Media Release

Researchers document first confirmed fire tornado

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The world's first confirmed case of a "fire tornado" has been documented by Canberra researchers following detailed analysis of a large quantity of evidence collected during the 18 January 2003 fires.

Lead researcher, report co-author and Special Risks Analyst at the ACT Emergency Services Agency (ESA) Rick McRae said the finding, just published in the journal *Natural Hazards,* was based on extensive research into weather observations and radar data at the time of the fires combined with video footage and photographs taken by members of the public.

"The various data were combined and analysed to provide information on the occurrence and behaviour of the phenomenon known as pyro-tornadogenesis", Mr McRae said.

"Pyro-tornadogenesis is the technical term used to refer to the ability of a large fire to produce a genuine tornado. Researchers had speculated about the ability of a fire to produce a tornado, but this is the first documentation of the creation of a true tornado by the convection column of a large fire," he said.

"The tornado formed in the plume of the McIntyres Hut Fire mid-afternoon on 18 January 2003, and initially crossed the Brindabella Ranges adjacent to Mt Coree. It then moved through Uriarra and Pierces Creek Pine Plantations and grazed the edge of the suburb of Chapman. The fire tornado faded as it entered Kambah, south of Mt Taylor."

The two year project also involved Dr Jason Sharples from the UNSW Canberra who is also a volunteer firefighter, Stephen Wilkes from the ACT Territory and Municipal Services Directorate and Alan Walker from the ESA.

"Our analysis indicated that the tornado had a rating of at least a 2, on the Enhanced Fujita scale of tornado severity. It had major effects on the behaviour of the fire on the urban edge and had enough force to remove roofs from houses and to blow cars off the road," Mr McRae said.

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“It moved at over 30 km/hr across the ground and had a basal diameter of nearly half a kilometre when it reached Chapman. It was a major tornado, but was barely noticed given the setting,” he said.

The research team also showed how a fire tornado is fundamentally different from a fire whirl, which is commonly seen associated with fires.

“Tornadoes are associated with thunderstorms and as such they are anchored to a thundercloud above, and are able to sporadically lift off the ground. Fire whirls, on the other hand, are anchored to the ground and do not require the presence of a thunderstorm,” Dr Sharples said.

The findings of the study are significant in a number of ways:

- In addition to providing the first concrete documentation of a fire tornado, the study provides further insight into the behaviour of thunderstorms that form over large fires, which is currently the subject of an international research effort;

- The research enables employees of the ACT’s Emergency Services to work at the cutting edge of science. All members of the research team are experienced bushfire fighters and recognise the importance of delivering new scientific knowledge to those tasked to protect the community from bushfire. This transfer of knowledge is essential in working to mitigate the impacts of catastrophic events like the 2003 wildfires;

- The study demonstrates the real value of having capabilities ready to observe all aspects of fire behaviour during major outbreaks. Airborne systems, air observers, weather radar and satellite imagery all played key roles in this study; and

- The researchers identified a possible shortcoming in the building codes employed in Australia’s fire prone environments. Building standards specify higher levels of structural engineering for cyclonic winds, but specifically exclude tornadoes. In his work for the ACT, Mr McRae has studied the risks from tornadoes, which do occur in and around Canberra from time-to-time and have caused damage. However, the potential risk from fire tornadoes has not previously been considered as part of defining suitable building standards. The research indicates that the building codes may need to be revised in certain fire-prone parts of Australia. The ESA will raise this issue with the Standards Australia Wind Loadings Committee and the Australian Buildings Code Board.”

The research was published in October 2012 in the journal Natural Hazards, and is available at http://rd.springer.com/article/10.1007/s11069-012-0443-7

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Mr Rick McRae is Special Risks Analyst in the Emergency Management, Risk and Spatial Services section of the ACT Emergency Services Agency, part of the ACT Government's Directorate of Justice and Community Safety.

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Mr Walker and Mr Wilkes worked on the 2003 fires for the NSW Rural Fire Service.