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Submission to Senate Inquiry into "Recent trends in and preparedness for extreme weather events"

**To the Senate Standing Committee on Environment and Communications Inquiry into Recent trends in and preparedness for extreme weather events**

I believe that some of our journal publications are relevant to this Inquiry. Some of these are attached here and could be reviewed and considered as part of this Inquiry with a view to considering the relationship between "trends" in extreme events and interannual to multidecadal variability in addition to the (equally important) role of anthropogenic climate change. Our research (see attached publications) has shown that the risk of extreme events (i.e. flood, drought, fire) for (at least) eastern Australia is strongly influenced by large-scale climate drivers such as the El Niño/Southern Oscillation (ENSO) and that the frequency and magnitude of these extremes varies on interannual to multidecadal time scales (i.e. historical observations show multiyear epochs that are "drought/fire dominated" or "flood dominated").

I note the Terms of Reference of the enquiry are to investigate and report on matters relating to:  
*(a) recent trends on the frequency of extreme weather events, including but not limited to drought, bushfires, heatwaves, floods and storm surges;*

I agree it is important to look at recent and historical "trends" in the frequency of extreme events.....but when doing this it must be done with a thorough understanding of the role of interannual to multidecadal climate variability associated with natural climate drivers (e.g. ENSO, Interdecadal Pacific Oscillation (IPO)) such that any "trends" found in extreme events can be put into context (i.e. how much of the "trend" is due to natural processes and how much is due to anthropogenic climate change?).

I also note the 2<sup>nd</sup> point in the Terms of Reference:

*(b) based on global warming scenarios outlined by the Intergovernmental Panel on Climate Change and the Commonwealth Scientific and Industrial Research Organisation of 1 to 5 degrees by 2070:*

*(i) projections on the frequency of extreme weather events, including but not limited to drought, bushfires, heatwaves, floods and storm surges,*

*(ii) the costs of extreme weather events and impacts on natural ecosystems, social and economic infrastructure and human health, and*

*(iii) the availability and affordability of private insurance, impacts on availability and affordability under different global warming scenarios, and regional social and economic impacts;*

Yes it is very important to investigate all the things mentioned in (i), (ii), (iii) but to do this just based on IPCC scenarios (which do not realistically represent the natural processes known to drive extreme events in Australia) is to only consider part of the story. The IPCC projections must be considered in conjunction with the what has occurred and what is possible due to natural interannual to multidecadal variability (particularly clustering of extremes) otherwise the preparedness assessments, climate change response and risk management strategies, studies estimating costs of future extreme events etc will be inadequate.

Extreme events (flood, bushfire, drought) always have and always will occur in Australia.....and a large proportion of this extreme event risk is and always will be driven by natural climate drivers (with anthropogenic climate change also likely to play a role but that role is not yet rigorously quantified or understood). Therefore, the important first step is to thoroughly understand the drivers and impacts of historical interannual to multidecadal variability – then once that is properly understood (which it

currently is not) and the associated risks are quantified and adapted to, then the IPCC scenarios could be utilised to see how things might change in the future (currently difficult because the climate models that produce the IPCC scenarios do not realistically simulate many of the process responsible for making extreme event frequency and magnitude in Australia so variable in space and time).

Attached are the following papers:

- Kiem, A.S., Franks, S.W. and Kuczera, G. (2003): Multi-decadal variability of flood risk. *Geophysical Research Letters*, 30(2), 1035, doi:10.1029/2002GL015992.
- Kiem, A.S. and Franks, S.W. (2004): Multi-decadal variability of drought risk - Eastern Australia. *Hydrological Processes*, 18(11), 2039-2050.
- Verdon, D.C., Kiem, A.S. and Franks, S.W. (2004): Multi-decadal variability of forest fire risk - Eastern Australia. *International Journal of Wildland Fire*, 13(2), 165-171.
- Kiem, A.S., Franks, S.W. and Verdon, D.C. (2006): Climate variability in the land of fire and flooding rain. *Australian Journal of Emergency Management*, 21(2), 52-56.
- Verdon-Kidd, D.C. and Kiem, A.S. (2009): Nature and causes of protracted droughts in Southeast Australia - Comparison between the Federation, WWII and Big Dry droughts. *Geophysical Research Letters*, 36, L22707, doi:22710.21029/22009GL041067.
- Kiem, A.S. and Verdon-Kidd, D.C. (2010): Towards understanding hydroclimatic change in Victoria, Australia – preliminary insights into the “Big Dry”. *Hydrology and Earth System Sciences*, 14, 433–445, [www.hydrol-earth-syst-sci.net/14/433/2010/](http://www.hydrol-earth-syst-sci.net/14/433/2010/).

If you have any questions or require further information please let me know.

Thank you

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