A BRIGHT BOLIDE PRODUCED BY A METEOROID FOLLOWING A JUPITER FAMILY COMET ORBIT. Díez[1], J.M. Madiedo[1] , F.M. Toscano[2] and J.M. Trigo-Rodríguez[3]. [1] Facultad de Ciencias Experimentales, Universidad de Huelva, Huelva, Spain, madiedo@uhu.es. [2]Facultad de Química, Universidad de Sevilla, 41012 Sevilla, Spain. [3]Institute of Space Sciences (CSIC-IEEC). Campus UAB, Facultat de Ciències, Torre C5-p2. 08193 Bellaterra, Spain.

Introduction: One of the techniques employed by the SPanish Meteor Network (SPMN) to monitor the night sky is based on high-sensitivity CCD video devices. These have a limiting magnitude of +3/+4 without using any image intensifier. Our meteor network has increased the number of such video stations from 2 in 2006 to 25 in 2011. Nowadays we perform a continuous monitoring of meteor and fireball activity over Spain and neighbouring regions, which is equivalent to an area of about 500.000 km^2. This expansion is being accompanied by a considerable effort to develop several software packages to accomplish different tasks, such as the automated operation of some of our stations and the data reduction of the huge amount of information these provide. Besides, favourable weather conditions in Spain combined with the high sensitivity of our systems give us an advantage to perform this continuous monitoring, which has provided important information about meteor and fireball activity. The analysis of bolides is, in fact, one of our priorities, as brighter ones can be potential meteorite producing events and fireballs also may provide useful information about disruption episodes in their parent objects. In this context, we have imaged on April 27, 2011 a double-station sporadic fireball with an absolute magnitude of about -7±1. The analysis of this bolide is made here.

Methods: The geometry of the event described here was favourable for two of our meteor observing stations. These are located, respectively, in La Hita Astronomical Observatory (province of Toledo) and Sevilla, and are separated by a distance of about 340 km. They operate high-sensitivity monochrome CCD video cameras from Watec Co. (Japan) in a fully autonomous way thanks to several software packages that have been developed with this purpose [1, 2, 3]. Holographic diffraction gratings with 1000 lines/mm attached to the lens of some of our cameras provide the emission spectrum for fireballs brighter than mag. -4/-5. In this way, we can obtain information about the chemical composition of the corresponding meteoroids [4, 5, 6, 7]. Uncompressed interlaced AVI video files are generated by our meteor monitoring cameras at 25fps. With our software Amalthea we extract from these the radiant, atmospheric trajectory and orbital parameters [8, 9].

Preliminary results and discussion: The mag. -7 fireball analyzed here (code SPMN270411) was simultaneously recorded from two SPMN meteor observing stations on April 27, 2011 at 22h11m32.2±0.1s UT (Fig. 1). The radiant and orbital parameters of the fireball are shown on table I. The preatmospheric velocity calculated from the velocities measured at the beginning of the meteor trail was V_∞=34.7 ±0.5 km/s. The corresponding orbit is plotted on Fig. 2. A Tisserand parameter of about 2.16 reveals that the meteoroid followed a Jupiter Family Comet orbit.

The fireball suffered several fulgurations (Fig. 1). The first of them took place at a height of about 66 km, with a velocity of 12.8 km/s. By calculating the air density at that point from the US standard atmosphere model [10] we have estimated the aerodynamic strength at which this flare occurred in the usual way [11]. A value of $2.1\pm0.7\times10^4$dyn/cm^2 was obtained for this parameter.

The emission spectrum of this fireball, which was obtained from La Hit Astronomical Observatory, was analyzed with our recently developed CHIMET software [12]. It was calibrated in wavelengths by using typical lines (Ca, Fe, Mg and Na multiplets) and also corrected by using the efficiency of the imaging device. The raw spectrum and the processed signal are shown on Fig. 3. Most prominent lines correspond to Fe I-5 (374.5 nm), Ca I-2 (422.6 nm), Fe I-41 (440.4 nm), Mg I-2 (516.7 nm) and Na I-1 (588.9 nm). Atmospheric oxygen lines can also be noticed. Additional improvements are currently being made on this software to calculate also the relative abundances of the corresponding chemical species.

Radiant data			
	Observed	Geocentric	Heliocentric
R.A. (º)	171.40±0.5	167.4±0.6	-
Dec. (º)	-16.5±0.5	-22.7±0.6	-
Ecliptical longitude(º)	-	-	141.8±0.4
Ecliptical latitude(º)	-	-	-9.3±0.2
V_∞ (km/s)	18.5±0.40	14.9±0.5	39.8±0.5

Orbital data			
a(AU)	5.1±1.0	**ω (º)**	32.3±0.5
e	0.81±0.03	**Ω (º)**	217.1535 ± 10^{-4}
q(AU)	0.936±0.002	**i (º)**	9.6±0.2
Q(AU)	9.4±2.0		

Table 1. Radiant and orbital data (J2000) for the sporadic bolide analized in this abstract.

Conclusions: Our network has experienced a very significant expansion in the last five years. This, together with favourable weather conditions in Spain, allow us to collect an important amount of data related to fireball activity over an area of about 500.000km^2. By analyzing the images of the mag. -7 double-station sporadic fireball considered here, we have obtained radiant and orbital data. The emission spectrum imaged during the ablation of the meteoroid has provided information about the chemical composition of this particle.

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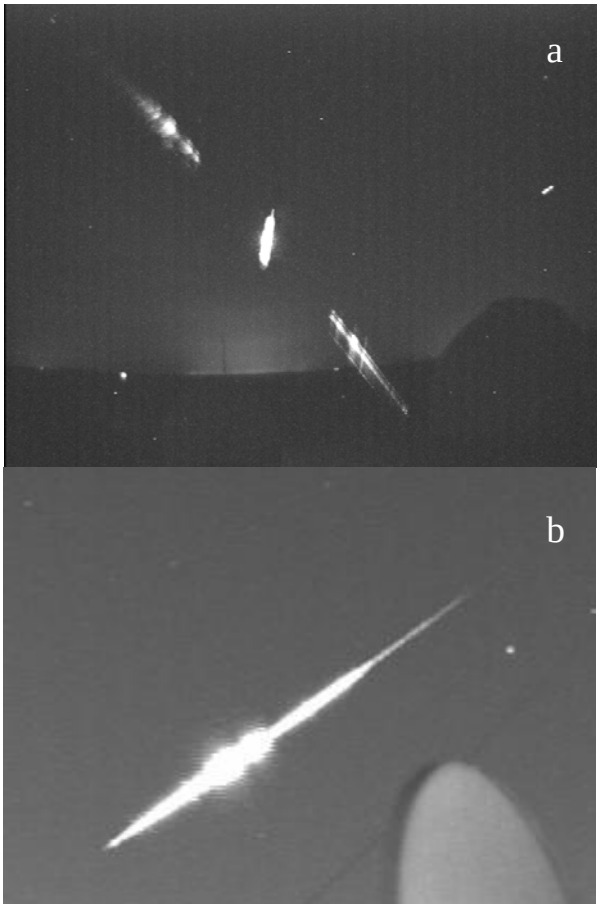

Figure 1. The SPMN270411 fireball imaged from a) La Hita Astronomical Observatory and b) Sevilla.

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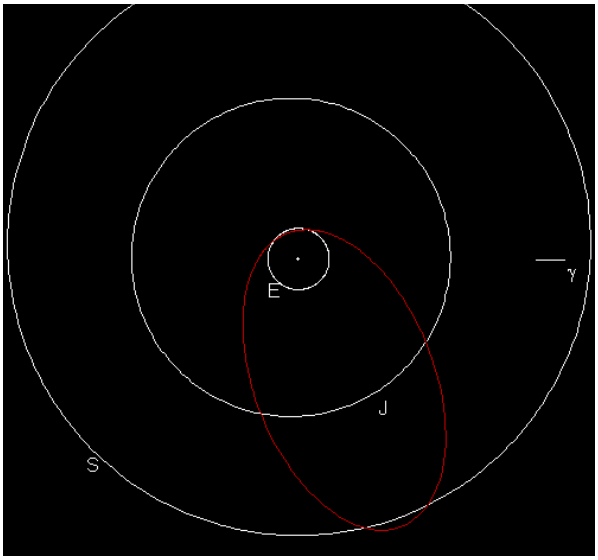

Figure 2. Heliocentric orbit of the SPMN270411 sporadic fireball. For comparison, the orbits of Saturn, Jupiter and Earth are also shown.

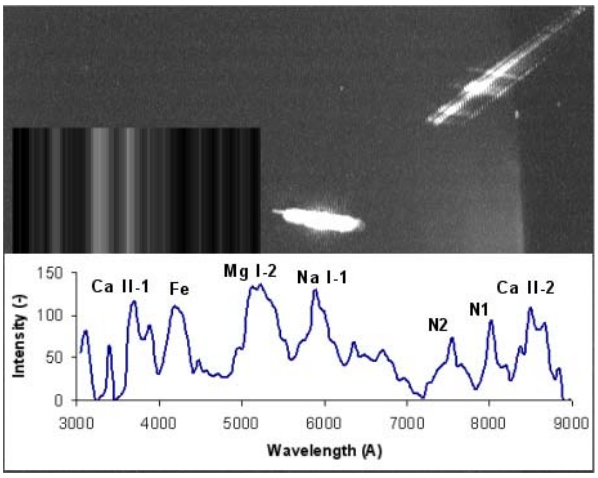

Figure 3. Raw and processed emission spectrum of the SPMN270411 fireball.