CLIMATE DATA IN SOUTHERN AFRICA: AGREEMENTS & CONTRADICTIONS.

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Abstract

Climate affects all sectors of the economy across the world, with varying degrees of sensitivity and vulnerability, yet our understanding of the climate systems is often hindered by the availability of high quality data. Although several station-based datasets collected and archived by various local weather agencies exist, there has been a decline in the number of these station datasets that are publicly available, mainly due in insufficient resources, as well as a tendency by country meteorological services to restrict free access to the data. The implications on climate science and climate-impact studies are hard to quantify but almost certainly significant. This study presents precipitation trends from twelve freely available datasets and discusses their agreements and contradictions. This study is part of the ongoing research activities within the Future Climate For Africa (FCFA) Future Resilience for African Cities and Lands (FRACTAL) project on climate change and urban resilience

Keywords: Climate data, Trends, Agreements and Contradictions.

Study Area & Introduction

- Southern Africa, considered in this study as the region lying between 36° to 5° S and 10° - 52° E, is characterized by a high degree of rainfall variability at various time scales that affects key sectors such as water and agriculture (Reason et al., 2006).
- Precipitation trend analyses has been of great concern during the past century because of the attention given to global climate change from the scientific community: they indicate a small positive global trend, even though large areas are instead characterized by negative trends (IPCC, 1996).
- In southern Africa, precipitation does not show significant trend pattern but a widespread variability (Usman and Reason, 2004). Over the past century, a downward rainfall trend, sometimes statistically insignificant, has been reported over the subcontinent (Solomon, S. ed., 2007). The 20th century has also been characterised by a high degree of rainfall variability, as well as by a number of severe droughts (Giannini et al., 2008).

Objective

This study investigates the agreements and contradictions in precipitation trends over Southern Africa.

Methods

Trend analysis initially focused on 110-year period from 1901 to 2010 but due to limited availability of station data, the investigation was subsequently concentrated on the 30-year period from 1979 – 2010. Trend significance was tested using the Mann–Kendall non-parametric test .

Data

1. Station data from 44 locations.
2. Twelve gridded datasets: CHIRPS_v2.0 (both 0.05deg and 0.25deg), CMAP, CRU_v3.2, FEWS ARC2, GPCC_v6.0 (both 0.5deg and 1deg), GPCP_v2.2, TRMM, UDEL, WFDEI_CRU & WFDEI_GPCC

Results

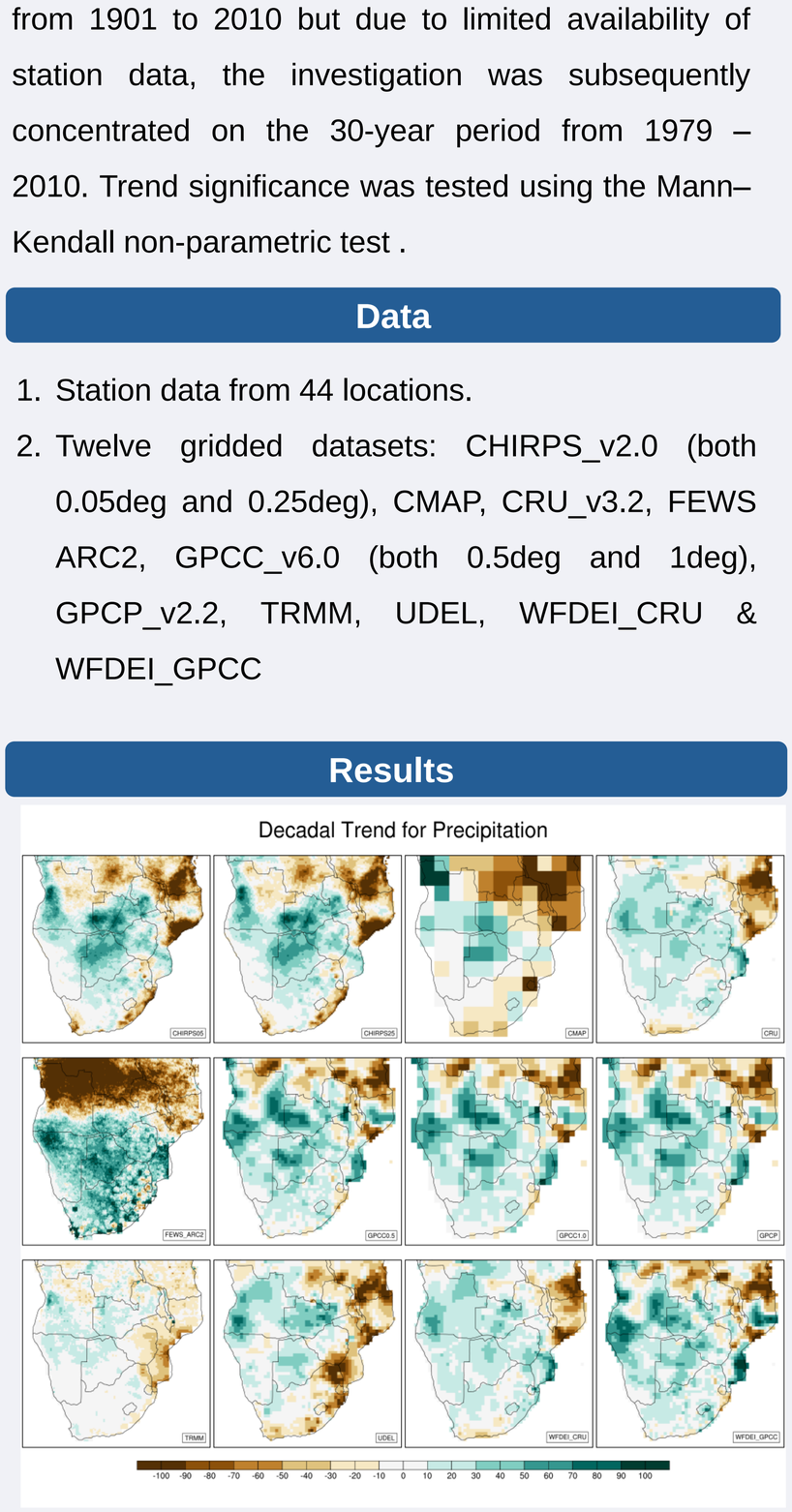

Figure 1: Decadal trend in mm/decade from 1979 to 2010 except for CHIRPS 0.05deg, CHIRPS 0.25deg & FEWS_ARC (1984) and TRMM (1998).

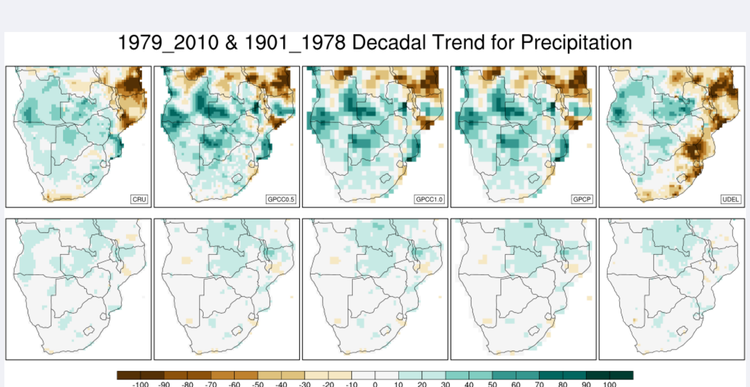

Table 2: Decadal Trend comparison between 1979 to 2010 (top) and 1901 to 1978 (bottom).

Results

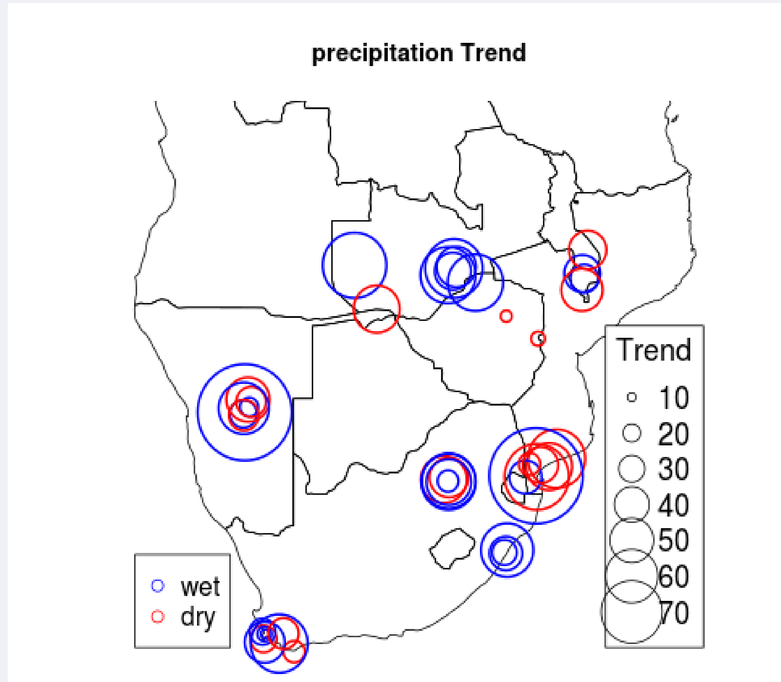

Figure 3: Station decadal trend in mm/decade between 1960 and 2000.

- Distinct positive trends for stations around Durban and Lusaka (figure 3).
- Trends for the last 3 decades are stronger compared to the earlier decades (figure 2)
- Gridded datasets with similar source data show similar trend (figure 1): TRMM, FEWS_ARC & CMAP – Satellite products, CHIRPS – Satellite & station and GPCC's, WFDEI's, CRU, UDEL, - station.

Conclusions

- Most of the publically available station data end in the late 1990's and early 2000's thus limiting the analysis of recent variability and trends.
- There's no distinct trend pattern over the region - This consistent with results reported by Usman and Reason, (2004).
- Ongoing/planned research will seek to identify appropriate gridded datasets for specific sectors and regions/cities.

Acknowledgement

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