DIGITAL EXPANSION OF THE DESERT FIREBALL NETWORK.

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Introduction: Fireball camera networks, designed to recover meteorites with orbits, have been established in several nations at various times in the past (e.g. [1]). But only a handful of samples have been obtained: sites in temperate zones are not well suited to meteorite recovery. We established a trial network of four film cameras in the Nullarbor desert of Western Australia in 2007 [2]. Deserts are eminently suitable for locating meteorites. They also preserve them from environmental degradation [3]. Meteorites are rapidly altered in the terrestrial environment [4]; even brief exposure to rain can affect the primordial record that they contain [5]. Although the trial Desert Fireball Network (DFN) covered a small area, by 2010 we had recovered two meteorites with orbits [6,7]. This success enabled us to upgrade and expand the DFN. Australia is ideally suited for the recovery of pristine meteorites with orbits. Arid and semi-arid zones constitute >70% of the land mass. When complete, the DFN will cover >50% of this area.

Upgrading and expanding the DFN: Our next-generation fireball observatories are fully autonomous systems, capable of operating for 12 months without maintenance, and storing all imagery collected over that period. They incorporate a 36MP full-format DSLR, and low-light video camera, run by an embedded PC. The package is an intelligent imaging system, which calibrates its own optics, modifies observations based on cloud conditions, and automatically recognizes fireballs events, pre-processing data prior to uploading it to the project server. The data pipeline includes image processing to determine fireball position at sub-pixel level; triangulation and fireball trajectory modelling; and darkflight modified by WRF climate modelling. In addition, members of the public can contribute their own observations via our 'fireballs in the sky' smartphone app.

Currently, the network stands at 15 fully automated stations. By end-August 2014 it will have grown to 35, covering ~1.3 million km^2. In this area we expect to observe 5 falls pa >0.5kg. Recovered samples will be studied via consortium analysis.

Finally, rather than discarding images that do not contain fireballs, the entire dataset is uploaded to our database at the iVEC/Pawsey Centre HPC data store. When the DFN is fully operational, 500TB pa will be uploaded. The DFN is already acting as an optical counterpart to Square Kilometer Array radio observations. Access to the complete imagery dataset will allow astronomers and other users to explore new research opportunities.

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