

REPORT ON THE 6TH COSPAR CAPACITY BUILDING WORKSHOP

Solar-Terrestrial Interactions: Instrumentation and Techniques (STIINTE)

Sinaia, June 4-16, 2007

The Committee for Space Research (COSPAR) initiated in 2001 a series of Capacity-Building Workshops with the objective to develop the scientific skills of young scientists from developing countries by well-targeted and high level courses on space data processing. The sixth workshop of this series took place in Sinaia (Romania, June 4-16, 2007), and was dedicated to the analysis of data from multisatellite space missions such as Cluster.

This workshop was attended by 24 very motivated PhD and post-doc students coming from Central and Eastern Europe: Romania, Hungary, Bulgaria, Czech Republic, Poland, Ukraine, Russia, Armenia, and Georgia.

Scientific programme

The scientific programme of the STIINTE workshop focused on various aspects of multisatellite missions, including both data analysis, instrumental aspects, numerical simulation and physical interpretation. The first week of the workshop consisted of a series of lectures and associated computer sessions. A typical day consisted of 3 hours of lectures in the morning, followed by two computer sessions of 2 hours each.

The following topics were addressed:

- The Cluster mission
- Basic data analysis techniques
- Introduction to public data archives
- Magnetospheric boundaries in spacecraft data and boundary analysis
- Magnetic and electric field instruments, design and calibration of space magnetometers
- AC field analysis measurements and wave analysis tools
- Particle spectrometry and analysis of particle spectra
- Auroral processes and conjugate observations of auroral signatures
- Introduction to kinetic theory, modelling of particle kinetics, MHD versus kinetic modelling

The lectures and computer sessions at this workshop were given by: Uli Auster (Braunschweig), Thierry Dudok de Wit (Orléans), Marius Echim (Bruxelles and Bucharest-Măgurele), Edita Georgescu (Garching), Stein Haaland (Bergen and Garching), Tomas Karlsson (Stockholm), Berndt Klecker (Garching), Joseph Lemaire (Bruxelles), Octav Marghitu (Bucharest-Măgurele and Garching), Götz Paschmann (Garching), Ondřej Santolík (Prague), and Joachim Vogt (Bremen). Most of the lecturers also acted as tutors for the project teams.

Our experience from previous workshops shows that 6 to 9 lecturers is the ideal number for such a two-week workshop. Some of the organisers also lectured or ran computer sessions, bringing the total number to 12. Two key criteria for selecting these lecturers were their pedagogical skills and their ability to interact and raise the interest of the students. For this particular workshop, we also considered existing collaborations with Central and Eastern European countries as an asset.

Most lectures were followed by hands-on computer session in the afternoon. This had already proven to be a remarkably efficient way of putting into practice what had been learnt during the morning. Most computer sessions were organised in a multilevel way, so that each student could work at his own pace and pick out the topics he was most interested in. Depending on the subject, the emphasis was put on the retrieval of satellite data from archives, on their analysis with various techniques or on running existing simulation codes.

Organising computer sessions probably is one of the most demanding aspects of such a workshop. First, the lecturers have to prepare a list of assignments that meet the expectations of the students. Then these assignments have to be organised in such a way that the students can follow them regardless of their knowledge about the computer environment and programming tools. Finally comes the challenge of setting up the computer network and always keeping it operating. We are strongly indebted to the local organising committee for succeeding in doing this.

Although the students already had several years of experience in space data analysis, all the lectures and the computer sessions were highly appreciated. The reason for this was their application-oriented rather than academic approach. Most lecturers spent more time on practical aspects and common problems (and their solutions) rather than on basic principles. The students indeed confirmed that practical problems such as the lack of knowledge about the pitfalls of an instrument, about the availability of a given data set or about the existence of an appropriate analysis technique, often are major obstacles in their scientific research. As a general rule, the objective was to inform the students about what exists or to provide them with means for finding the information they need.

Projects

After a first and already quite intensive week, the work culminated in the preparation of scientific projects by different teams. Each team had to address a specific problem in magnetospheric physics, gather the appropriate data or carry out the proper simulations, and deliver results. A list of topics had been proposed, both by the students and by the lecturers, out of which five topics were selected:

- Auroral Knight relation using electric field and particle data
- What are the proper solar wind inputs for predicting geomagnetic indices ?
- Determination of the macroscopic parameters of the Earth's magnetopause
- Estimation of the IMF disturbances propagation delay time
- Test of collisionless transport equations in the solar wind

The team-work was very intensive and provided an excellent opportunity for the students to interact, to develop their communication skills and to apply what had been learnt. Most of the lecturers also acted as tutors. Adrian Blăgău (Garching and Bucharest-Măgurele) and Dragoș Constantinescu (Braunschweig and Bucharest-Măgurele) joined as tutors during the second half of the school. The interaction with the students was intense and discussions often lasted until late in the night.

On the last day of the workshop, each team defended its project to a panel of nine senior scientists who were participating at the simultaneous STIMM-2 (Solar Terrestrial Interactions from Microscales to global Models) meeting. The high performance of all five teams was unanimously recognized by the members of the jury. The outcome of the project period was celebrated during an award ceremony on that same day.

One immediate benefit of these projects is the continuation of the collaborations between some of the team members. At least two projects will be presented at the next Cluster conference (STAMMS2, Orléans, 24-28 September 2007), which will be attended by some participants. More importantly, the workshop has contributed to creating a community by bringing together young scientists that are likely to meet again and play a leading role in future space projects. Although the impact of this cannot be evaluated at present, we consider it to be one of the prime benefits of the workshop.

Feedback and follow-up

All the reactions we received were unanimously positive. Some points, however, are still open to improvement or necessarily need a compromise. Below follows a list of some of the issues that were raised during or after the workshop.

- The students come with different expectations and often strongly differ in their education. The latter point can be overcome by following a multilevel approach. The differing expectations are harder to deal with. Some students may for example have a strong preference for instrumentation whereas others may want to go deeper into the physics. One solution, which has not been tried out so far, would be to have some splinter sessions. This does not imply having more lecturers, since many of them could actually address similar issues from different viewpoints.
- The differing expectations of the students were particularly obvious during the computer sessions, where progress strongly depended on their prior knowledge of the analysis software (IDL, Matlab, or other) and the computer environment. All computers were running under Linux, whereas most students were more familiar with Windows. Everyone agreed though that it was a rewarding experience to stay under Linux.
- Some students also expressed the need for having more time to discuss scientific issues. Although the schedule was quite dense, there were plenty of opportunities to interact during breaks, meals, evenings (most of which were free) and social events. There was a need, however, for having some formal time slots during which students could ask questions. One potential advantage of such “question sessions” is the possibility of having a debate involving several people rather than a dialogue.
- The workshop has also revealed the need for improving the working environment of scientists in Central and Eastern Europe. Many teams still suffer from a strong subordination of science to administration, which is often a major obstacle to international collaborations. One issue here is the training of local administrative personnel with the aim to ease the participation of scientific teams in competitive international projects. More detailed analysis is needed to determine how this problem should be addressed.
- Many participants have expressed a need for a follow-up in Central and Eastern Europe. Missions such as Cluster, FAST, and THEMIS have provided a wealth of high-quality data that are particularly appropriate for collaborative research, and could help young scientists to interact more strongly with their colleagues from other countries. The STIINTE workshop has confirmed the need for this and hopefully will lead to a more regular series of such events.

- Let us finally stress the positive impact on the host country, which has strongly invested in this workshop and will rightly reap significant benefits. The STIINTE and STIMM-2 workshops have given the young Romanian space physics community an opportunity to show its potential in playing a key role in space science. At the same time, the workshops confirmed to the local Romanian administration the importance of developing space science and emphasized the need for fostering collaborative projects.

Acknowledgements

The sponsors and supporters of STIINTE were: COSPAR (host), the Romanian Space Agency (ROSA), the Romanian Authority for Scientific Research (ANCS), ESA, URSI, UNESCO, the United Nations Office for Outer Space Affairs (UNOOSA), ICSU, ITT Visual Information Solutions, the Mathworks Inc., and the Phoenix Business computer company. Satellite data were generously provided by PI and CoI institutions involved in the Cluster, FAST, and THEMIS missions.

Costel Bunescu, Vlad Constantinescu, Horia Comișel, and Dragoș Constantinescu, together with Mariana Țeglet and Cosmin Rogojină, ensured the challenging setup and maintenance of the computer environment. Adrian Blăgău and Gabriel Voitcu had an instrumental contribution to the efficient solving of various logistic problems before and during the workshop. Thanks also to Cătălina Țeglet and Marius Stelea, for the reliable and well appreciated transport support.

The meeting took place in the COTA1400 hotel high above Sinaia, a small resort in the Carpathian mountains. We are grateful to the hotel personnel, particularly to Ionuț Bârlă, Dan Comărniceanu, Ovidiu Costea, Alin Dimache, and Radu Stănescu, for the high quality service provided, and for the prompt response to the specific needs of the workshop.

Finally, we would like to express our deepest gratitude to the members of the local organizing committee, to the Space Plasma and Magnetometry Group from the Institute for Space Sciences, Bucharest, for the preparation of this workshop, for their hospitality, and for highly appreciated social events. For sure we will not forget soon the thunderstorms and the close encounters with the bears !

For more information about the workshop and to access the workshop material, see

<http://www.faculty.jacobs-university.de/jvogt/cospar/cbw6/>
or <http://iss30.nipne.ro/cbw6/>

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August 20, 2007

