A SPORADIC FIREBALL PRODUCED BY A METEOROID TRAPPED IN A JOVIAN RESONANCE. S. López[1], J.M. Madiedo[1,2], J.M. Trigo-Rodríguez[3] and A.J. Castro-Tirado[4]. [1]Facultad de Ciencias Experimentales, Universidad de Huelva, Huelva, Spain, madiedo@uhu.es. [2]Departamento de Fisica Atomica, Molecular y Nuclear. Universidad de Sevilla. 41012 Sevilla, Spain. [3]Institute of Space Sciences (CSIC-IEEC). Campus UAB, Facultat de Ciències, Torre C5-p2. 08193 Bellaterra, Spain, trigo@ice.csic.es. [4]Instituto de Astrofísica de Andalucía, CSIC, Apt. 3004, 18080 Granada, Spain.

Introduction: The analysis of meteor and fireball events simultaneously recorded from multiple observing stations allows getting valuable orbital information of large meteoroids striking our atmosphere. From these orbits we can try to establish which are the parent bodies of these particles of interplanetary matter. With this aim the SPanish Meteor Network (SPMN) performs a continuous monitoring campaign from 25 meteor stations located in the Iberian Peninsula. In this way we are obtaining helpful information about the physico-chemical properties of meteoroids belonging to major and minor streams, but also of members of sporadic origin. In this work we present the preliminary analysis of a sporadic fireball observed on May 17, 2012.

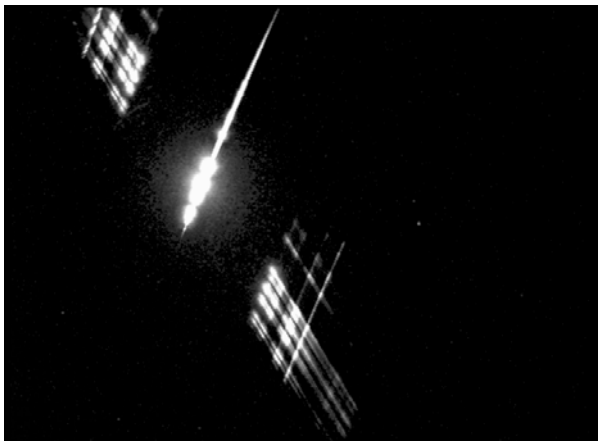

Figure 1. Composite image of the SPMN170512 fireball and its emission spectrum, imaged from El Arenosillo.

Instrumentation and methods: We have employed an array of CCD video devices (models 902H and 902H Ultimate manufactured by Watec Co.) to image the bolide considered in this work. These operate from our automated SPMN meteor observing stations at Sevilla and El Arenosillo [1, 2, 3]. Some of these cameras are endowed with holographic diffraction gratings (1000 lines/mm) for meteor spectroscopy. For data reduction we have employed our AMALTHEA software, which employs the planes intersection method [4] to determine the atmospheric trajectory and radiant of meteor events. The orbital parameters of the meteoroid are calculated by following the procedure described in [4]. The analysis of the emission spectrum was performed with our recently developed CHIMET program.

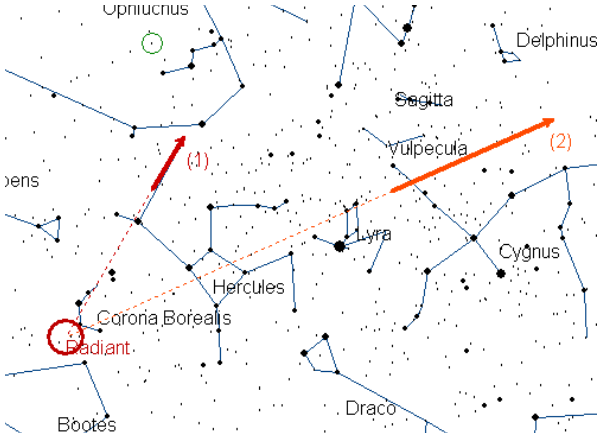

Figure 2. Apparent trajectory of the SPMN170512 fireball as recorded from Sevilla (1) and El Arenosillo (2).

Figure 3. Projection on the ground of the atmospheric trajectory of the SPMN170512 fireball.

Observations and results: This mag. -7 event is listed in our fireball database with code SPMN170512. It was recorded on May 17, 2012, at 0h08m43.5±0.1s UTC (Figure 1). Its apparent trajectory as seen from both meteor observing stations is shown in Figure 2. Our analysis reveals that the bolide began at a height of 96.3±0.5 km and ended at 58.5±0.5 km. The parent meteoroid entered the atmosphere with a velocity, obtained by extrapolating the velocities measured at the

beginning of the meteor trail, of 19.0±0.3 km/s. The projection of the trajectory on the ground is shown in Figure 3, while radiant and orbital parameters are summarized on Table 1. The calculations indicate that the meteoroid was trapped in a 3:1 resonance with Jupiter. As Figure 1 shows, the fireball exhibited multiple flares along its trajectory. This can also be seen by analyzing the light curve obtained for this event (Fig. 4). The main flare took place at a height of 65.2 km, under an aerodynamic pressure, calculated in the usual way [5], of about $3.7\pm0.6\times10^4$dyn/cm^2.

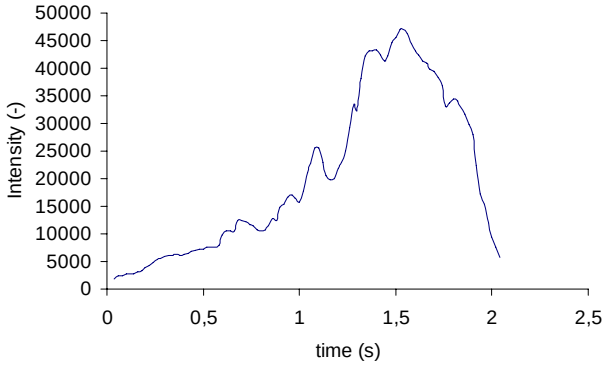

Figure 4. Light curve of the SPMN170512 fireball.

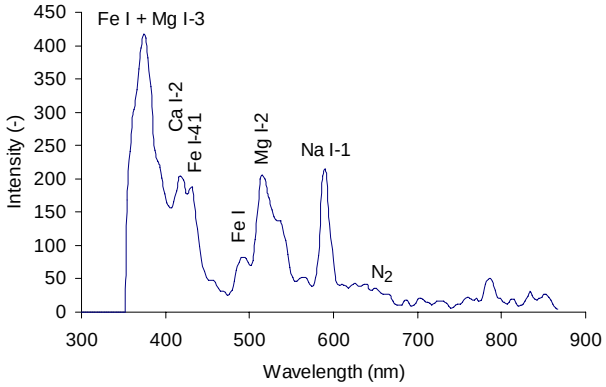

Figure 5. Calibrated spectrum of the SPMN170512 fireball, with main emission lines.

Radiant data			
	Observed	Geocentric	Heliocentric
R.A. (º)	229.6±0.3	224.4±0.3	
Dec. (º)	29.0±0.2	26.9 ±0.2	
V_∞ (km/s)	19.0±0.3	15.6±0.3	37.3±0.3
Orbital parameters			
a (AU)	2.4±0.1	**ω (º)**	221.8±0.3
e	0.631±0.001	**Ω (º)**	56.41234 ± 10^{-4}
q (AU)	0.911±0.002	**i (º)**	16.8±0.3

Table 1. Radiant and orbital data (J2000) for the SPMN170512 fireball.

On the other hand, the spectrum recorded by one of our video spectrographs is shown in Figure 5, where the main emission lines have been highlighted. This spectrum has been calibrated by following the procedure described in [6, 7]. Most lines correspond to Fe I multiplets. The contribution of Mg I-3 (382.9 nm), Ca I-2 (422.6 nm), Mg I-2 (516.7 nm) and Na I-1 (588.9 nm) is also very prominent. Atmospheric N_2 lines can also be noticed.

Conclusions: We have obtained the orbital elements of a sporadic meteoroid from the analysis of the mag. -6 fireball produced during the ablation of this particle in the atmosphere. Radiant and trajectory data could also be inferred. The emission spectrum imaged by one of our spectral cameras has provided information about the chemical nature of the meteoroid.

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References: [1] Madiedo J.M. and Trigo-Rodríguez J.M. (2007) *EMP* 102, 133-139. [2] Madiedo J.M. et al. (2010) *Adv.in Astron*, 2010, 1-5. [3] Trigo-Rodriguez J.M. et al. (2009) *MNRAS*. 392, 367–375. [4] Ceplecha Z. (1987) Bull. Astron. Inst. Cz. 38, 222-234. [5] Bronshten V. A., 1981, *Geophysics and Astrophysics Monographs*. Reidel, Dordrecht. [6] Trigo-Rodríguez J.M. et al. (2003) *MAPS* 38, 1283-1294. [7] Trigo-Rodríguez J.M. et al. (2004) *MNRAS* 348, 802-810.