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Meteor activities within Europlanet

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The Europlanet project (<http://www.europlanet-ri.eu/>) is being carried out under the Seventh Framework Programme (FP7) of the European Union with the aim to increase the productivity of planetary projects, improve European scientific expertise in relevant research areas, and increase overall knowledge of planetary environments.

1 Introduction

The Europlanet Research Infrastructure links planetary scientists from more than 100 laboratories in Europe and around the world. The project helps planetary scientists to get the best out of their research by organizing networking activities, meetings, and conferences, providing access to laboratories and field sites in Europe, developing new facilities, and creating on-line access to planetary science data. This unique and innovative strategy has been developed in the frame of the Europlanet project with emphasis on maximizing synergies between different fields contributing to planetary research: space- and Earth-based observations, data reduction, laboratory experiments, numerical simulations, and modeling. The project is now in its final year, and many of the goals have been achieved. Here, we highlight Europlanet activities involving researchers interested in meteors.

2 Meteor activities within Europlanet

Meteor activities within Europlanet cover a wide area:

1. continued participation in the European Fireball Network activities;
2. regular Perseid meteor observing campaigns (2009, 2010, 2011, and 2012);
3. development of data reduction software;
4. set-up and testing of digital meteor station(s);
5. software development for digital meteor stations;
6. development of a prototype lunar impact flash observatory;
7. development of the Virtual Meteor Observatory (VMO), an archive for meteor observations;
8. student education and training;
9. cooperation with amateurs; and
10. participation in Europlanet-RI NA2 Expert Exchange Program.

The Technical University of Berlin (TUB), the German Aerospace Center (DLR), and Armagh Observatory organize international meteor observing campaigns every

summer focusing on the Perseids meteor shower. Since 2009, double-station observations have been carried out in the Peloponnese peninsula in Greece, involving graduate and undergraduate students and local amateur astronomers. As a result, a meteor data set covering the whole activity period of the Perseid meteor shower between July 22 and August 20 has been acquired. The observations were made using the Smart Panoramic Optical Sensor Head (SPOSH), a camera designed to image faint, short-lived phenomena on dark planetary hemispheres (Oberst et al., 2011). Due to the high sensitivity of the camera's sensor and the custom-made wide-angle lens, the camera has been successfully operated during our observing campaigns. In 2012, the post-maximum activity of the Perseids was monitored from August 15 to 20, favored by the New Moon on August 17. The reduction of the meteor data was done automatically using software developed at the TUB and the DLR. At present, the trajectories and orbits of 284 meteors have been computed (Margonis et al., 2012).

The meteor data reduction software has been optimized and extensively tested with data acquired in 2011 during the Perseids observation campaign funded by Europlanet and the TUB. The resulting meteor trajectories, radiants, heliocentric orbits and their errors have been tested against the results of up-to-date published meteor surveys. Furthermore, the method for computing the brightness of the meteors was discussed, and a routine was developed which uses the information of the camera's orientation to automatically identify the brightest stars in an image and retrieve their magnitudes in different bandwidths from a star catalogue.

As far as the development of a prototype lunar impact flash observatory is concerned, different techniques have been discussed which could be applied in order to increase the quality of the images depicting the dark side of the Moon. The study is to be completed by the end of this year, so the techniques developed will be available for implementation during future lunar observations.

The Virtual Meteor Observatory (VMO) has been developed in response to requirements defined by a Europlanet workshop in 2006. It is part of the Europlanet Integrated and Distributed Information System (IDIS). It is currently maintained by the Meteor Research Group of ESA's Research and Scientific Support Department in cooperation with the International Meteor Organization.

To ensure exchange of the acquired knowledge, and to further promote small solar system bodies research, a series of highly successful Europlanet workshops were organized:

1. Meteor Orbit Determination Workshop, Roden, 2006 (Koschny et al., 2008);
2. Impact Flashes and Ionospheric Effects, Cologne, September 27, 2008;
3. Meteoroid Effects on the Hermean Exosphere: Ob-

servations, Models and Predictions for Future Missions, November 12–13, 2009, Austrian Academy of Sciences, Space Research Institute, Graz, Austria;

4. Meteor Observations, Armagh, 2010;
5. Flashes, Craters and Moonquakes: Exploring the Present-Day Meteor Impact Flux on the Lunar Surface, October 21-22, 2010, Berlin, Germany;
6. The Meteoroid Flux in the Martian Satellite System—Models, Predictions, Observational Data, and Implications, Moscow, Moscow State University of Geodesy and Cartography (MIIGAiK), July 5–6, 2012¹.

These workshops brought together the seemingly disparate fields of meteor astronomy, hypervelocity impact physics, dust exosphere modelling, cratering, planetary interior modeling, and space instrumentation under the umbrella of the impact process. Participants became familiar with the different effects of impacts, the methods of measuring them, the data reduction techniques, and the models used to understand them. The workshops have helped explore the potential for future interaction between these fields with the goal that the knowledge from one discipline enhances, or even becomes the enabling factor to advance another. Finally, a future plan is to put together a schedule of actions and events with high interdisciplinary benefits to build on the legacy of these interactions.

A number of meteor publications have resulted from the workshops and the Europlanet Expert Exchange Program: journal articles (Oberst et al., 2011; Christou et al., 2012; Oberst et al., 2012), presentations and posters at scientific conferences, including EPSC in 2009–2012 (Elgner et al., 2009; Margonis et al., 2010; 2011; 2012).

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¹http://europlanet.miigaik.ru/2012/English_version/

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