

Future opportunities and interdisciplinary activities

It has indeed been a very busy and exciting year at the Stellar Astrophysics Centre (SAC). From 15 to 19 June 2015 SAC hosted a large international workshop - *KASC8/TASC1 workshop, Space Asteroseismology: The next generation* - with 150 participants from all over the world. The workshop aimed at planning and discussing the present and future activities within space asteroseismology. The workshop covered new results from the analysis of Kepler/K2 data as well as the development of analysis techniques required to exploit those data to their full potential. The workshop also contained a first general discussion of the activities of the TESS Asteroseismic Science Consortium (TASC) as well as an initial discussion of the planning of PLATO asteroseismology.

From 19 to 22 October 2015 the whole staff and all our students at SAC went to Skagen on the annual SAC Retreat to discuss and plan the future with the aim of reaching the exciting and ambitious goals of the centre. A mixture of talks given by invited researchers and members of the SAC staff and lively discussions created the perfect environment for planning our future.

Following the official opening in 2014 of the Hertzsprung SONG telescope on the island of Tenerife we have now started to see a huge flow of amazing data from SONG. The subgiant star μ Herculis has been observed by SONG for more than 200 nights in 2014 and 2015. The quality of this data series is excellent in terms of noise and frequency resolution. Based on the present accuracy of the SONG data for μ Herculis, it is clear that over the coming decade we will be able to follow the development of mode life time, frequency shifts and p-mode power with the aim of measuring changes in oscillations caused by stellar activity. There is no doubt that μ Herculis will become the best studied subgiant star in the Milky Way. It is the perfect single-site target and a showcase for the wonderful capabilities of the SONG Hertzsprung Telescope.

The Stellar Astrophysics Centre has a large number of collaborators on a national and international level. In a fast evolving research environment we need to identify new opportunities and search for new collaborators (both individuals and groups). SAC is also initiating new interdisciplinary activities involving close collaborations with geophysicists and engineers. A major component in the Stellar Astrophysics Centre structure is the external nodes. The following six external groups are formally connected to SAC: University of Sydney, Australia; University of Birmingham, UK; Max Planck Institute for Solar System Research, Göttingen, Germany; NASA Ames, USA; Kiepenheuer Institute für Sonnenphysik, Germany and Massachusetts Institute of Technology, Cambridge, MA, USA. The external nodes are central in our research activities and representatives from most of the nodes were also present at the four-day SAC Retreat in Skagen in the autumn. In 2015 we have had an active exchange of staff and students between the nodes and Aarhus University for short and long periods.

One of the main scientific results from NASA's Kepler mission is that every Sun-like star is likely to host a number of exoplanets, many of them very different from those we find in our solar system. We have identified hot Jupiters, super-Earths, hot Neptunes, water worlds and exo-Earths. In order to improve our understanding of those exoplanets we have started a close collaboration with the Department of Geoscience at Aarhus University. This interdisciplinary activity focuses on dynamic processes within the interior of exoplanets including mantle convection, plate tectonics, volcanoes, mountain building and the generation of magnetic fields. Together with the researchers at Geoscience we have started a workshop series and close collaboration in order to take the first steps towards modelling of exoplanet interiors and with the aim of defining a Geodynamics of Exoplanets program at Aarhus University. It is clear that we have not only a strong growing exoplanet group at the Stellar Astrophysics Centre but also a flourishing Geochemistry and Petrology group at the Department of Geoscience at Aarhus University.

A new exciting collaboration across several disciplines was established in 2015 with the aim of studying the possibility to design, build and launch a small scientific satellite. The development of satellite technology during the past years has made it possible to build and launch reliable and relatively cost-efficient nano-satellites with a payload focusing on research. Stellar Astrophysics Centre has for years participated in the development of scientific projects around major scientific space missions in the framework of NASA, ESA and CNES. We have now started the process of identifying the research potential and studying the possibility for Aarhus University to design and launch a nano-satellite focusing mainly on astronomy, but also on physics, geoscience and engineering.

The collaboration involves researchers from the Departments of Engineering, Geoscience and Physics at Aarhus University as well as our nodes at Sydney and Birmingham. We have also established a close collaboration with the company GOMSpace Aps in Aalborg in order to involve the industry with the aim of making the development fast and efficient.

A large number of other activities took place at SAC in 2015 incl. outreach, teaching, workshops, access to new challenging data, international conferences and exchange of staff between the SAC nodes. We provide a more detailed description of some of those activities below.