



Recent climate trends in Southern Africa

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The aim of this study is to describe and explain climate variability from 1901 to 2003 in southern hemisphere Africa. The monthly mean data used in this study are global grids for temperature and precipitation ($0.5^\circ \times 0.5^\circ$ spatial resolution) sea level pressure (SLP, $5^\circ \times 5^\circ$) and sea surface temperature (SST, $1^\circ \times 1^\circ$).

The analyses of climate trends, based on linear regressions, were performed for several 30-year periods (1901-1930, 1931-1960, 1961-1990, 1974-2003) as well as for the whole 103-year period. Different monthly trend patterns could be pointed out on a regional scale. Maximum warming could be identified for central southern Africa during the MAM season and a slight cooling trend in Madagascar (in SON). Significant (95% level) precipitation trends were hardly found for the whole period due to the high precipitation variability. But during the shorter 30-year sub-periods, particular regions with significant trends could be pointed out. Negative precipitation trends during recent decades, however, seem to be weaker than previously reported. Highly significant long-term SST-trends reach highest values in mid- to higher southern latitudes. Concerning the SLP-data, trend analyses provide remarkable positive trends in the southern realm of the subtropical high-pressure systems. This can be interpreted as enforced trade winds.

Monthly t-mode Principal Component Analyses for all available data sets have been applied in order to investigate the atmospheric dynamics which cause these climate trend patterns. The results of these t-mode PCAs confirm an intensified circulation in the subtropical regions, which is reflected by enforced subtropical high pressure-systems. The PC-time coefficients of these patterns depict strong positive trends.