

The Spanish Meteor Network (SPMN): full coverage of the Iberian Peninsula by means of high-sensitivity CCD video devices.

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Introduction

The Spanish Meteor Network (SPMN) is an interdisciplinary project involving several universities and research centres in Spain with the aim to study meteoroids and the interaction of these particles of interplanetary matter with the Earth's atmosphere. It started continuous operation on 2004 by using low-scan CCD all-sky cameras [1]. A significant improvement was made on 2006 with the installation of several video CCD stations. Since 2009 these new stations allow for a full coverage of the whole Iberian Peninsula.

Latest improvements of the SPMN video network

The CCD all-sky coverage performed by the SPMN was expanded since 2006 with the setup of several video CCD stations in different places of Spain. Thus, three video stations were setup by the University of Huelva in Andalusia between 2006 and 2007 and one station was setup by IEEC-CSIC in Catalonia in 2008 [2]. Also in 2008 another video station was setup in Toledo, in central Spain, and some months later other similar observing stations were setup in Madrid, Alava and Galicia. All of them are based on an array of high-sensitivity video cameras that perform a continuous monitoring of the night sky by covering an atmospheric volume enclosed within a radius of more than 500 under ideal conditions. Most of these cameras are manufactured by Watec (Watec Co. Japan) and because of their high sensitivity (0.0002 lux at f1.4) image intensifiers are not necessary. Nowadays, this video network allows for a continuous monitoring of meteor activity over Spain and neighbouring countries, although the SPMN is still under expansion and

another station is being setup in Folgueroles (Catalonia).

The latest of our video stations started operation in April 2008 and is located in the environment of the Doñana Natural Park, in the south-west of Spain. It is located in the facilities of a research centre (CIECEM) belonging to the University of Huelva where additional equipment to study the impact of meteoroids on the surface of the Moon is also being operated. This location allows for over 320 clear nights per year, which makes this an ideal place to develop our research project. This station is endowed with an array of twelve high-sensitivity video CCD cameras that allow for a 24 hours a day coverage of the sky (Fig. 1). Thus, bright daytime fireballs can also be studied.



Figure 1. Images of the control room and some of the high sensitivity CCD video cameras of the CIECEM meteor observing station.

Weather permitting, meteor events over the Iberian Peninsula can be currently recorded by at least two of our observing stations. In some areas these

events are being detected by four of these SPMN video stations (Fig. 2). This allows us to reconstruct the corresponding atmospheric trajectory and to obtain parameters such as initial velocity, radiant and orbital elements. Several video packages have been developed by the SPMN to accomplish these tasks.



Figure 2. Sporadic fireball (mag. -7) recorded from La Cañada (Ávila) on May 16, 2009 at 20:38:40 UT. This fireball has been simultaneously detected by four of our SPMN video stations.

Results and data reduction

The above-mentioned SPMN video network expansion has been accompanied by the development of several video packages that allow for data reduction of the information recorder by our systems. Thus, the SPMN has developed a software package to obtain the atmospheric trajectory of double-station events recorded on video according to the procedures described in [3]. This program can also obtain the orbital parameters of the corresponding meteoroid and, from photometry or deceleration data, is able to calculate its mass [4]. Besides, it can be also used to predict the impact point of a meteorite by taking into account the influence of wind and the characteristics of the meteoroid (shape, mass, spin, etc.).

Conclusions

We are performing a continuous multi-station monitoring of meteor activity over Spain and neighbouring countries thanks to the expansion that our network has experienced in the last three years. Thus, since 2009 we can cover the whole Iberian Peninsula and in most cases meteor events can be simultaneously registered by at least two observing stations. Besides, some of our CCD

video cameras operate under very favourable conditions (over 320 clear nights per year).

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