ORBITAL ELEMENTS AND EMISSION SPECTRUM OF A COMAE BERENICIDS FIREBALL. L. Martínez[1], J.M. Madiedo[1], F.M. Toscano[2], A.J. Castro-Tirado[3], J.M. Trigo-Rodríguez[4], S. Pastor[5] and J.A. de los Reyes[5]. [1] Facultad de Ciencias Experimentales, Universidad de Huelva, Huelva, Spain, madiedo@uhu.es. [2]Facultad de Química, Universidad de Sevilla, 41012 Sevilla, Spain. [3]Instituto de Astrofísica de Andalucía (IAA-CSIC), PO Box 3004, 18080 Granada, Spain. [4]Institute of Space Sciences (CSIC-IEEC). Campus UAB, Facultat de Ciències, Torre C5-p2. 08193 Bellaterra, Spain. [5]Observatorio Astronómico de La Murta. Molina de Segura, 30500 Murcia, Spain.

Introduction: The Comae Berenicids (COM) is a minor meteor shower with an activity period that extends from Dec. 12 to January 23 and a maximum around the end of December. This shower was tentatively linked to comet 1913 I (Lowe), but this object was so poorly observed that its existence was not confirmed [1, 2]. By simultaneously imaging meteors belonging to this shower, we can obtain precise physico-chemical parameters that can provide a better understanding of the Comae Berenicids meteoroids stream. These include, for instance, radiant and orbit information. But, besides, bright events allow us to register the emission spectrum produced when meteoroids ablate in the atmosphere, and this can provide useful information related to the chemical composition of these particles of interplanetary matter [3, 4, 5, 6].

Nowadays, the SPanish Meteor Network (SPMN) monitors the night sky from 27 meteor observing stations located in the Iberian Peninsula. We have the advantage of more favourable weather conditions during December and January when compared to other areas in the northern hemisphere and, so, this provides good conditions to analyze the Comae Berenicids during the activity period of this shower. We present here the analysis of a three-station Comae Berenicids fireball with an absolute magnitude of about -8±1 imaged on January 14, 2011.

Methods: We employ high-sensitivity monochrome CCD video cameras (Watec Co., Japan) to monitor the night sky. A detailed description of these systems has been done elsewhere [7, 8]. Two of the SPMN video stations involved in the detection of the Coma Berenicids fireball considered here (El Arenosillo and La Hita) work in an autonomous way by means of proper software [9]. The third station that imaged this event (La Murta) operates from the province of Murcia. Besides, the cameras operating from La Hita and El Arenosillo have attached holographic diffraction gratings (1000 lines/mm) to obtain the emission spectra resulting from the ablation of meteoroids in the atmosphere. This provides chemical information about these particles of interplanetary matter [3, 4, 5, 6].

Preliminary results and discussion: The mag. -8 fireball analyzed here (code SPMN140111) was simultaneously recorded from three of our video meteor observing stations on January 14, 2011, at 0h44m41.5±0.1s UT (Fig. 1). The radiant (Figure 2) 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_∞=58.1 ±0.3 km/s.

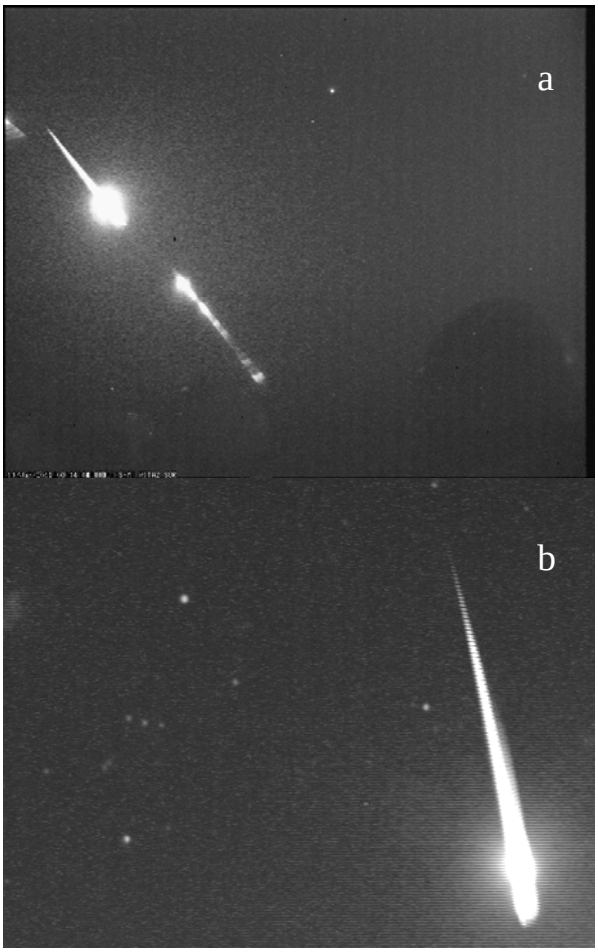

Figure 1. Mag. -8 Comae Berenicids fireball imaged from a) La Hita Astronomical Observatory b) La Murta Astronomical Observatory on Jan. 14, 2011, at 0h44m41.5±0.1s UT.

We could also image the spectrum of this fireball from our meteor observing station operating from La Hita Astronomical Observatory. The signal obtained in the spectrum was corrected by taking into account the instrumental efficiency, and then calibrated in wave-

lengths by using typical metal lines (Ca, Fe, Mg, and Na multiplets). The raw spectrum is shown on Fig. 3, where the processed spectrum obtained by using the deinterlacing and the background removal filters implemented in our recently developed CHIMET software is also included [10]. 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.

Radiant data			
	Observed	Geocentric	Heliocentric
R.A. (º)	170.2±0.2	170.3±0.2	-
Dec. (º)	26.3±0.2	26.2±0.2	-
Ecliptical longitude(º)	-	-	126.8±0.4
Ecliptical latitude(º)	-	-	27.8±0.3
V_∞ (km/s)	58.1±0.30	56.7±0.31	42.1±0.31
Orbital data			
a(AU)	29.6±15.4	**ω (º)**	299.5±0.9
e	0.991±0.002	**Ω (º)**	293.3344±10^{-4}
q(AU)	0.252±0.004	**i (º)**	113.8±0.8
Q(AU)	58.9±15.4		

Table 1. Radiant and orbital data (J2000) for the Comae Berenicids fireball analyzed in the text.

The initial height was 111.9 km over the ground level and the ending point was located at a height of 63.0 km. The fireball experienced a very bright flare at about 72 km over the ground level, when the velocity was of about 52.4 km/s. By using the average atmospheric density from the US standard atmosphere model [11] we have calculated the aerodynamic strength at which the meteoroid suffered this break-up as usual [12], obtaining 1.5±0.7×10^5dyn/cm^2.

Conclusions: Our continuous monitoring of the night sky is providing information about meteor and fireball activity over Spain and neighbouring areas. With this aim, we employ high sensitivity CCD video cameras endowed with holographic diffraction gratings. The analysis of the mag. -8±1 Comae Berenicids fireball studied here has provided the radiant, orbit and information about the chemical composition of the corresponding meteoroid.

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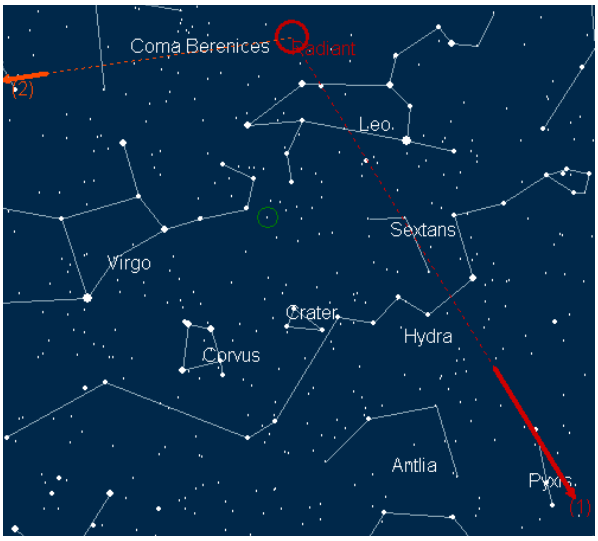

Figure 2. Radiant calculated by performing the astrometric calibration from two observing stations (1. La Hita, and 2. Arenosillo).

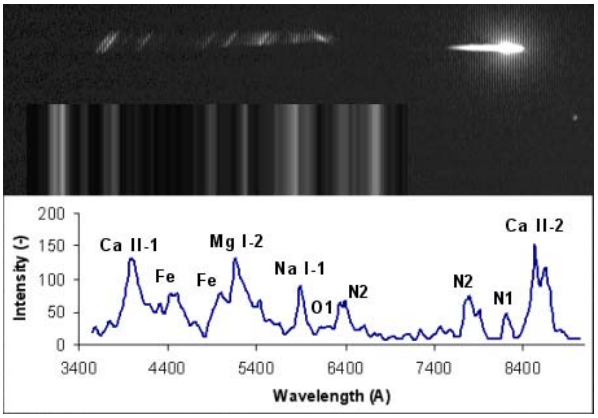

Figure 3. Raw and processed emission spectrum of the SPMN140111 Comae Berenicids fireball.