UPDATES FROM THE AUSTRALIAN DESERT FIREBALL NETWORK

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Introduction: The Earth is bombarded by $1.5x10^6$ kg of material every year [1], though most of this is dust to sand sized objects. Fireballs are the bright phenomena observed when larger material enters the Earth's atmosphere. These meteoroids have the potential to survive the atmosphere to drop a meteorite on the ground. As they are sporadic, being able to capture these rarer fireball events requires a large spatial and temporal observation window. The Desert Fireball Network (DFN) in Australia was initiated in 2007 with 4 film cameras, and since 2015 has expanded to over 50 digital systems covering ~3 million km2 of sky [2]. The DFN now forms part of the even larger Global Fireball Observatory (120 systems across 8 countries) [3]. Observing fireballs using such a distributed system allows the trajectory to be accurately re-created to calculate a meteoroid's orbit. A powerful capability of the DFN/GFO is its ability to not only calculate impactor origins, but to predict landing sites for surviving meteorites.

Orbits: Fireball producing meteoroids are typically associated with asteroidal origins. The DFN orbital dataset has over 1800 orbits for these larger bodies, allowing us to gain a greater understanding of material origins. Significant recent observations includes an asteroid temporarily captured by the Earth prior to impact [4], and significant amounts of asteroidal material on Jupiter Family Comet orbits [5].

Orbital Meteorites: Recovering meteorites for which an associated orbit has been derived, provides a level of spatial context to the samples. The long term goal is to bridge the knowledge gap between known asteroid types and meteorite chemistries. The original trial DFN network recovered two meteorites (Bunburra Rockhole; Mason Gully). Since the expansion, using field hardened autonomous digital observatories, nearly 70 meteorites (>50 g) have been observed to fall over Australia, with a further six meteorites having been recovered (Murrili, Dingle Dell, Arpu Kuilpu, Madura Cave, and two yet unnamed).

Discussion: We will present the latest recoveries of DFN orbital meteorites, as well as highlights of recent scientific results.

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