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A probabilistic model to predict property loss from fires at fine temporal and spatial scales

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A probabilistic fire risk model was developed using a spatially explicit Bayesian Network (BN) to integrate a wide range of processes and their interactions to predict the daily probability of property loss. The BN considered influences of environmental (e.g., fuel type, topography, house density, weather) and human attributes (e.g. house density) and along with processes (e.g., ignition and propagation) governing fire behaviour. A fire spread simulator was used to generate distributions of fire size and travel distance under various fire weather and fuel treatment scenarios. Results were used to populate the BN model and generate predictions of the likelihood of fires igniting and spreading to the urban interface at intensities likely to result in property loss. Two urban case study landscapes in south-eastern Australia (Sydney and Melbourne), were tested using a resolution or either 5 or 10 km square grids over a 20 year period (1990 to 2010). Median predicted probabilities of potentially destructive fires reaching the interface corresponded with recorded instances of large fires that affected interfaces. Relatively high probability events were over-predicted compared with observed data which may be due to either the effects of suppression that were not accounted for in the model or an absence of ignitions on these days. Overall, use of the model indicated that identification of the highest fire risk areas consideration needs to be given to not only weather but also the fuels, the distribution of property, plus features inherent in the landscape that affect fire spread.