

## A COMPARISON OF FRONTAL NUMBER USING A RANGE OF IDENTIFICATION METHODS – A CASE STUDY IN SOUTH WESTERN AUSTRALIA

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The south-west corner of Western Australia (SWWA) is a region dominated by winter rainfall associated with frontal systems. Early winter rainfall totals in SWWA declined in the 1970s and further declined in the 2000s. We use this region and season as a case study for assessing the strengths of a number of different frontal recognition methods.

The first method follows the Bureau of Meteorology's daily weather charts where fronts are manually drawn following a synoptician's guidelines and information from satellites and models. Fronts on days associated with rainfall in SWWA are counted. The second method classifies all raindays into 20 different types using a self-organising map (SOM), determines which types best describe frontal systems and counts the frequency of those types. The third searches for the pre-defined dominant spatial pattern of frontal systems in this region. The fourth searches for the time evolution of the wind from the north-west quadrant to the south-west with meridional wind shifts of greater than 2 ms<sup>-1</sup> and maps a contiguous length of such shifts to the location of a front.

The manual method is time-consuming, and thus only 11 years have been assessed. All methods correlate positively over the 11 years. All objective methods were extended using reanalyses over the 1958-2006 period. The SOM method produces an upward trend in the number of frontal systems over 1958-2006, and is not correlated with the other methods. The other two objective methods produce a downward trend, and are positively correlated with each other and rainfall. These results suggest that these two methods hold potential to be used to better understand the synoptic drivers of rainfall variability in southern Australia.

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