



Recurrent daily rainfall patterns over South Africa and associated dynamics during the core of the austral summer

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This study investigates the influence of some modes of climate variability on the spatio-temporal rainfall variability over South Africa during the core of the rainy season, December to February (DJF). All analyses are based directly on the rainfall field instead of atmospheric processes and dynamics. An original agglomerative hierarchical clustering approach is used to classify daily rainfall patterns recorded at 5352 stations from DJF 1971 to DJF 1999.

Five clusters are retained for analysis. Amongst them, one cluster looks most like the rainfall and circulation mean picture. Another one, representing 37% of the days, describes strong negative rainfall anomalies over South Africa resulting from a regional barotropic trough-ridge-trough wave structure and moisture divergence. These dry anomalies are more frequent in El Niño years (with a 0.75 correlation between ENSO and the seasonal occurrences of that cluster) and are associated with a weakening and/or a regional shift of the Walker-type circulation and the subtropical jet stream. Three clusters, which describe, respectively, a decrease, an increase, and a conservation of the seasonal mean eastward rainfall gradient, are all associated with strong cyclonic moisture flux anomalies centred over Angola or northern Botswana and the anomalous convergence located over the largest positive rainfall anomalies, suggesting the importance of regional low pressures. One of them is clearly associated with tropical temperate troughs. The rainfall patterns of these three clusters tend to propagate eastward, and their seasonal frequencies tend to increase in La Niña years.