INITIAL RESULTS FROM THE EXPANDED DESERT FIREBALL NETWORK

E. K. Sansom[1], P. A. Bland[1], M. C. Towner[1], J. P. Paxman[2], R. M. Howie[2], M. Cupak[1] , M. J. Galloway[3], G. K. Benedix[1] [1]Dept. Applied Geol., Curtin Univ., GPO Box U1987, Perth, WA 6845, Australia. E-mail: eleanor.sansom@curtin.edu.au. [2]Dept. Mech. Eng., Curtin Univ., Perth, WA 6845, Australia. [3]School Comp. Math., Univ. Western Australia, Perth, WA 6009, Australia.

Introduction: Meteorite falls that are observed with enough accuracy from multiple locations can give orbits and constrain origins of meteorites from within the Solar System. Dedicated camera networks have been established previously around the world for fireball observation (e.g. [1]), each with limited success based on their locations in temperate zones. The Desert Fireball Network (DFN) is well suited to meteorite recovery and the only network in the Southern Hemisphere. In its initial stage of 4 film cameras, two meteorites with orbits were recovered [2][3]. Since 2012, the DFN has been establishing a digital network and, over a short period from September to November 2014, the number of autonomous observatories more than doubled from 15 to 32. This amounts to a current observ-ation area of 1.7 million km^2: the largest network ever built.

Automated Data Reduction: Data is acquired at a rate of ~57.6 TB / month, requiring an automated pipeline for data reduction. With a significant amount of hardware deployed, the autonomous fireball observatories were left to acquire data while this pipeline was established.

Event detection at an observatory is cross-checked for multi station confirmation. Points are picked along the fireballs [4], calibrated to altitude and azimuth and their exact times identified [5] before triangulation for orbit and positions along the trajectory. Velocities are then used to estimate masses [6].

Recent Events: This year 91 double-station fireballs over 2 secs in length have been automatically detected and triangulated. Of these, 17 were over South Australia (SA), 34 across the Nullarbor Plain (NP) and 43 from the Western Australian Wheatbelt (WA). At this stage, we have selected five interesting candidates to reduce and test our pipeline software. DN150417 captured over NP was 10.3 secs long, making it the longest fireball in our dataset. DN141125 (SA) was 9.3 secs and was captured by eight DFN observatories. This is unprecedented. The trajectory is also visibly seen to become two separate trails in one image, confirming fragmentation. DN141215 (WA) was captured by four observatories just after the peak of the Geminid meteor shower and has a consistent radiant. DN150331 (SA) has an incredibly bright trail and is just over 3 secs long but with a visible trajectory continuing past the final bright flare. And finally, DN141129 (WA) was 5.9 secs and captured by one of our school outreach observatories.

We anticipate that a subset of these fireballs - and others yet to be analysed - will have delivered a meteorite to the ground. Search sites and strategies will be discussed in the presentation.

References: [1] Halliday I. et al. 1996. *Meteoritics & Planetary Science* 31:185 [2] Bland P.A. et al. 2009. *Science* 325 :1525-1527. [3] Towner M.C. et al. 2011. Abstract #5124. 74th Meteoritical Society Meeting. [4] Galloway et al. 2015. *(this Conference).* [5] Howie et al. 2015 *(this Conference).* [6] Sansom et al 2015. *Meteoritics & Planetary Science. (accepted).*