Results from the Perseid Campaign 2009 with SPOSH cameras

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During the Perseids meteor stream of 2009 we had carried out observations in Austria and Greece using SPOSH (Smart Panoramic Optical Sensor Head) cameras from 10th August to 14th August, 2009. The SPOSH camera (developed at DLR and Jena Optronik under a contract to ESA/ESTEC) is well suited for meteor observations because of it's high technical capabilities, and due to a highly sensitive back-illuminated CCD and its wide field of view of 120° x 120° (170° x 170° over the image diagonal) provided by a custom-made optical system.

To minimize the influences of bad weather and to maximize the chances of a successful campaign, we had established observing sites in two different regions of Europe. Two cameras were brought to Greece and set up on the Mainalon and Parnon mountains, with the support of the members of the Astronomical Union of Sparta. Two more SPOSH cameras were operated in Austria at Gahberg and Kanzelhˆhe Observatory. Students from the Technical University of Berlin during their internship at DLR joined the campaign at Gahberg Observatory.

The main goals were
- to find orbit parameters for a large set of meteors
- to identify the individual meteor (stream member, sporadic)
- to optimize observation and data analysis techniques

Fig.1: The same bright meteor at stations Mainalon (left) and Parnon (right). 11. August 2009
From Triangulation one can calculate orbit parameters for the meteor in a straightforward way

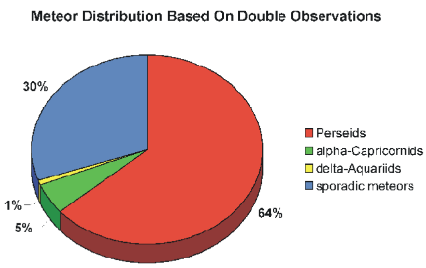


Fig.2: Data derived from orbit calculation

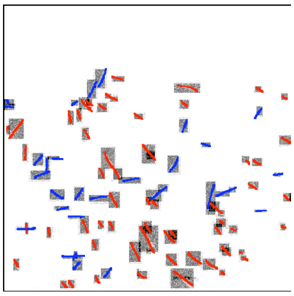


Fig.3: Overlay of meteor images.
Colors by educated guess only

We acquired 120.000+ Images and identified 2500+ meteors in our data.

For the number of meteors anyone can make a simple statistical analysis. One can make an intuitive guess that whether a meteor is a stray one or belongs to a main stream. This is not as easy as one would expect: Fig.3 shows all meteor trails for a time period of one hour. Meteors marked in red might be a member of the perseid stream. Without further information there is no way of learning and conforming more about a meteor's properties i.e. its trajectory.

To identify a meteor we calculate its orbit parameters (1) and compare it to the pre-established orbital status of a known meteor stream or with their parental bodies.

For the determination of the orbital parameters of the optically captured meteors we use images those were acquired at the same time from the two different observation sites.

From these parameters we can identify and count stream members. We compare our obtained orbit parameters of the individual meteor with the known orbits for comets. Thus we were able to identify a number of alpha-Capricornids and delta-Aquariids in our images.

Fig. 2 shows the distribution of meteors captured during the 2009 Perseid campaign derived from the analysis of our orbit parameters. More results

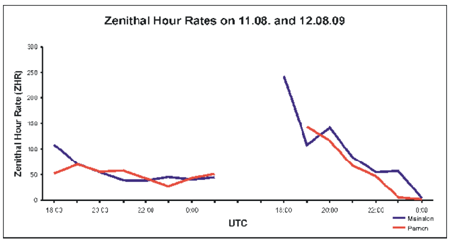
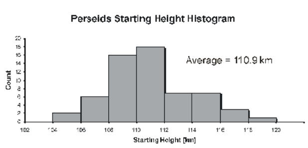
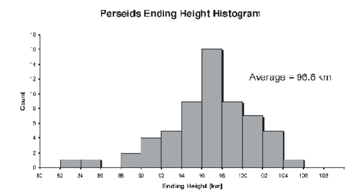
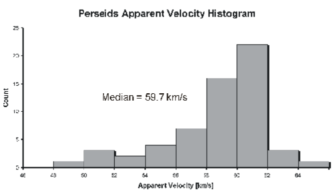


Fig.4: Illustrates the ZHR for the 11th and 12th August 2009 for observing sites Mainalon and Parnon. The used population index is 2.6. A view correction factor of 2.9 had to be applied for the Parnon data due to partially covered filed-of-view. The obtained values are in good agreement to the data published by the International Meteor Organization (IMO). URL: www.imo.net







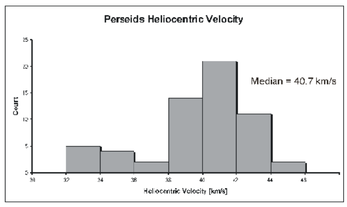


Fig. 5-9 are derived from the large numbers of our calculated orbital data. For the first time we could measure and analyse information about meteor properties like: Starting height, ending height and entrance angles.

Also we can give results for apparent and heliocentric velocity of the meteors. These values are more or less expected, which prove the authenticity, correctness and stability of our programs. Fig. 10-11 show the propagation

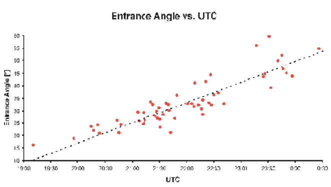


Fig.9

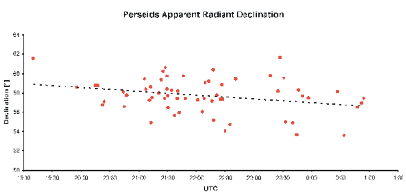


Fig.10

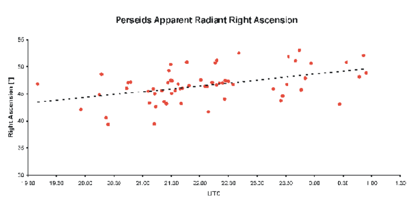


Fig.11

Acknowledgement

The campaign enjoyed the dedicated support by the following meteor enthusiasts:
Dr. Joachim Flohrer, Wilfried Tost, Klaus-Dieter Matz, Stephan Elgner, Rolf Schrödter, Benjamin Grzesik, Anastasios Margonis, Nicole Güldemeister, Apostolos Christou and Prof. Jürgen Oberst. We thank Mr. Filimon (Sternwarte Gahberg) and the Astronomical Union of Sparta for their friendly acceptance and support of the campaign. J. Ehrich (Jena-Optronik) and D. Koschny (ESA/ESTEC) deserve thanks for providing their SPOSH Cameras for the campaign. Additional support by Andreas Knöfel, Hakan Svedhem, Aum Mishra, Theodora Okoye, Kevin Oluoch and Prabim Pokhrel.

DLR German Aerospace Center