A METEOROID FROM A JUPITER FAMILY COMET RECORDED AS A BRIGHT BOLIDE IN 2012. A. Romero[1], J.M. Madiedo[1,2] and J.M. Trigo-Rodríguez[3]. [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.

Introduction: The continuous monitoring of meteor and fireball provides information about the origin and nature of meteoroids ablating in the Earth's atmosphere, but also about the mechanisms that deliver these materials to our planet. Thus, for instance, from the analysis of meteor events simultaneously imaged from, at least, two different locations it is possible to obtain atmospheric trajectories, radiant, orbital and physico-chemical parameters such as the mass of the meteoroids and the tensile strengths of these particles [1, 2, 3]. In addition, meteor spectroscopy provides helpful information about the chemical nature of meteoroids [5, 6, 7]. With this aim, the SPanish Meteor Network (SPMN) is performing a continuous fireball monitoring and meteor spectroscopy campaign over Spain and neighbouring areas. Here we present orbital and chemical information derived from the analysis of a fireball imaged in 2012. This event was produced by a meteoroid from a Jupiter Family Comet.

Methods: The two meteor observing stations involved in this work (Sevilla and Huelva) employ high-sensitivity CCD video cameras (models 902H and 902H Ultimate, from Watec Corporation) to monitor the night sky. The operation of these systems is explained in [1, 2]. In addition, these automatic stations perform a continuous spectroscopic campaign by recording the emission spectrum produced by meteoroids ablating in the atmosphere. In this way, we can infer information about the chemical nature of these particles of interplanetary matter [5, 6, 7].

Radiant data			
	Observed	Geocentric	Heliocentric
R.A. (º)	53.1±0.3	44.3±0.3	
Dec. (º)	47.0±0.2	45.7±0.2	
V_∞ (km/s)	16.9±0.3	13.0±0.3	39.5±0.3

Orbital parameters			
a (AU)	3.7±0.3	**ω (º)**	209.1±0.3
e	0.75±0.02	**Ω (º)**	278.5108 ± 10^{-4}
q (AU)	0.929±0.002	**i (º)**	9.0±0.2

Table 1. Radiant and orbital data (J2000).

Results and discussion: The slow fireball analyzed here (code SPMN250212) was recorded on December 29, 2012, at 23h42m07.6±0.1s UT (Figure 1). The photometric analysis of the images indicates that it reached a maximum absolute brightness of -10±1. Its apparent trajectory as seen from both meteor observing stations is shown in Figure 2. The atmospheric trajectory and radiant were calculated with our AMALTHEA software, which employs the method of planes intersection [8]. According to our analysis, the bolide began at about 81.5±0.5 km above the ground level, with the terminal point located at about 32.6±0.5 km. The parent meteoroid struck the atmosphere with an initial velocity V_∞=16.9±0.3 km/s. The fireball was called "Sevilla", as the meteoroid disintegrated over this city. The projection on the ground of this atmospheric path is shown in Figure 3. With this information, the orbit in the Solar System of the particle was calculated (Figure 4). The radiant and orbital parameters (J2000) are summarized on Table 1.

Figure 1. Composite image of the SPMN291212 "Sevilla" fireball, imaged from Huelva together with its emission spectrum.

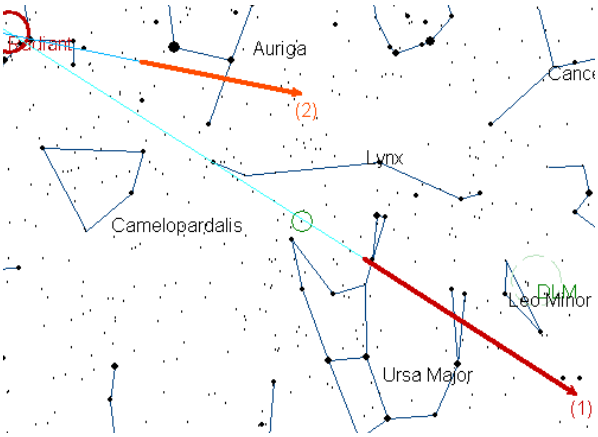

Figure 2. Apparent trajectory of the Sevilla fireball as recorded from Huelva (1) and Sevilla (2) meteor observing stations.

Figure 3. Projection on the ground of the atmospheric path of the Sevilla fireball.

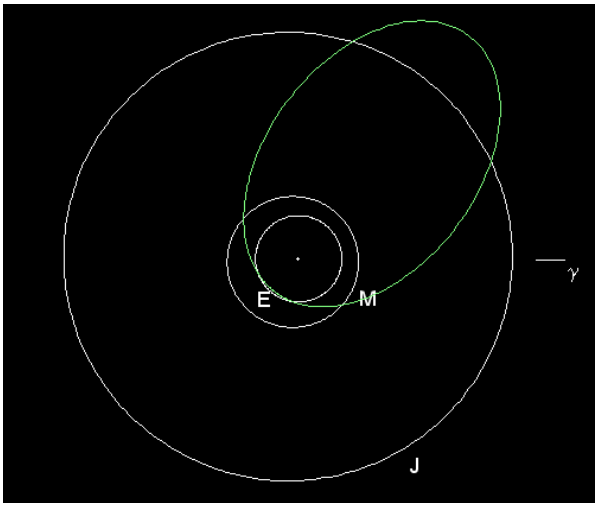

Figure 4. Projection on the ecliptic plane of the orbit of the parent meteoroid.

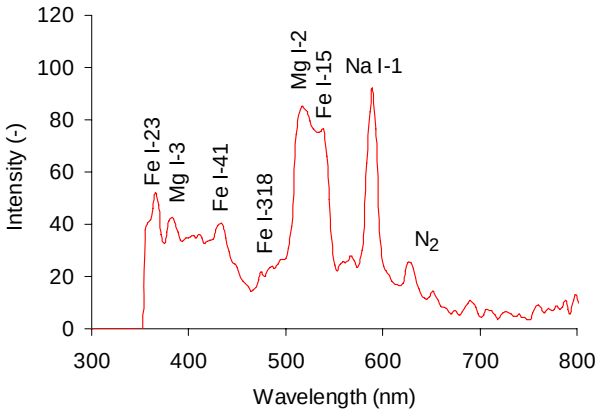

Figure 5. Calibrated emission spectrum.

The emission spectrum produced by the bolide was recorded by one spectrograph operating at Huelva (Figure 1). The calibrated spectrum, once corrected by taking into account the instrumental efficiency, is shown in Figure 5, where main emission lines identified in this signal have been highlighted. As can be seen, the spectrum is dominated by a strong emission from Na I-1, Mg I-2 and Fe I-15 multiplets. Atmospheric nitrogen bands can be noticed in the red region.

Conclusions: We have obtained the atmospheric path and radiant for a double-station mag. -10 fireball observed over the south of Spain. The bolide penetrated till a height of about 32.6 km above the ground level. The orbit of the parent meteoroid was also derived. These data reveal the sporadic nature of this event. Besides, the meteoroid followed a JFC orbit. A high Na content in the particle is inferred from the analysis of the emission spectrum.

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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] Madiedo J.M. et al. (2012) MNRAS, submitted. [5] Trigo-Rodríguez J.M. et al. (2003) *MAPS* 38, 1283-1294. [6] Trigo-Rodríguez J.M. et al. (2004) *MNRAS* 348, 802-810. [7] Borovicka J. (1993) *Astron. Astrophys*. 279, 627-645. [8] Ceplecha Z. Bull. Astron. Inst. Cz. 38, 222-234, 1987.