ATMOSPHERIC STABILITY ENVIRONMENTS AND FIRE WEATHER (1) – AN EXTENDED HAINES INDEX

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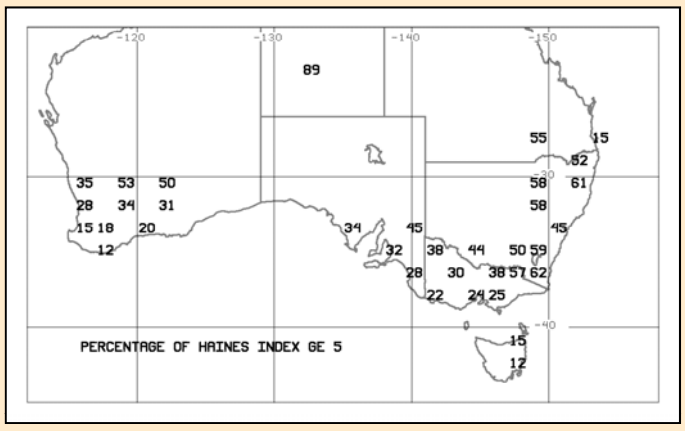
While traditional fire danger indices such as the FFDI, the FWI, and the USFDRS focus on the danger of a “wind-driven” fire, it is widely considered amongst fire managers that atmospheric stability affects fire behaviour.
The Haines Index, which combines a temperature lapse rate and a dryness component to give a score from 2-6 is widely used in the US, but has less acceptance in Australia.

THE HAINES INDEX IN AUSTRALIA

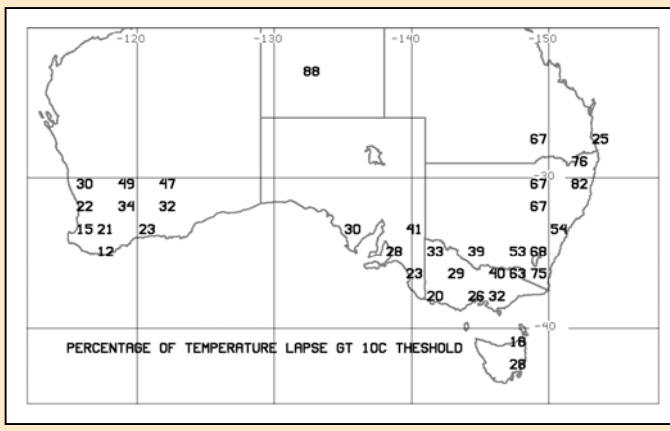
THE PROBLEM

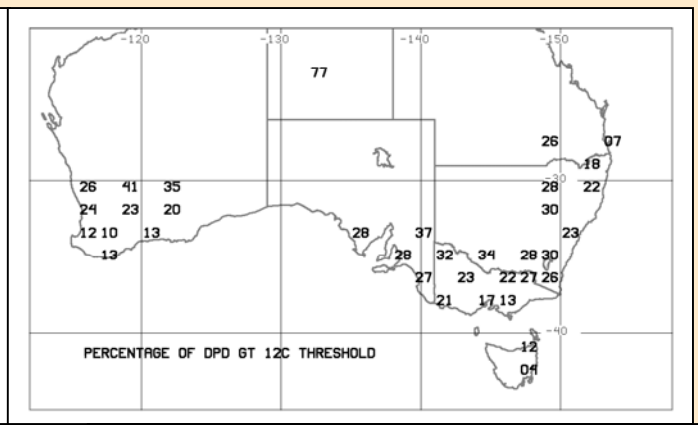
Too many days have HI ≥ 5 so don’t discriminate the 5% of “bad” days.



THE REASON

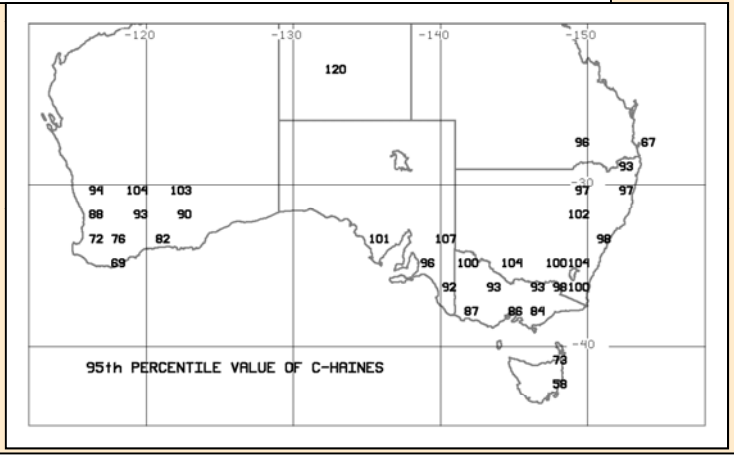
The lapse rate and the dewpoint depression ingredients of the Haines Index exceed the upper bounds used in Haines’ formulation on too many days – the Australian climate is different.





A SOLUTION?

Re-formulate the Haines Index to use open-ended linear functions of temperature lapse and dewpoint depression. With some constraints, this leads to a potential range from 0 – 13.5. There is considerable variation in the climate of this proposed “C-HAINES” Index across Australia, but the 95th percentile values show a strong relationship with the number of days for which the HI ≥ 5 or HI = 6 at the same point.



IS THE NEW C-HAINES USEFUL? (TRIAL PRODUCTS THIS SUMMER)

Systematic quantitative comparison with fire activity data sets will be needed
Comparison with a large number of fire and pyrocumulus events shows

- Only weak correlation between C-HAINES and FFDI – independent information
- Association of extreme C-HAINES values and some unexpected night-time fire activity events
- Association of extreme C-HAINES values and sustained fire activity under decreasing FFDI
- Often a period of very high C-HAINES leading up to fire ignition or extreme fire activity days
- An association of extreme FFDI and extreme C-HAINES on days of major pyrocumulus developments

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