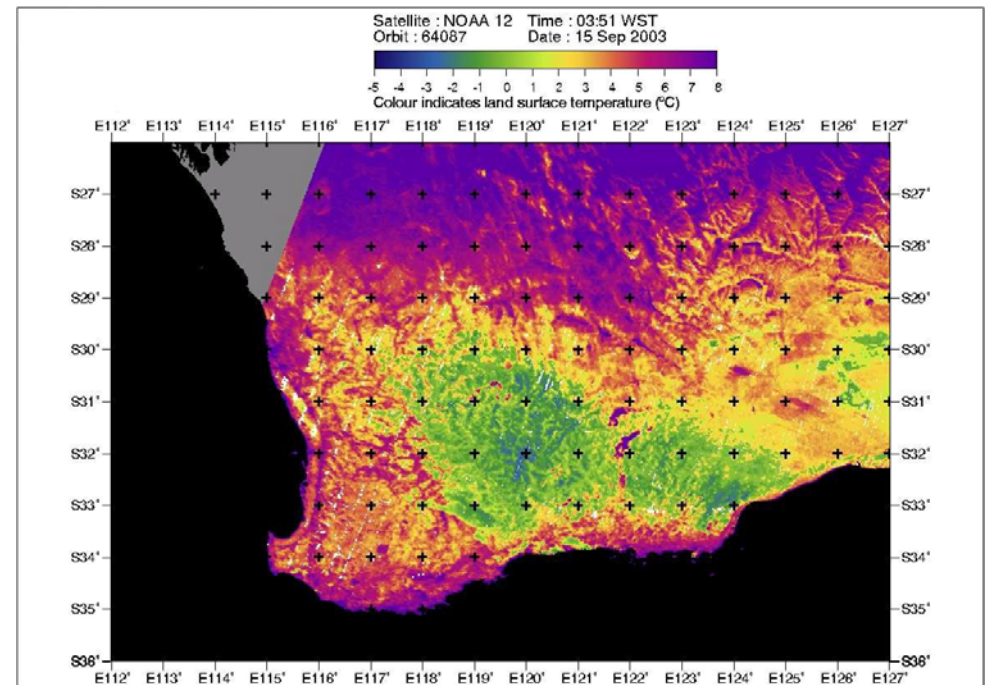


Climate Change and Frost in Western Australia

T.J. Lyons

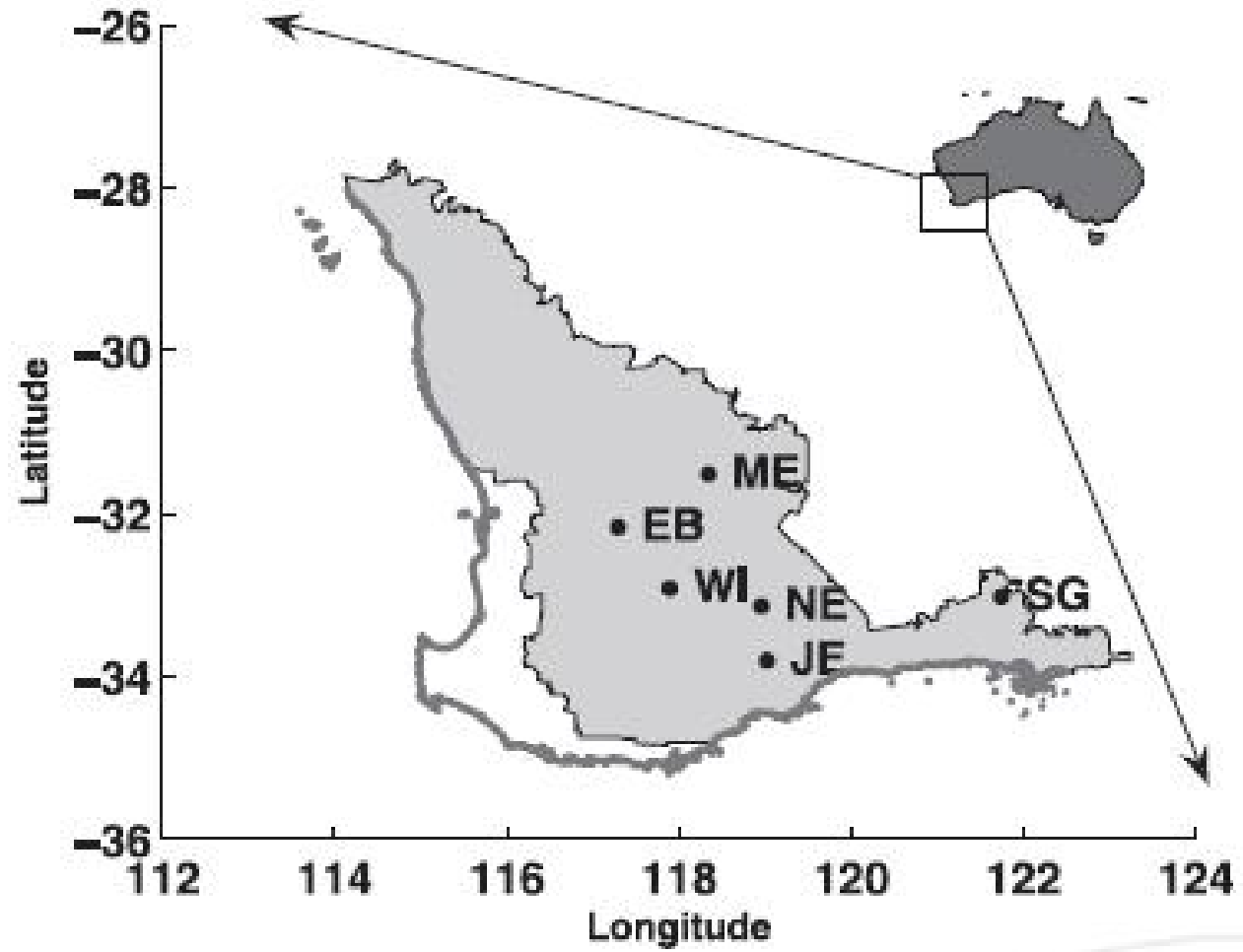
State Centre of Excellence for Climate Change,
Woodland and Forest Health

J. Kala, I.J. Foster, U. Nair

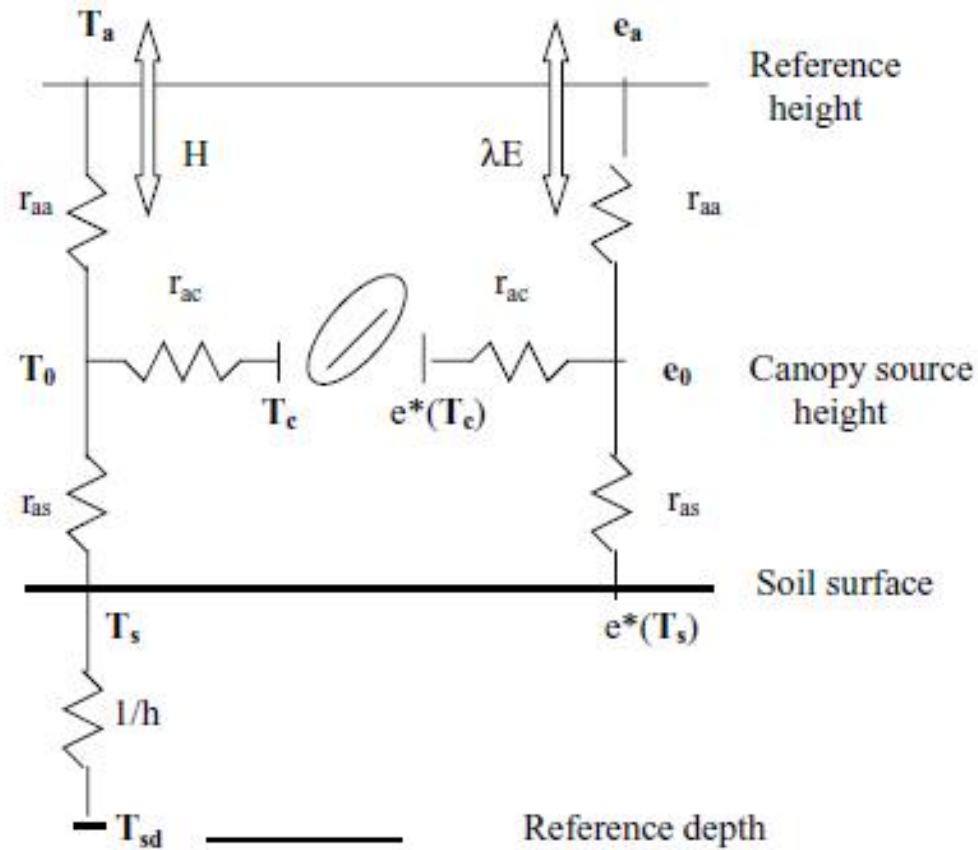




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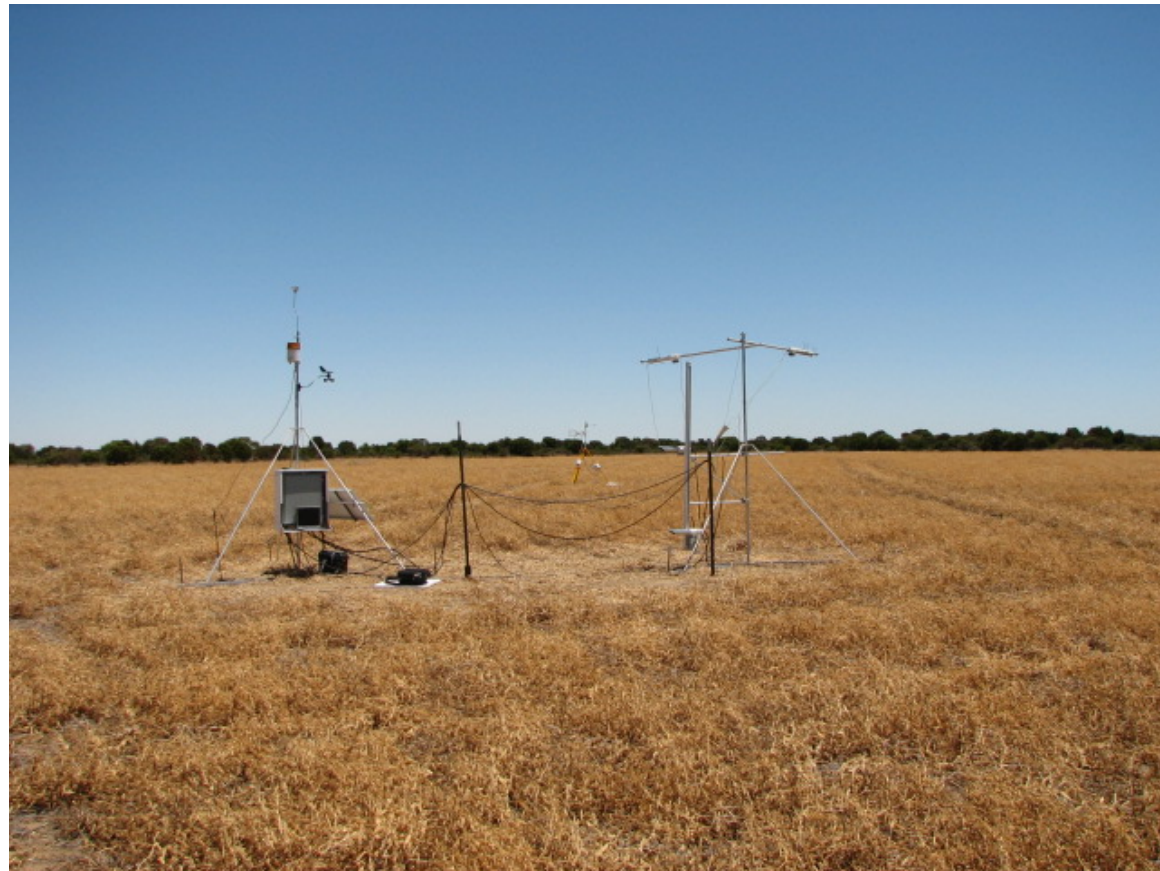
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crop or foliage temperature provides direct indication of the extent of potential crop damage



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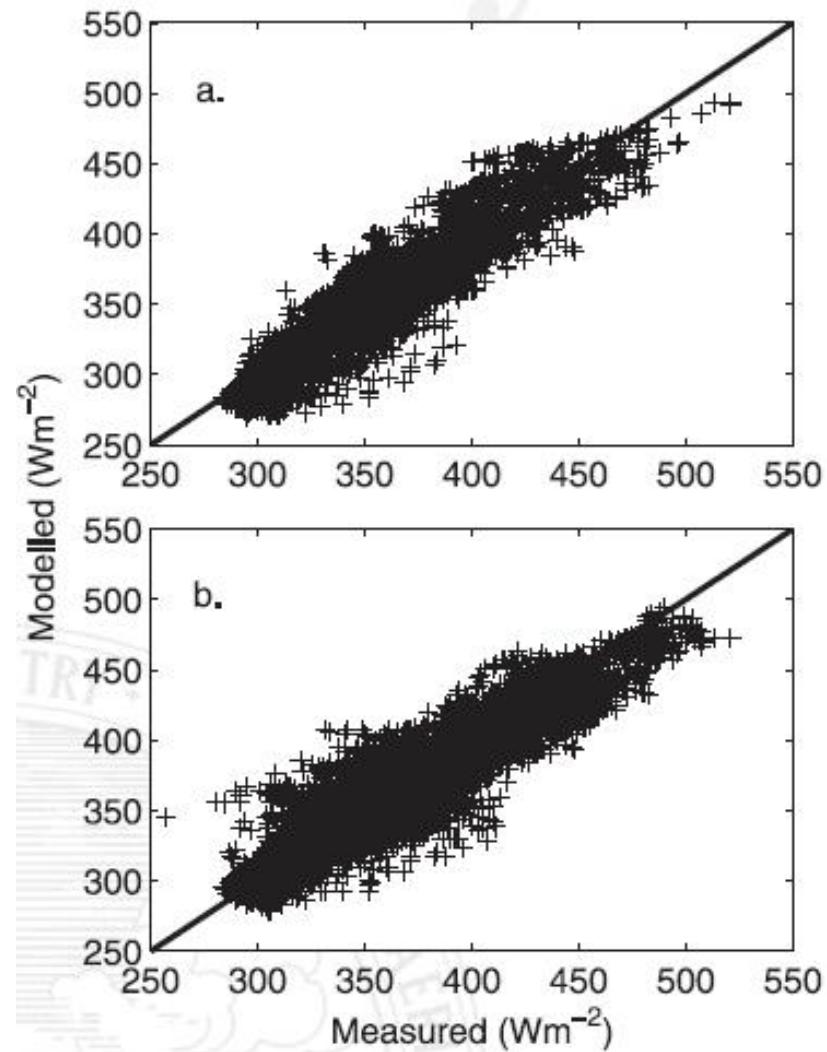


**Radiation and Energy Balance Systems, Inc.
(REBS) Bowen ratio unit**

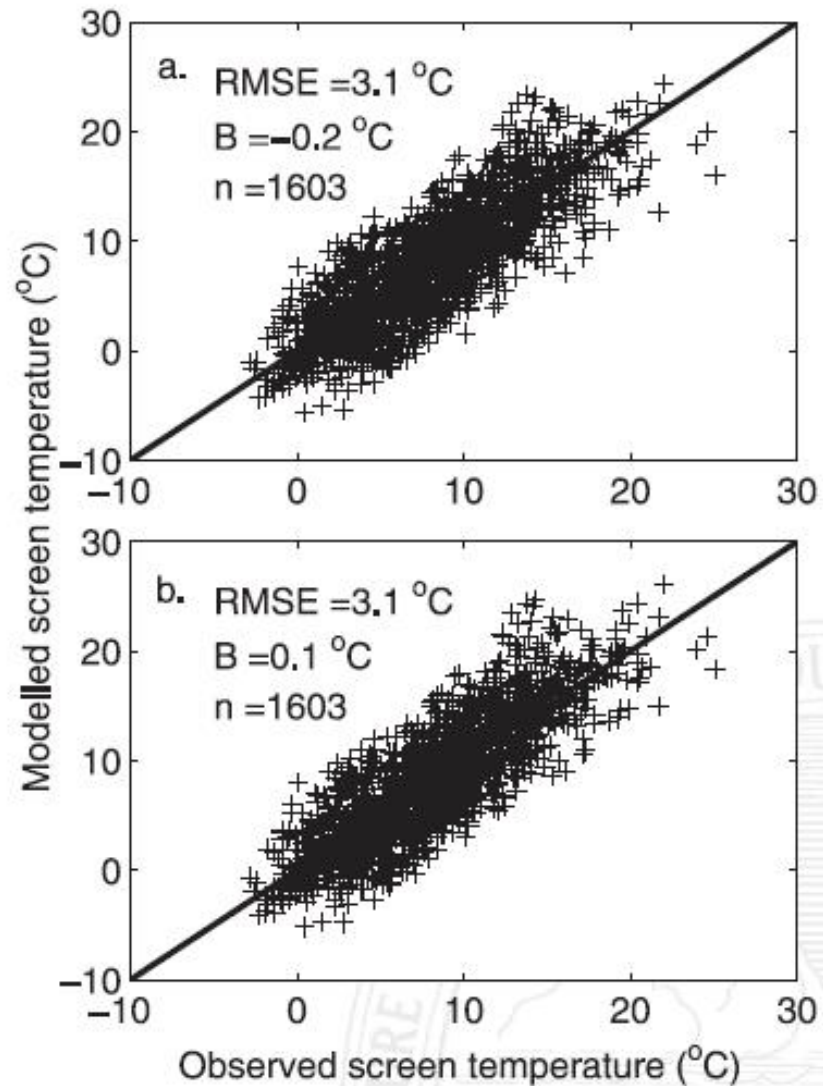
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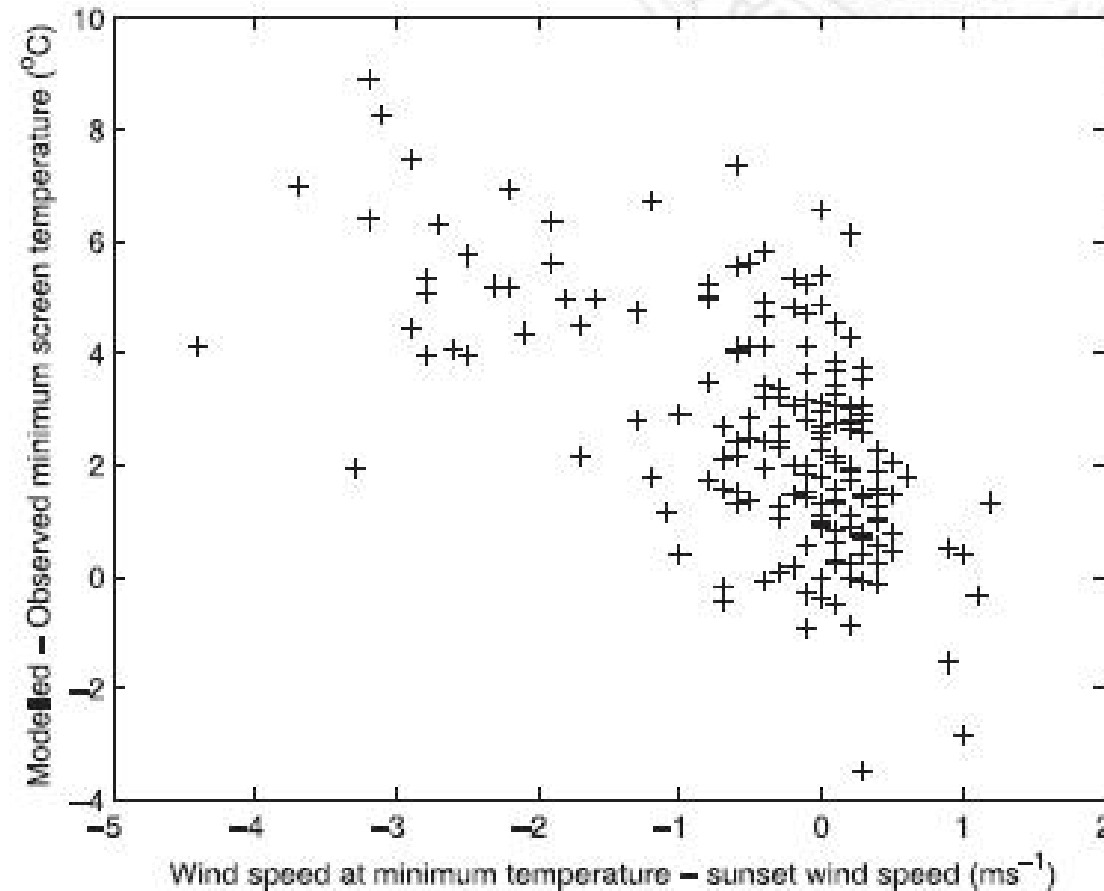
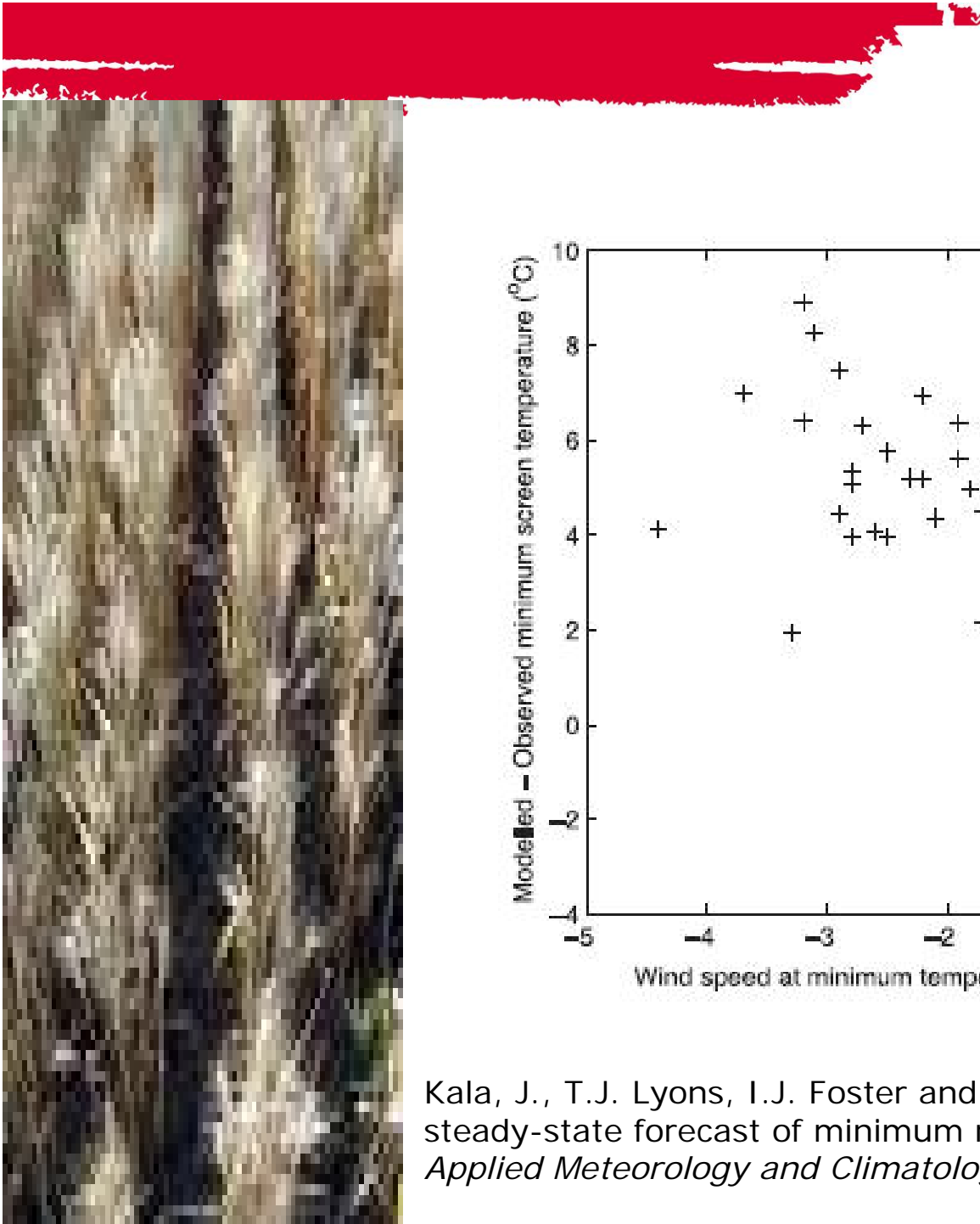
Kala, J., T.J. Lyons, I.J. Foster and U.S. Nair, 2009: Validation of a simple steady-state forecast of minimum nocturnal temperatures. *Journal of Applied Meteorology and Climatology*, **48**, 624–633.



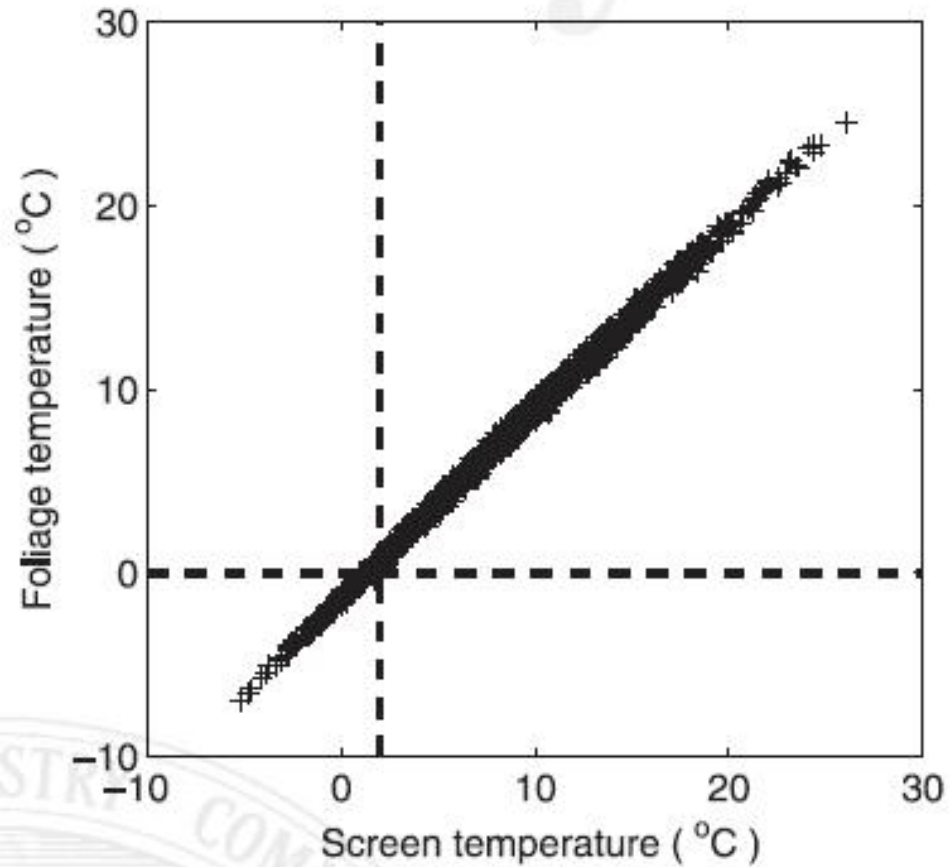
Kala, J., T.J. Lyons, I.J. Foster and U.S. Nair, 2009: Validation of a simple steady-state forecast of minimum nocturnal temperatures. *Journal of Applied Meteorology and Climatology*, **48**, 624–633.

Station	<i>n</i>	RMSE (W m ⁻²)	<i>B</i> (W m ⁻²)	% < 2°C
ME	1603	3.1	-0.2	69
EB	1602	2.7	0.8	64
JE	1486	2.4	0.2	52
NE	1357	2.7	0.5	61
SG	1533	3.0	0.1	53
WI	1607	2.7	0.5	48

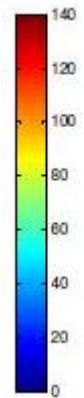
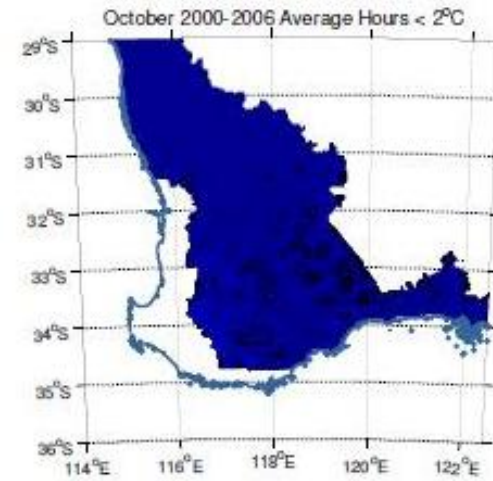
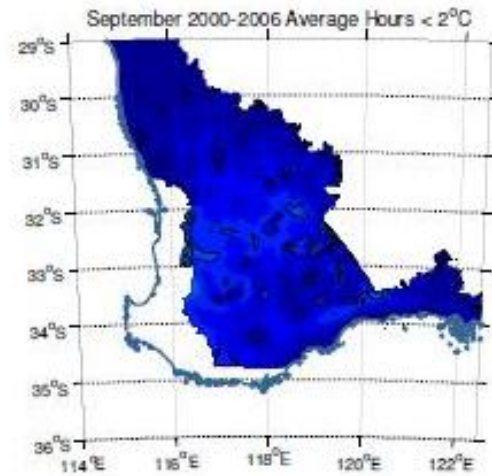
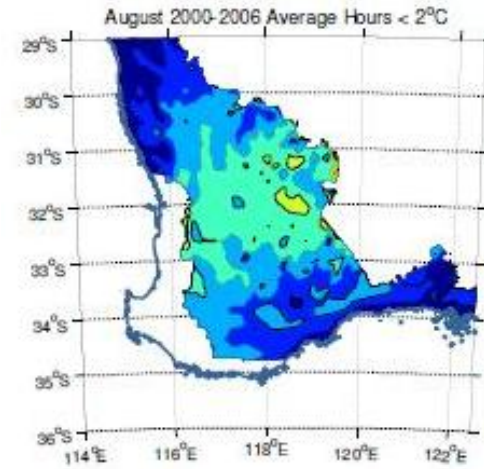
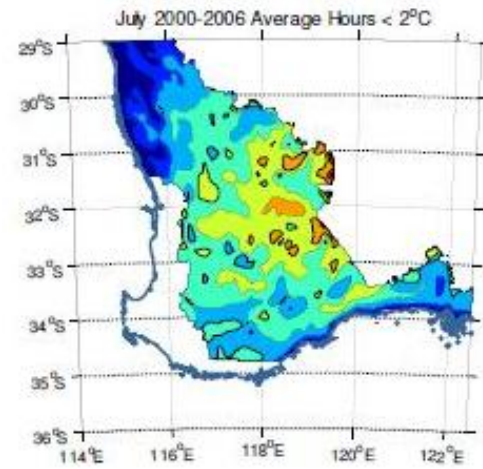
Sample size, RMSE, and bias between modelled and observed minimum screen temperatures at Merredin, East Beverly, Jerramungup, Newdegate, Salmon Gums, and Wickepin for the years 2000–06 and the percentage of observations correctly predicted < 2°C

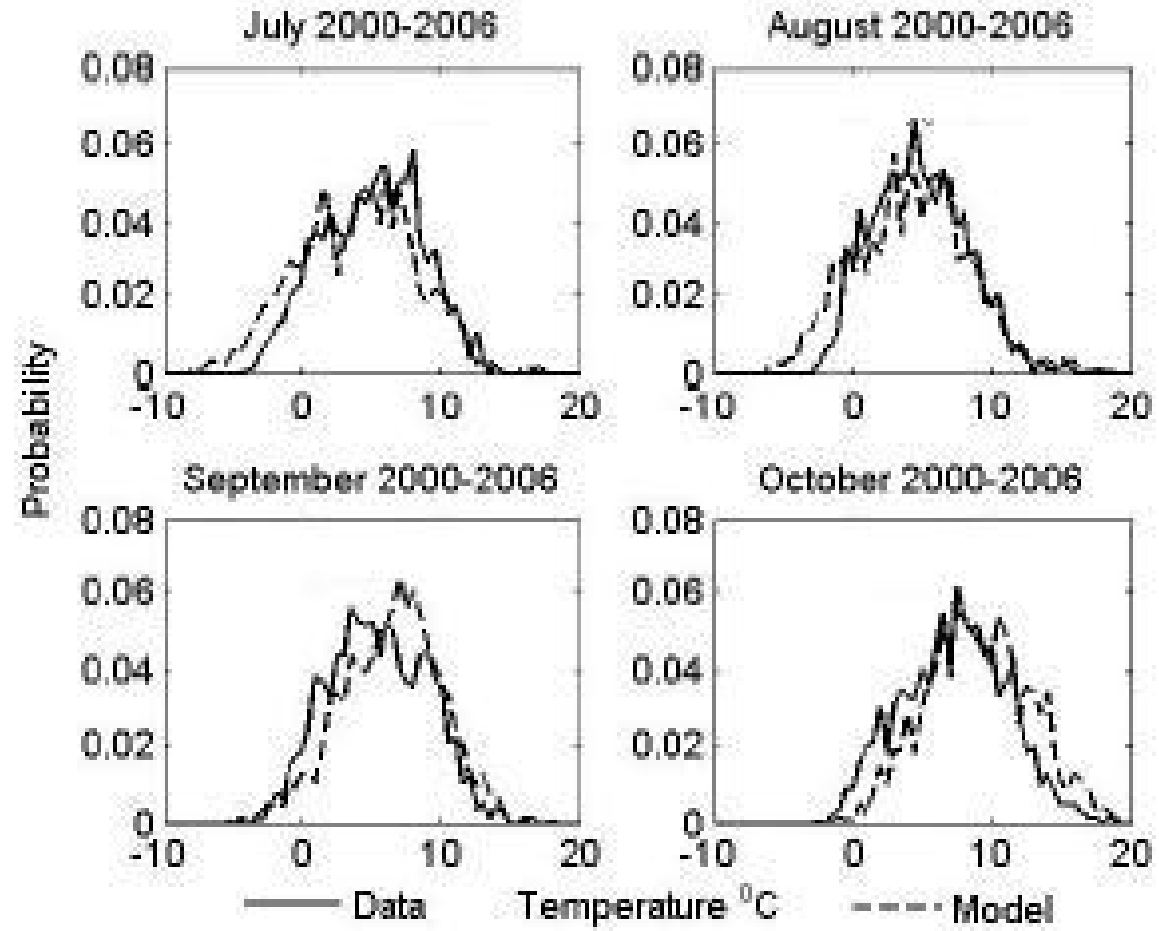


Kala, J., T.J. Lyons, I.J. Foster and U.S. Nair, 2009: Validation of a simple steady-state forecast of minimum nocturnal temperatures. *Journal of Applied Meteorology and Climatology*, **48**, 624–633.



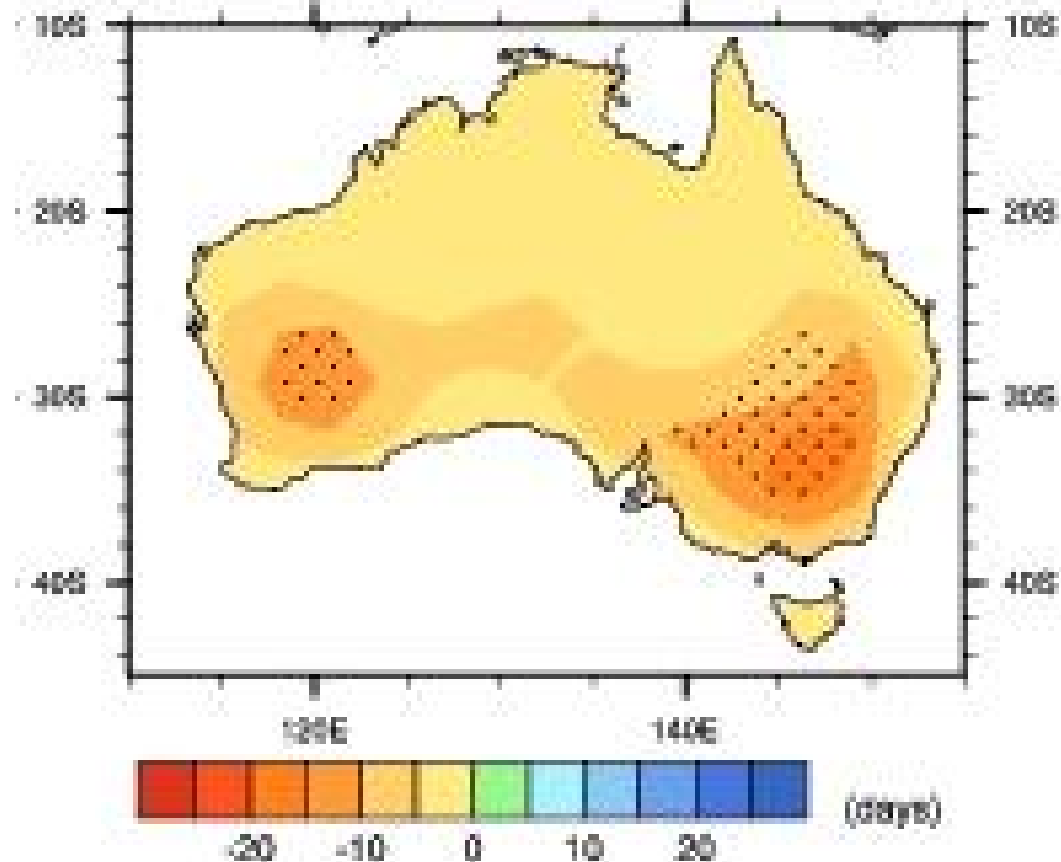
Kala, J., T.J. Lyons, I.J. Foster and U.S. Nair, 2009: Validation of a simple steady-state forecast of minimum nocturnal temperatures. *Journal of Applied Meteorology and Climatology*, **48**, 624–633.







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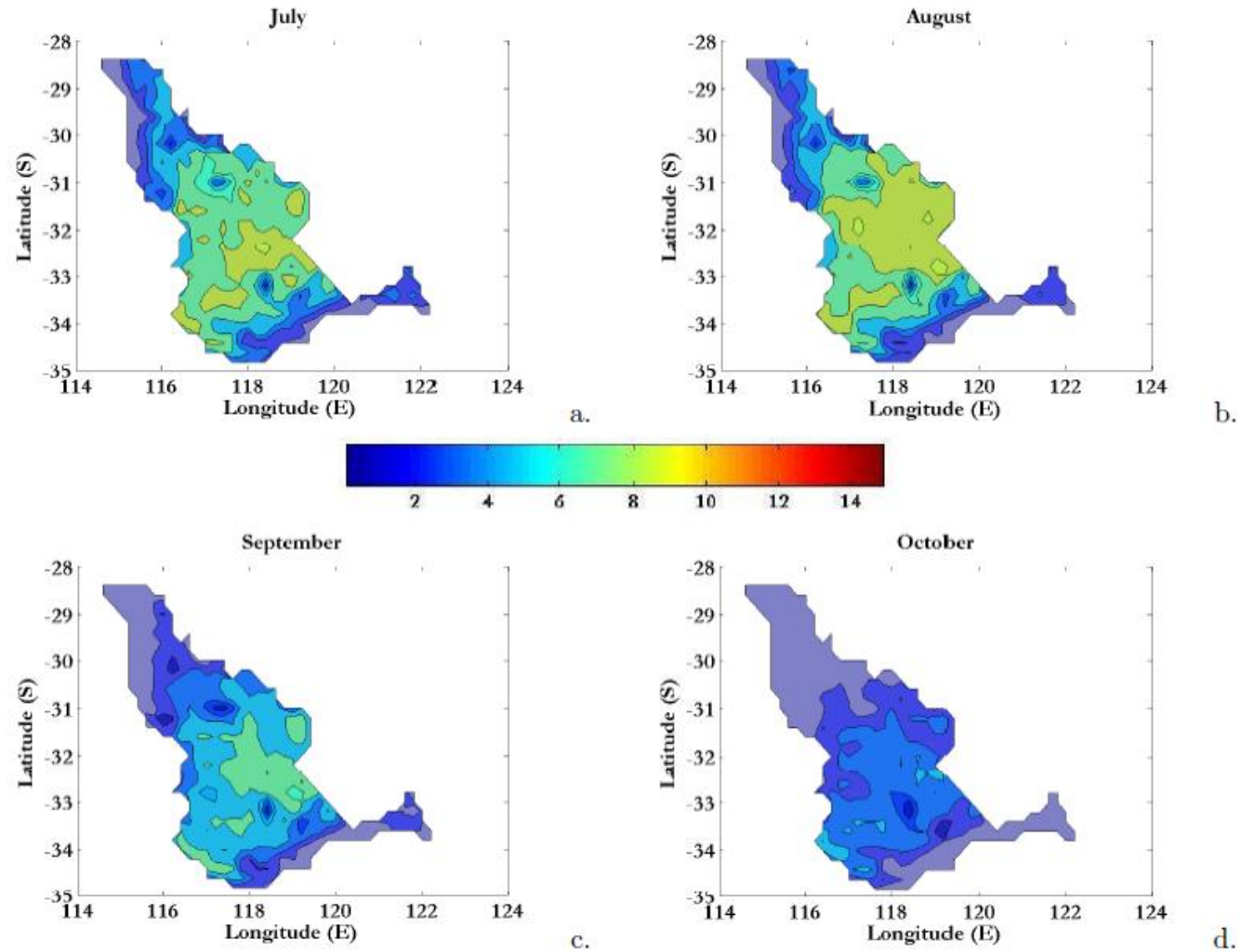


Ensemble mean projected change (2080-2099) minus (1980-1999) in frost days.

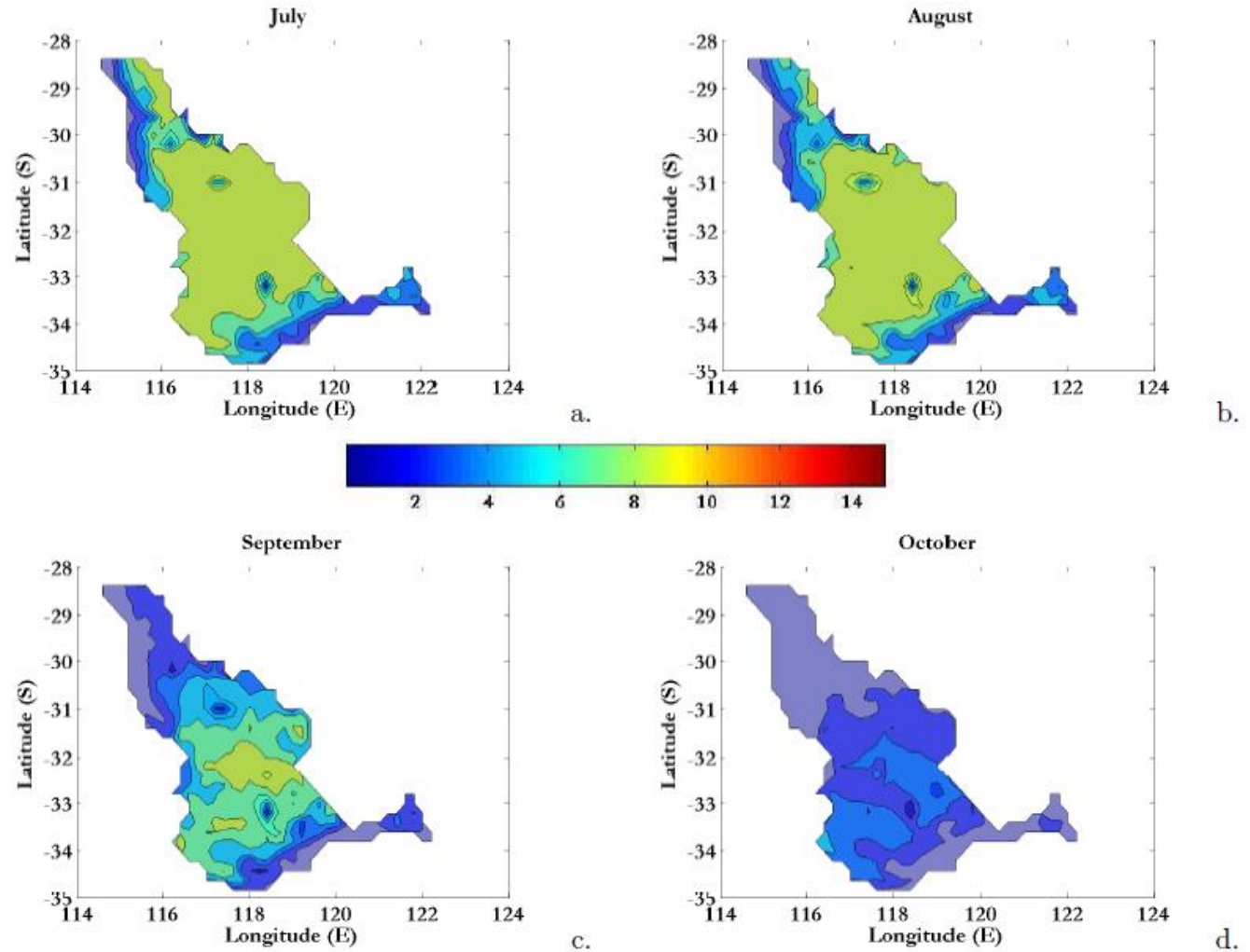
Alexander, L.V. and J.M. Arblaster, 2009: Assessing trends in observed and modelled climate extremes over Australia in relation to future projections. *International Journal of Climatology*, **29**, 417-435



Average number of frost ($T < 2^{\circ}$) events per month over the period 1997-2006

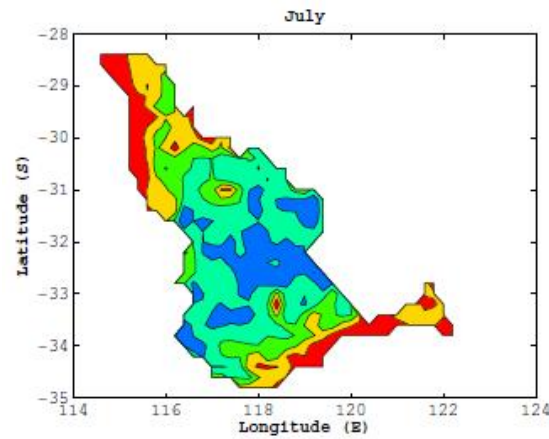


Average number of frost ($T < 2^{\circ}$) events per month under $1.5 \times \text{CO}_2$

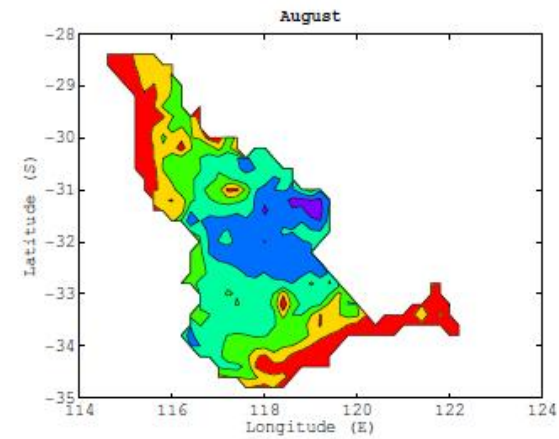




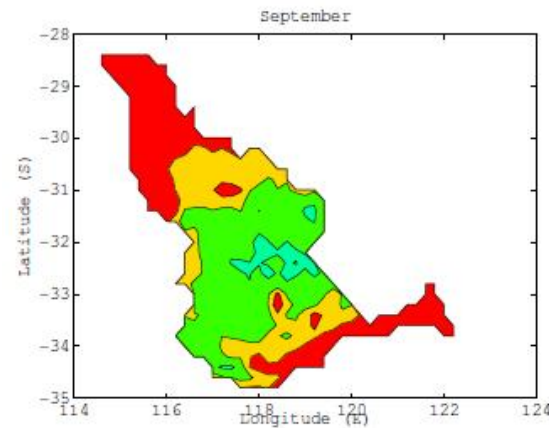
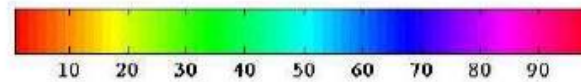
Average hours of frost ($T < 2^{\circ}$) per month over the period 1997-2006



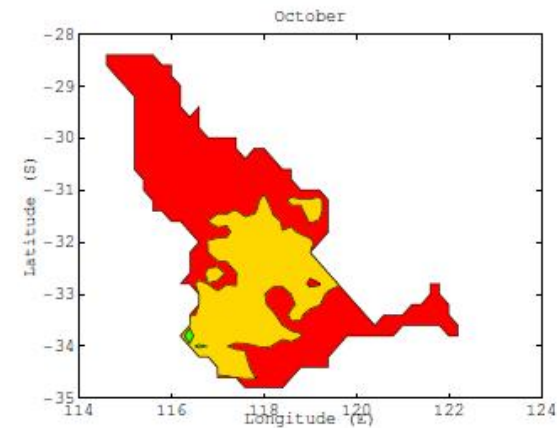
a.



b.



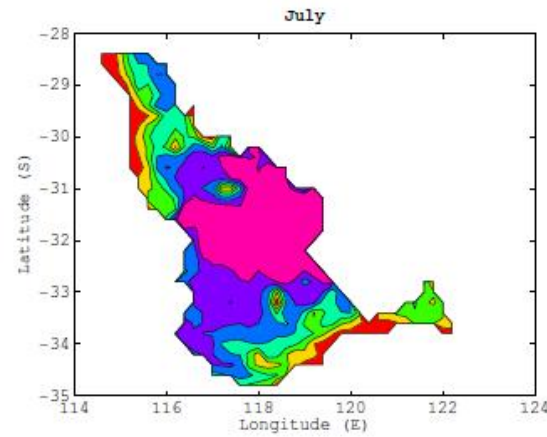
c.



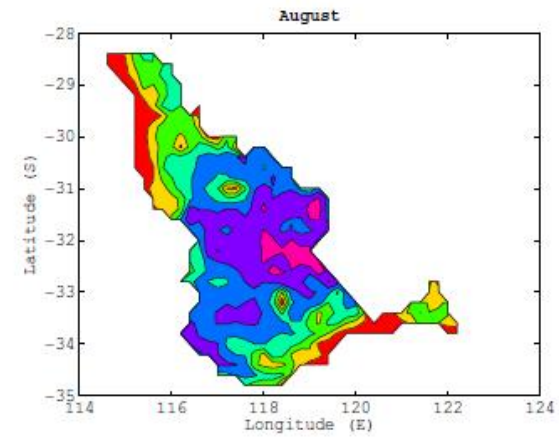
d.



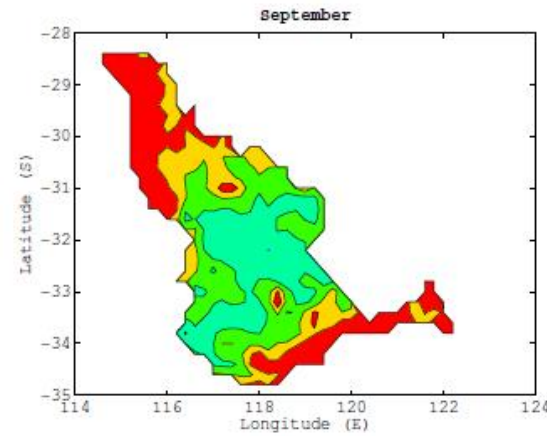
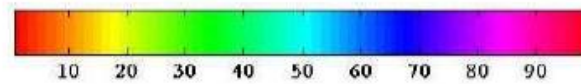
Average hours of frost ($T < 2^{\circ}$) per month under $1.5 \times \text{CO}_2$



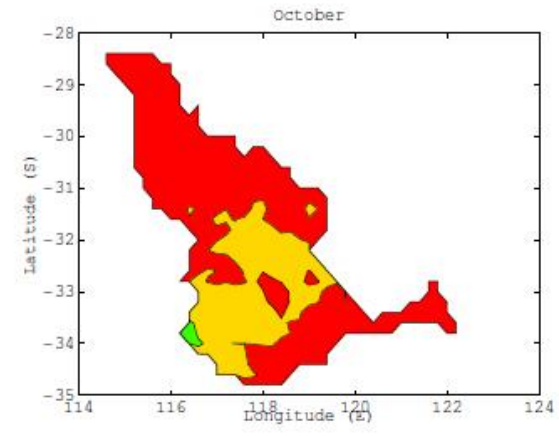
a.



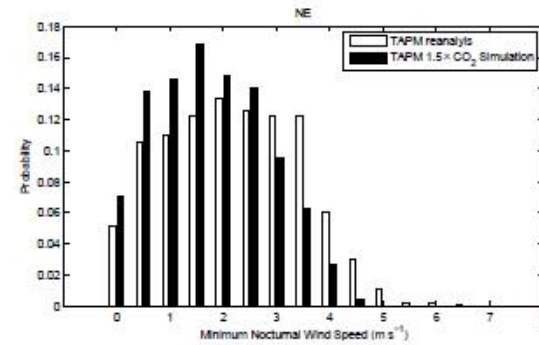
b.



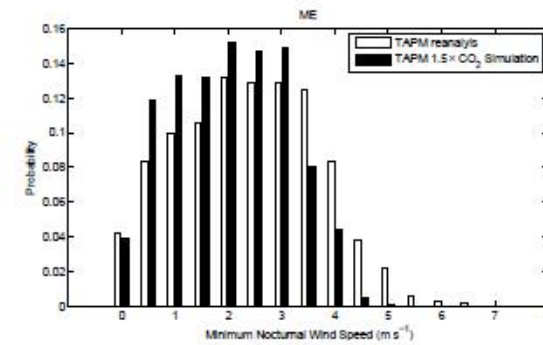
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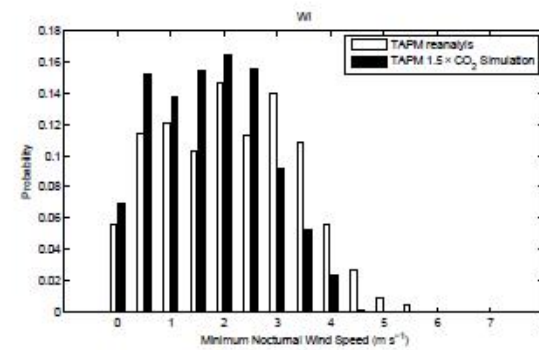
d.



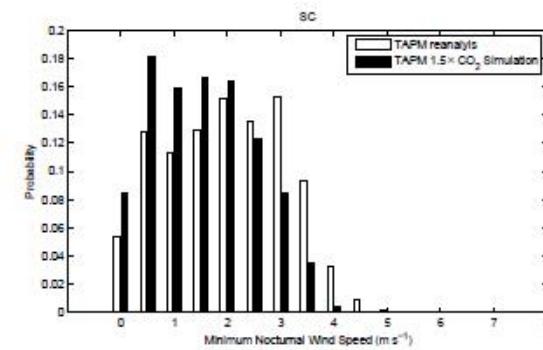
a.



b.



c.



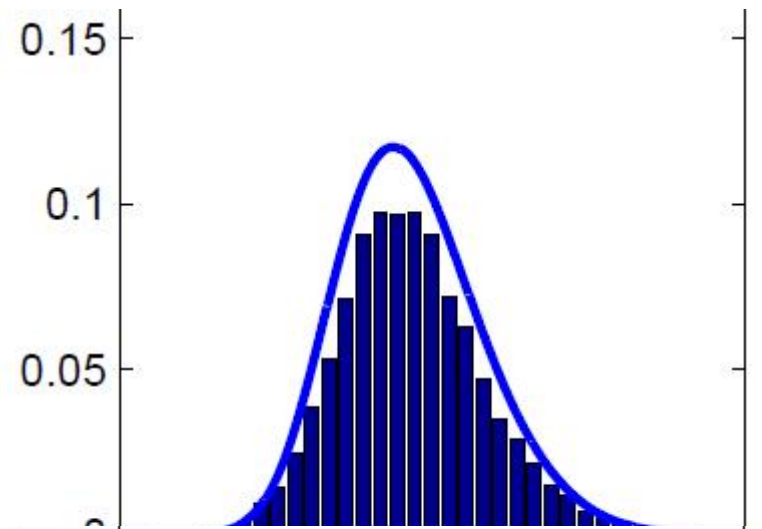
d.

Decrease in minimum nocturnal wind speeds

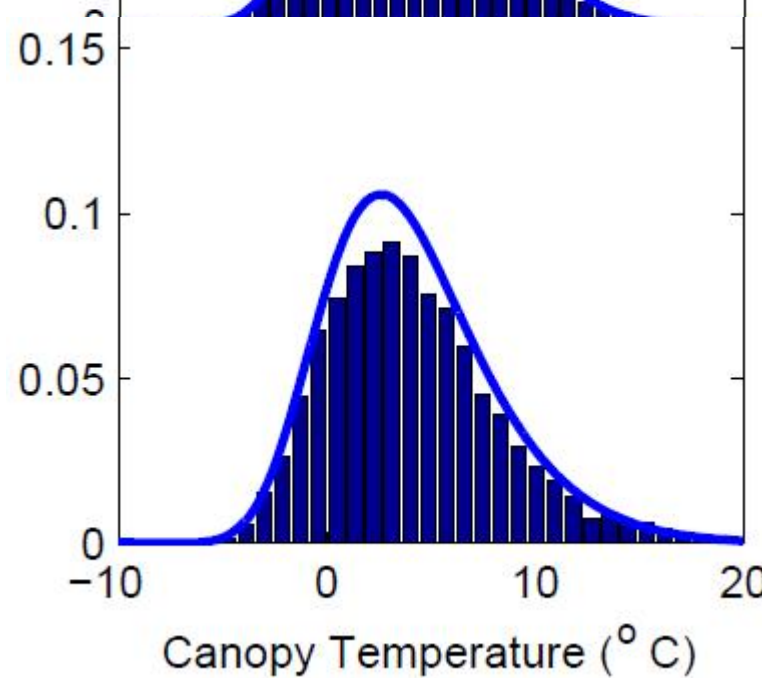


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Current climate



1.5 x CO₂



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