A FIREBALL PRODUCED BY A METEOROID BELONGING TO THE DELTA AQUILIDS STREAM. R. Nieto[1], J.M. Madiedo[1, 2], J.L. Ortiz[3], A.J. Castro-Tirado[3], J.M. Trigo-Rodríguez[4], J. Zamorano[5], J. Izquierdo[5], F. Ocaña[5], A. Sánchez de Miguel[5], 5. [6]S. Pastor and [6]J.A. de los Reyes. [1]Facultad de Ciencias Experimentales, Universidad de Huelva, 21071 Huelva, Spain, madiedo@uhu.es. [2]Dpto. de Física Atómica, Molecular y Nuclear, Facultad de Física, Universidad de Sevilla, 41012 Sevilla, Spain. [3]Instituto de Astrofísica de Andalucía, CSIC, Apt. 3004, 18080 Granada, Spain. [4]Institute of Space Sciences (CSIC-IEEC). Campus UAB, Facultat de Ciències, Torre C5-p2. 08193 Bellaterra, Spain. [5]Dpto. de Astrofísica y CC. de la Atmósfera, Facultad de Ciencias Físicas, Universidad Complutense de Madrid, 28040 Madrid, Spain. [6]Observatorio Astronómico de La Murta. Molina de Segura, 30500 Murcia, Spain.

Introduction: According to Jenniskens [1], the δ-Aquilids are active from April 10 to April 16, with a maximum peak around April 13. It is currently included in the IAU working list of meteor showers with code 131 DAL. The proposed parent body of the DAL stream is comet C/1984 S1 (Meier). The calculation of precise orbital elements can be very helpful to improve our knowledge about this poorly-known shower. High-sensitivity CCD devices can be very helpful for this purpose, as these provide information about different physico-chemical parameters of meteoroids ablating in the atmosphere [2, 3, 4]. We present here the analysis of a DAL bolide imaged in the framework of the continuous meteor and fireball monitoring campaign developed by the SPanish Meteor Network (SPMN).

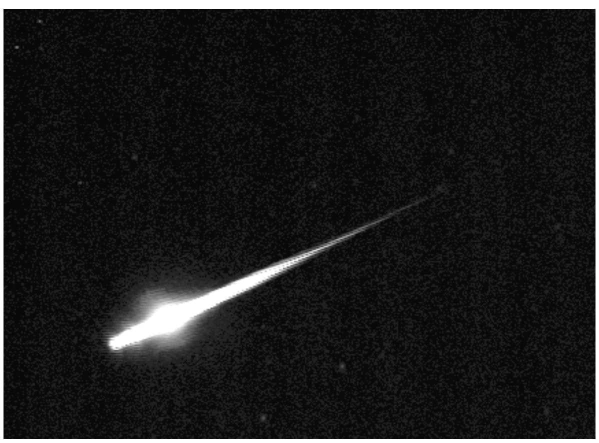

Figure 1. Composite image of the bolide as recorded from Sierra Nevada.

Radiant data			
	Observed	Geocentric	Heliocentric
R.A. (º)	306.8±0.3	306.7±0.3	
Dec. (º)	13.0±0.2	12.8±0.2	
V_∞ (km/s)	62.2±0.3	60.9±0.3	41.9±0.3
Orbital parameters			
a (AU)	83±5	**ω (º)**	119±1
e	0.99±0.01	**Ω (º)**	19.79274 ± 10^{-4}
q (AU)	0.749±0.006	**i (º)**	120.2±0.3

Table 1. Radiant and orbital data (J2000).

Instrumentation and methods: The meteor observing stations that recorded the fireball analyzed here (Sierra Nevada and La Murta) employ an array of low-lux CCD video devices (models 902H and 902H Ultimate, from Watec Corporation) to monitor the night sky. The operation of these stations has been described in [2, 3]. Data reduction was performed with our AMALTHEA software, which employs the planes intersection method to determine the atmospheric trajectory and radiant of multi-station events [5].

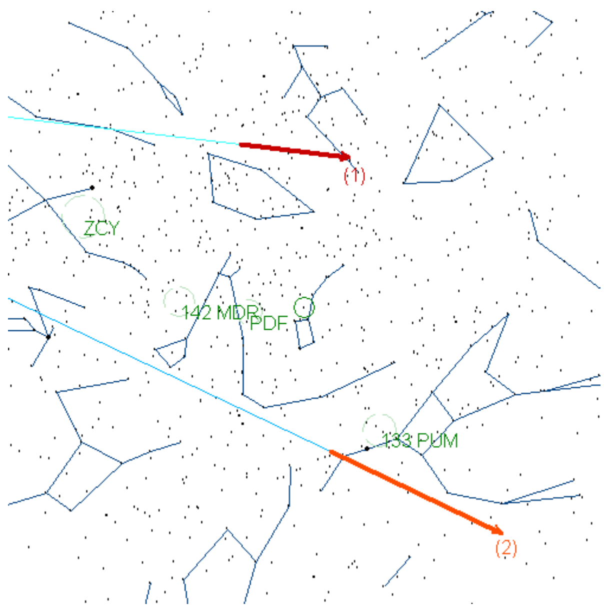

Figure 2. Apparent trajectory as observed from (1) Sierra Nevada and (2) La Murta meteor stations.

Atmospheric path, radiant and orbit: The bolide discussed in this work was recorded on April 10, 2011, at 3h57m48.9±0.1s UTC (Figure 1). Its apparent trajectory as observed from both meteor stations is shown in Figure 3. From the photometric analysis of the images we concluded that the maximum brightness of this event was equivalent to an absolute magnitude of about -7±1. The apparent radiant was located at α=306.8º, δ=13.0º. The fireball began at 133.0±0.5 km above the ground level, with the meteoroid striking the atmosphere with an initial velocity V_∞=62.2±0.3 km/s.

The bolide penetrated till a height of about 83.0±0.5 km. Figure 3 shows the projection on the ground of this atmospheric path. As can be seen in Figure 1, this fireball exhibited a bright fulguration by the end of its trajectory, which was due to the sudden disruption of the parent meteoroid. This took place at a height of about 89.5 km and took place under an aerodynamic pressure, calculated in the usual way [6], of $1.0 \pm 0.3 \times 10^4$dyn/cm^2. On the other hand, the orbit of the parent meteoroid is shown in Figure 4. Orbital and radiant parameters are summarized on Table 1.

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

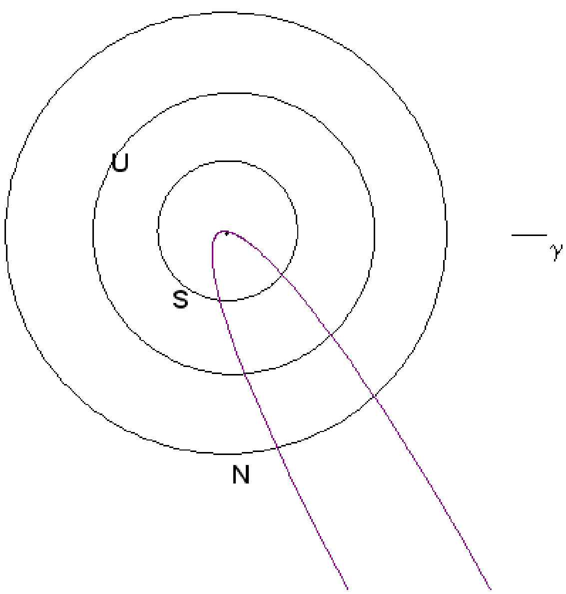

Figure 4. Projection on the ecliptic plane of the orbit of the parent meteoroid.

Conclusions: A double-station δ-Aquilid bolide was recorded in the framework of our continuous meteor and fireball monitoring campaign. Its analysis has provided the atmospheric trajectory and radiant of this event, and also the orbit in the Solar System of the parent meteoroid.

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References: [1] Jenniskens, P. (2006) *Meteor Showers and their Parent Comets.* Cambridge University Press. [2] Madiedo J.M. and Trigo-Rodríguez J.M. (2007) *EMP* 102, 133-139. [3] Madiedo J.M. et al. (2010) *Adv.in Astron*, 2010, 1-5. [4] Trigo-Rodriguez, et al. (2009) *MNRAS*. 392, 367–375. [5] Ceplecha, Z. (1987) *Bull. Astron. Inst. Cz.* 38, 222-234. [6] Bronshten V. A., 1981, *Geophysics and Astrophysics Monographs*. Reidel, Dordrecht.