Coupled fire-atmosphere simulations of the Sir Ivan Fire

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Figure 1. Pyro-convective cloud over the Sir Ivan fire.
Credit: ABC

The Sir Ivan Fire

The Sir Ivan fire in NSW burnt 55,000 ha on 12 February 2017. 35 homes were consumed, extensive stock lost and thousands of kilometers of fence lines were destroyed. Severe drought conditions in the lead-up contributed to very dry fuels and a declaration of 'the worst fire conditions ever seen in NSW'. Operational numerical weather prediction models provided accurate lead-in guidance and "Catastrophic" fire conditions were identified several days in advance. Pyrocumulonimbus (pyrocb) developed above the fire as the wind shifted from northwesterly to southerly in the afternoon.

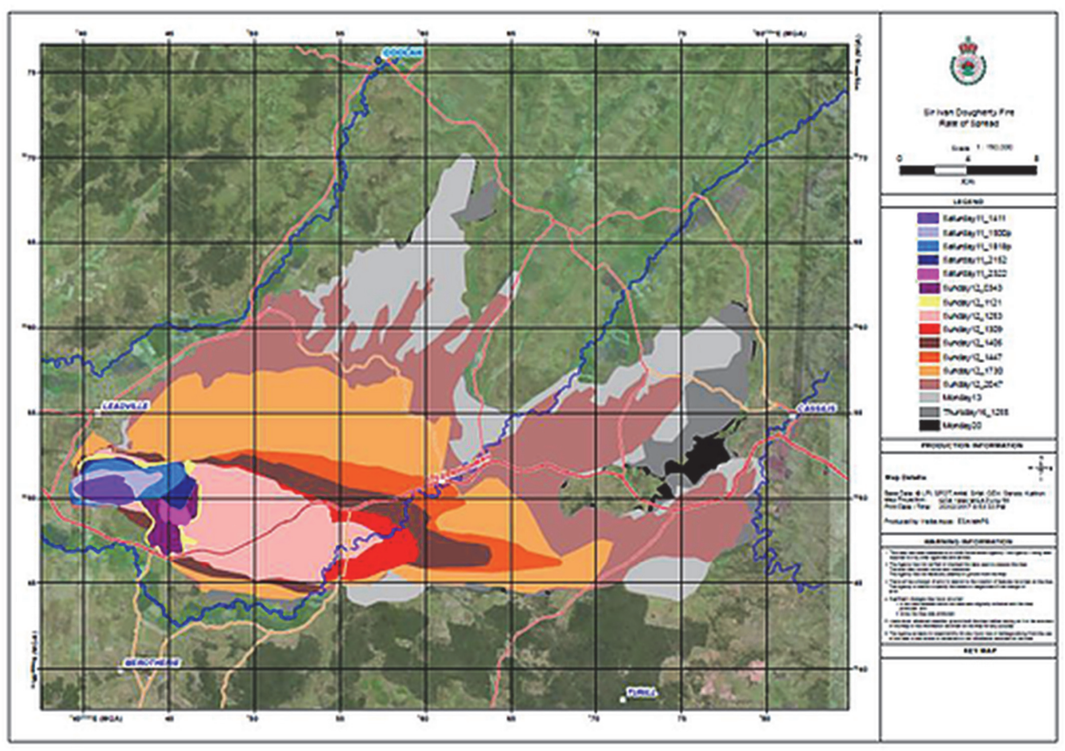

Figure 2. Sir Ivan fire progression map (credit: NSW RFS)

ACCESS-Fire modelling

ACCESS-Fire couples an empirical fire spread model to the Australian numerical weather prediction model. The coupled model captures the dynamical interactions between a fire, local topography and the surrounding atmosphere in three dimensions. Feedback processes between the fire and atmosphere occur as the energy fluxes from the fire modify the surrounding environment, particularly the nearby wind field. Initial simulations with the coupled model are shown at Fig. 3. Results are encouraging, showing wind and topographic interactions and plume development.

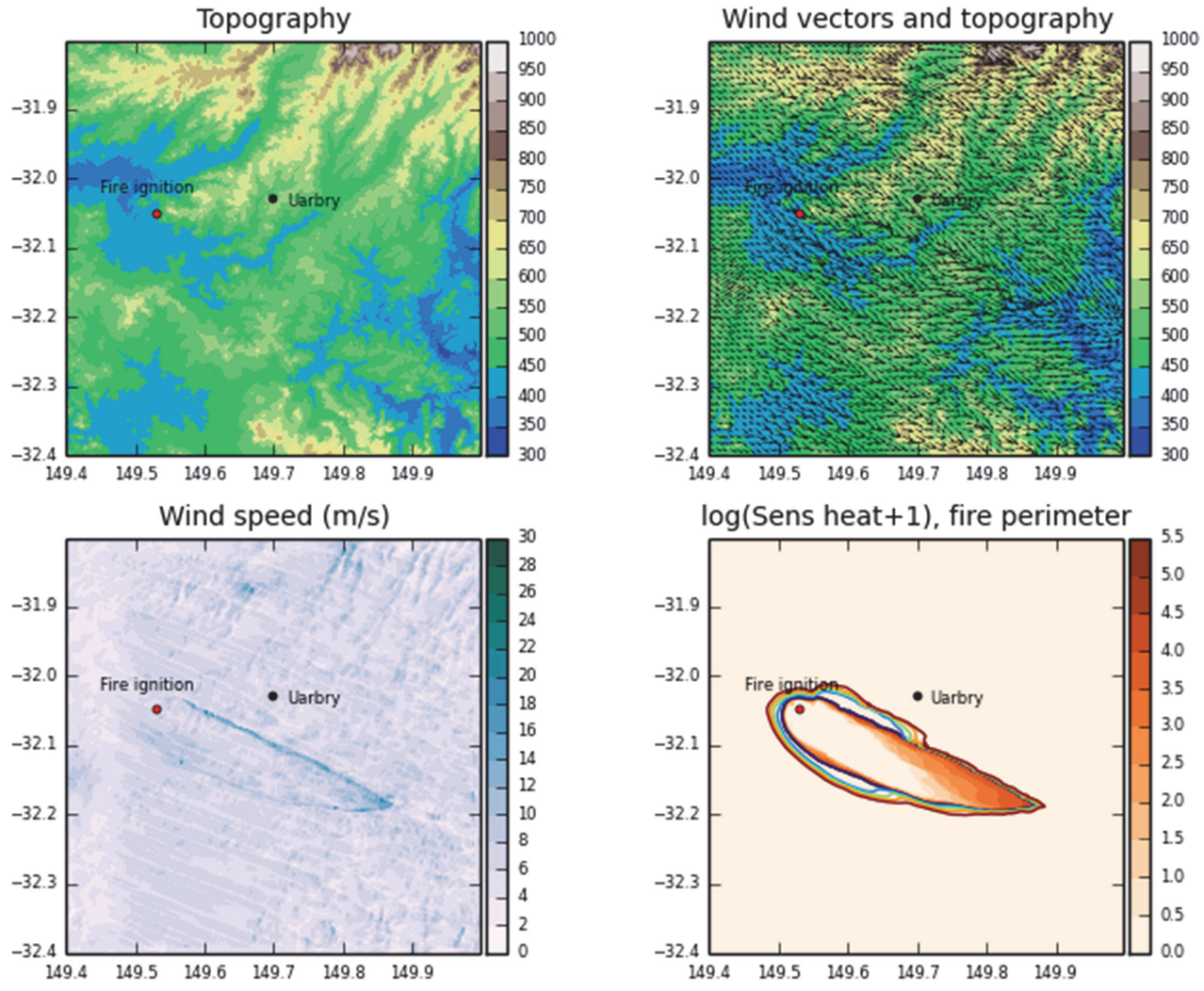

Figure 3. Preliminary ACCESS-Fire simulations of the Sir Ivan fire

PLANS

The results shown here are early simulations. Significant work is in progress including assessing and calibrating the fire spread, refining the model's science settings and evaluation of results. Particular focus will be given to the model treatment of the frontal wind change and the vertical structure of the atmosphere near the time of pyrocb development. A comprehensive set of observations were made on the day and a detailed validation of observations against model output will be made.

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