VICTORIA FIRE WEATHER CLIMATOLOGY DATASET – OVERVIEW AND OUTPUTS

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A high spatial and temporal resolution climatology of fire weather is important for fire management planning. A homogeneous 41-year (1972–2012) hourly 4-km gridded climate data set for the fire-prone state of Victoria, Australia has been generated. The dataset includes temperature, relative humidity, wind speed, wind direction, FFDI, and daily DF and KBDI. This unique data set provides an almost limitless opportunity for hitherto unavailable analyses such as - identifying optimal prescribed burning windows and developing regionally relevant scenarios for bushfire management plans.

INTRODUCTION

There is a need for a detailed understanding of the climatology of fire weather across the Australian landscape. Especially if strategic decisions to ameliorate the sometimes-extreme impacts of bushfires on the socio-economic wellbeing of the community are to be based on sound scientific evidence, and if variability and trends in this climatology are to be correctly interpreted. However, spatially and temporally homogenous data have not been available at the required resolution to be used for these purposes. The data set outlined in this poster is the first of its kind to provide hourly values of meteorological variables on a regular, high spatial resolution grid for Victoria.

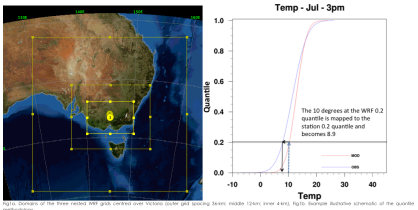


Fig1a. Domains of the three nested WRF grids centred over Victoria (outer grid spacing 36 km; middle 12km; inner 4 km). Fig1b. Example illustrative schematic of the quantile methodology

METHODS

The mesoscale model used to develop the data set was the weather and research forecasting model (WRF). Three integration domains were used in the configuration with grid spacings of 36 km (outer mesh), 12 km (middle mesh), and 4 km (inner mesh) (Fig1a). Each nest has 33 vertical model levels. Initial state and lateral boundary conditions for the outer mesh are provided by 6-hourly interval global reanalyses. Three global reanalyses were utilised for initial state and lateral boundary conditions to start integrations using the WRF model and to nudge fields through a 15-day process, discarding the first day (Mills *et al*. 2013). The outputs were subjectively and objectively assessed. A bias correction was calculated and applied using a quantile mapping method (Fig1b).

RESULTS

The outputs include surface hourly 4 x 4 km gridded temperature, relative humidity, wind speed, wind direction, forest fire danger index and daily drought factor and keetch byram drought index for January 1972 to December 2012. Additionally, outputs from the WRF model (not displayed here) include hourly three-dimensional fields of all atmospheric variables.

Outputs provide an almost limitless opportunity for hitherto unavailable analyses. For example:

Temperature extremes and monthly variability in maximum, mean and minimum.

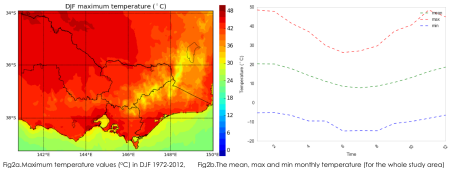


Fig2a.Maximum temperature values (°C) in DJF 1972-2012. Fig2b.The mean, max and min monthly temperature (for the whole study area)

Seasonality – relative humidity percentiles

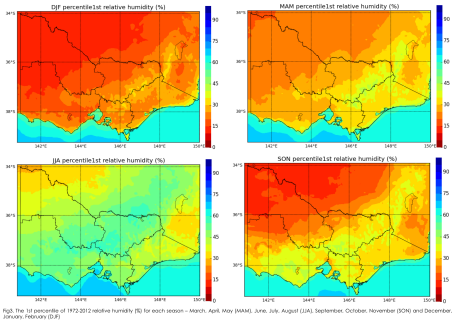


Fig3. The 1st percentile of 1972-2012 relative humidity (%) for each season – March, April, May (MAM), June, July, August (JJA), September, October, November (SON) and December, January, February (DJF)

Time series and anomalies

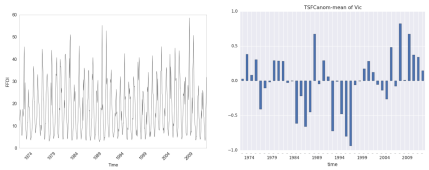
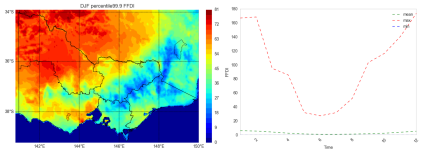


Fig4a. Study area monthly maximum FFDI (mean 18, standard deviation 11.5, minimum 2.9, maximum 58.6), Fig4b. Annual mean temperature anomaly of study area (based on climatology 1972-2012)

RESULTS cont.

FFDI percentiles and monthly variability in maximum, mean and minimum.



Diurnal variability

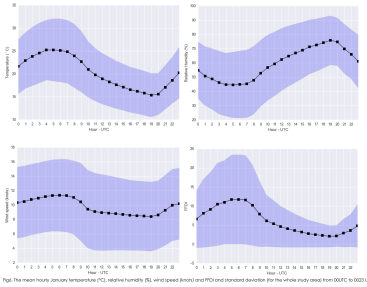


Fig5. The mean hourly January temperature (°C), relative humidity (%), wind speed (knots) and FFDI and standard deviation (for the whole study area) from 00UTC to 0023 UTC

FFDI probabilities

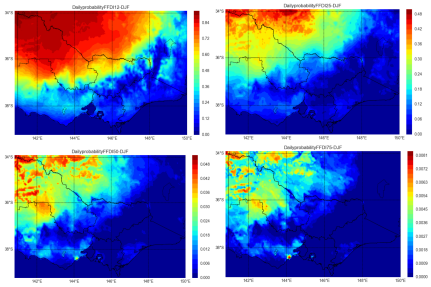


Fig7. Daily probability of FFDI greater than a. 12, b. 25, c. 50 and d. 75 for DJF (note – different legend ranges)

CONCLUSION

The Victoria fire weather climatology data set described here is the only hourly long-term 4-km dataset containing temperature, relative humidity, wind speed and wind direction along with fire danger and drought indices that is currently available. The opportunities to advance bushfire research for this region using this dataset and thereby provide information to improve risk analysis and fire management planning are immense.