a Bayesian approach. This brings a detection probability, which is relevant in cases of low signal-to-noise-ration, e.g. at low frequencies in the solar oscillation spectrum. Overall, this code will offer the flexibility needed form the community when it comes to obtaining mode parameters from sun-as-a-star velocity and intensity data.

Combining data of different instruments brings the advantage of suppressing the incoherent noise present in the individual data sets, while concluding better on the coherent oscillation signal in the background of the coherent noise. Still work needs to be carried out, especially in regard of developing Bayesian statistics to account for common noise.