THE 2011 DRACONIDS OBSERVATION CAMPAIGN FROM AIRPLANE AND GROUND STATIONS. J. Vaubaillon1, P. Kotten2, S. Bouley3, R. Rudawska1, L. Maquet1, F. Colas1, J. Töth3, J. Zender4, J. McAlulife2, D. Pautet3, D. Koschny4, P. Jenniskens1, A. Leroy8, J. Lecacheux9 and K. Antier1, IMCCE (77 Av. Denfert Rochereau 75014 Paris, France, vaubaill@imcce.fr). 2Astronomical Institute of ASCR, Fricova 298, 25165 Ondrejov, Czech Republic, kotten@asu.cas.cz), 3Faculty of Mathematics, Physics and Informatics, Comenius University in Bratislava, Slovak RepublicJuraj.Töth@fmph.uniba.sk), 4SRE-, (Solar System Science Operations Division, European Space Agency, ESTEC Noordwijk, the Netherlands, joe.zender@esa.int). 5INSA/ESAC Directorate of Scientific and Robotic Exploration European Space Agency - ESAC., Villafranca del Castillo, P.O. Box 78, 28691, España, jonathan.mcalulife@sciops.esa.int), 6Utah State university, (Science Engineering Research (SER) 220B, 4415 Old Main Hill, Logan, UT 84322-4415, dominiquepautet@gmail.com), 7 Carl Sagan Center, SETI Institute, 189 Bernardo Ave, Mountain View, CA 94043, USA (Petrus.M.Jenniskens@nasa.gov), 8Uranoscope d’Ile de France, 7 avenue CARNOT, 77 220 GRETZ-ARMAINVILLIERS, France, arnaudastrol@yahoo.fr, 9LESIA, Observatoire de Paris, Section de Meudon, 5, place Jules Janssen 92195 MEUDON Cedex, France, jean.Lecacheux@obspm.fr

Introduction: On October 8, 2011 around 20 UT, the Draconid meteor shower showed an exceptional outburst. This activity was forecasted by meteoroid stream modeling [1]. The science of the forecasting of the meteor shower is now robust enough that large observation campaigns can be organized. Several airborne and ground-based missions have been organized with success in the past [2]. In this paper, we describe the airborne and ground-based observation campaigns for the 2011 Draconids.

What was exceptional about the 2011 Draconids? The Draconids are slow meteors, originating from Comet 21P/Giacobini-Zinner. This Jupiter Family comet is suspected to carry a relatively high proportion of organic material in its grains [3]. The Draconid meteoroids are also known to be the most fragile meteoroids, making them potentially the most pristine material falling to Earth today. Moreover, the past Draconids storms observed in 1933 and 1946 are perhaps caused by the trails ejected in 1900. The predicted 2011 Draconids might also be caused by the exact same trail, allowing us to calibrate past observations. The goal of the campaign: During this campaign, we aimed to record the exceptional 2011 Draconids outburst, in order to derive the spatial density of the 1900 trail. This is a better understanding of what was observed during past storms using modern observing techniques. In addition, we set out to verify whether or not a second outburst would occur expected from trails ejected during the 19th century from comet orbits before its discovery. The witness of such an outburst would tell us a lot about the pre-1900 orbit of the comet. The dissemination of cometary grains potentially carrying organic molecules in the solar system motivated the spectroscopic observation of the disintegration of the Draconids meteoroid in the Earth’s atmosphere.

What did we do? In order to maximize the chances of a successful observation, we decided to use two research aircrafts that would put us above the clouds. The first plane belongs to France (CNRS-INSU/CNES/MeteoFrance) and is operated by the SAFIRE organization. The second is owned and operated by the German DLR. Allsky [4], wide field [5] as well as narrow field cameras [6] were deployed at each window (side and roof) of the two planes. Intensified, visible as well as infrared cameras [7] were used as well for imagery as for spectroscopy modes. In addition, still images [8] were continuously recorded. 17 cameras were used in total. The flight path took us over Scandinavia for a total of eight hours.

In addition, ground-based observation stations were deployed in Germany [9], Greece, and southern France. Double station observations were used to count the meteors and measure their orbits, as well as correlate meteor debris trains detected by lidar to optically observed meteors.

This campaign was a stellar example of ongoing international collaborations for meteor outburst observations.


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