Assessing the impact of Climate Change on Fire Weather

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Why are the climate change impacts on Fire Weather hard to forecast?

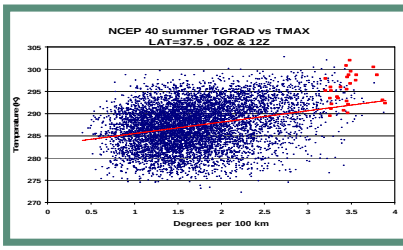
► Bushfires depend on small-scale features and extreme conditions that climate models cannot represent with sufficient accuracy and over long enough periods.

Our new approach:

► Use of a new diagnostic tool to identify synoptic systems leading to the most destructive and disastrous bushfires experienced in southeast Australia in recent decades (Mills, 2005).

► Extremely high thermal gradients and maximum temperatures have been associated with the deep fronts inducing extreme fire danger days.

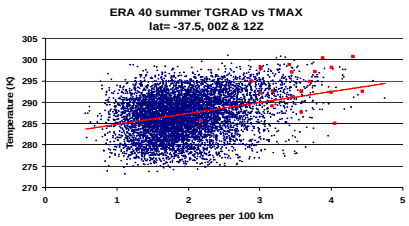
► No need to have a wide range of variables, the temperature at 850 hPa is enough. It can be readily applied to climate models of the 4th Assessment of the IPCC.



NCEP verified with ERA-40 dataset.

► A similar clustering of historic fires have been found with the ERA40 dataset.

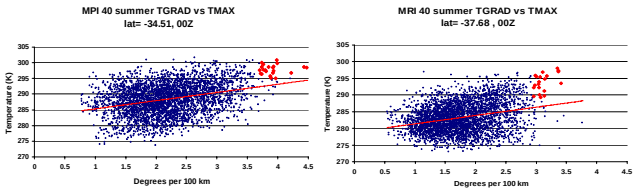
Scatterplots of $|\nabla T|$ versus the maximum temperature value on 37.5S over Victoria at 850 hPa over DJF from 1963/64 to 2002/03. Red values correspond to historic fire events. (NCEP on the left, ERA-40 on the right)



How well do the IPCC models reproduce the signal for the 20th century?

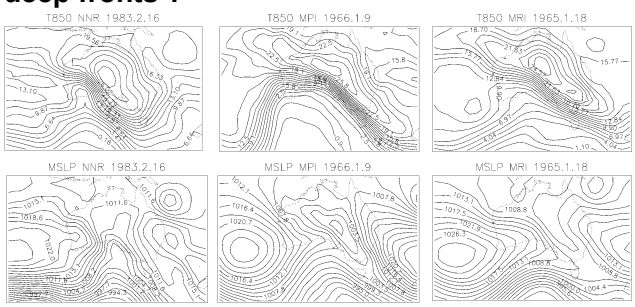
► The MPI and MRI models reproduce quite well the features found with the reanalyses for the 20th century.

►Using temperature from a lower latitude gives a better representation of the observed slope.



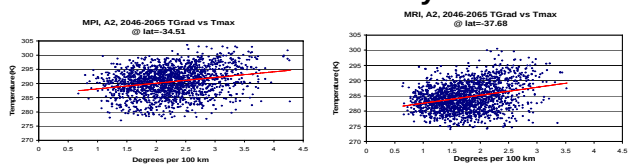
Same scatterplots as above but with MPI (left) and MRI (right) datasets. Red values are arbitrarily designated extreme values.

Does the proxy "high thermal gradient and maximum temperature" enable us to pick deep fronts ?



Temperature at 850hPa (top) and mean sea level pressure (bottom) fields for Ash Wednesday 1983 (NNR) and the first extreme days for MPI and MRI datasets (respectively from left to right).

First results for the 21st century.



Same scatterplots as above with MPI and MRI scenario A2 datasets for 2046-65.

What's next ?

► Find an empirical law to determine the thresholds for the extreme values of thermal gradient and maximum temperature.

► Analyse the results of 2 scenarii (A2 and B1) for 10 models over 2 periods in the 21st century (2046-65 and 2081-2100).

► Export the diagnostic tool to other regions of Australia.