THE DESERT FIREBALL NETWORK: FIRST RESULTS OF TWO YEARS SYSTEMATIC MONITORING OF FIREBALLS OVER THE NULLARBOR DESERT OF SOUTH WESTERN AUSTRALIA

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Introduction: Camera networks for fireball observations, designed to calculate orbits, atmospheric trajectories, and not least fall positions of meteorites, have been in operation for several decades, but have recovered only a small number of samples. This is mainly because meteorites are very difficult to find in vegetated areas. Our solution to this problem was to place a network in the Nullarbor of Australia, a desert that is eminently suitable for locating meteorites. Here we present the first results from two years of regular operation of this new Desert Fireball Network.

Instruments: Initially we had to overcome a number of technical and logistic difficulties in establishing the network, and maintaining reliable operation in a hostile environment. Our system has to cope with desert conditions, work in very remote areas, be monitored remotely, and require minimal human intervention. To satisfy all these basic requirements we have modified the Autonomous Fireball Observatory (AFO) already developed by Spurný and co-workers for the European Network [1]. Although this unit was designed to work in very different conditions (ie. the temperate zone in Europe) we were able to modify it to operate in a desert. It is weather resistant, sealed against dust, coated with a paint that reflects ~85% of incident solar heat (it also includes a solar shield), and designed to use minimal electrical power. The result is a Desert Fireball Observatory (DFO). After two years of succesful tests of the first DFO in the Australian outback, we established a small network consisting of three stations in the Nullarbor Region of south western Australia in December 2005. The fourth station was set up in November 2007 (see Fig.1). Two years of regular operation have shown that the network performs flawlessly, and it has already produced some very valuable results.

Results: During the past two years we recorded more than one hundred fireballs. However, given the small size of the network, almost half were recorded only from one station, or had a bad viewing geometry, and therefore were determined with lower precision. Because of these factors we show a subset of the data here. We present complete and precise data on atmospheric trajectories, orbits, light curves and dynamics for 30 selected DN fireballs (see the example on Fig.2) recorded from December 7th 2005 to spring 2008. Most of the presented fireballs belong to the sporadic background. According to their orbits and physical properties, 16 of the presented fireballs are of asteroidal origin and 14 have a cometary origin (with the vast majority of these on short periodic orbits). Altogether 5 of the recorded fireballs had a computed terminal mass larger than 100 grams. However, the brightest and largest one, the DN071007 fireball, terminated over the Southern Ocean, and impact areas of another two are lying on the edge of the Nullabor with dense vegetation, so only two cases >100 grams are currently suitable for systematic searching.

Fig.1. Desert fireball station #4.

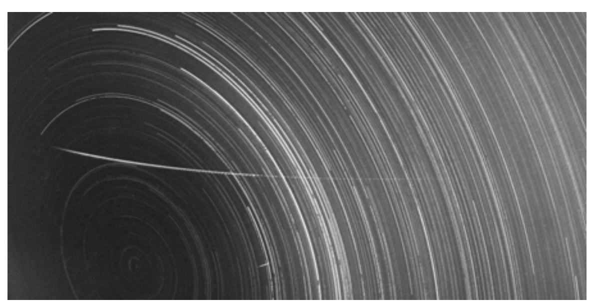

Fig.2. Detail of the DN040506 fireball from station #3.

References: [1] Spurný P. et al. (2006), *Proceedings IAU Symposium No.236*, 121-130.

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