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Using self organizing maps to relate changes in extreme rainfall to changes in synoptic circulation

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Extreme rainfall events are, while infrequent, associated with significant societal and infrastructural impacts. Several studies have shown changes in the intensity of extreme rainfall over many regions of South Africa as well as spatial heterogeneity in these changes (Mason et al., 1999; Easterling et al., 2000; Groisman et al. 2005; Kruger, 2006, New et al., 2006). However, these studies examined station data only and understanding the synoptic scale drivers of the observed changes was not the focus.
This paper builds on the above work through an assessment of changes in large scale circulation features and the manifestation of these in station data over two rainfall regimes in South Africa. Self organizing maps, a form of artificial neural net, were used to categorize 40 years of daily synoptic data into a number of characteristic synoptic circulations and changes in the circulation characteristics were assessed. Extreme precipitation in the station data was then associated with driving circulation modes and examined within this context. This allowed for not only a documentation of changes in extreme precipitation but also for an elucidation of the changes in the dynamical drivers. Seasonal attributes of the synoptic states will be presented and related to the extreme rainfall station record.

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