



Long-term trends of rainfall identify priority zones for targeting climate smart agricultural technologies in East and South Africa

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Problem

- Rain-fed farming systems experience greater impacts of climate change and variability



- Understanding long term trends in rainfall inform future trajectories
 - Support evidence-based targeting of climate smart agricultural (CSA) technologies
- Detection of spatial-temporal trends for rainfall in Africa hindered by sparse distribution of gauge stations and numerous gaps in gauged data



Objective

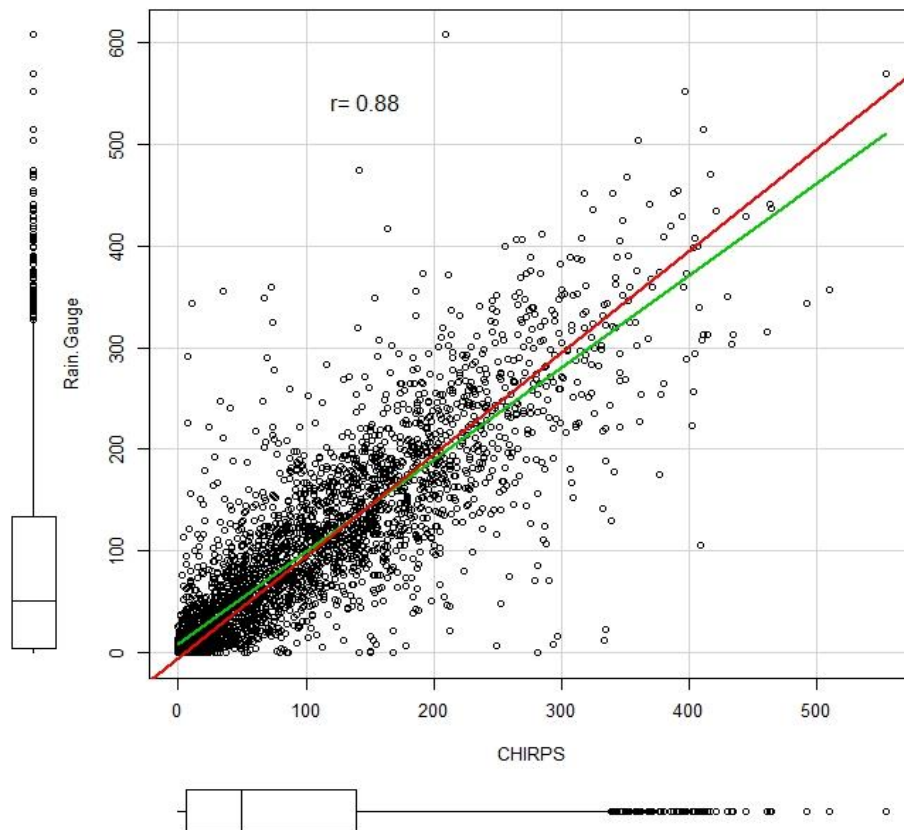
- Investigate long-term variability and trends (1981 - 2017) in rainfall in East and Southern Africa using remote sensing data

Specific objectives

- Validate CHIRPS-v2 satellite rainfall estimate with rain gauge data
- Map long-term variability in monthly and annual precipitation
- Determine magnitude and significance of monotonic trends in rainfall

Validating satellite rainfall with gauge data

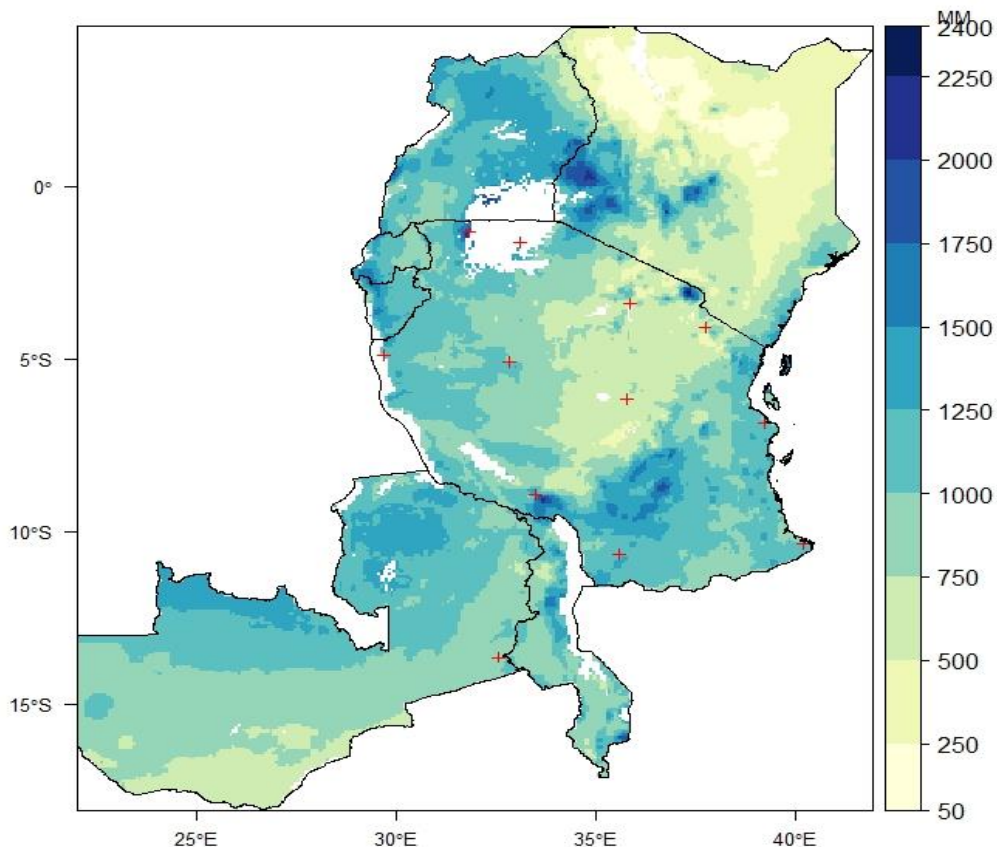
- 88% agreement between monthly CHIRPS-v2 and gauge rainfall
- CHIRPS-v2 overestimate low intensity & underestimate high intensity



- CHIRPS-v2 offer new opportunity for monitoring spatial-temporal variation in droughts and floods in data sparse regions

Long-term mean annual rainfall

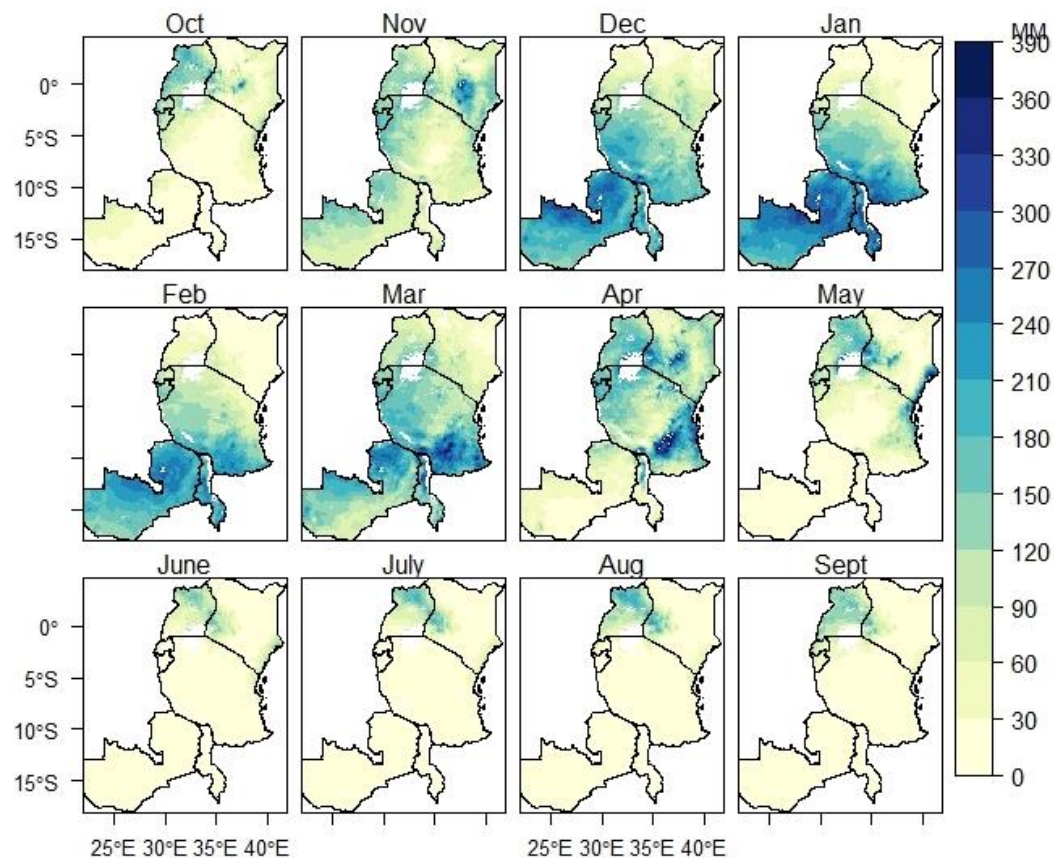
- Annual rainfall reveal high spatial temporal variation with most dry conditions in north and eastern Kenya



- Highest annual rainfall values recorded around mountain peaks: Mt. Kilimanjaro, in Tanzania, Mt. Kenya and Aberdare Ranges in Kenya, Mt. Elgon in Uganda

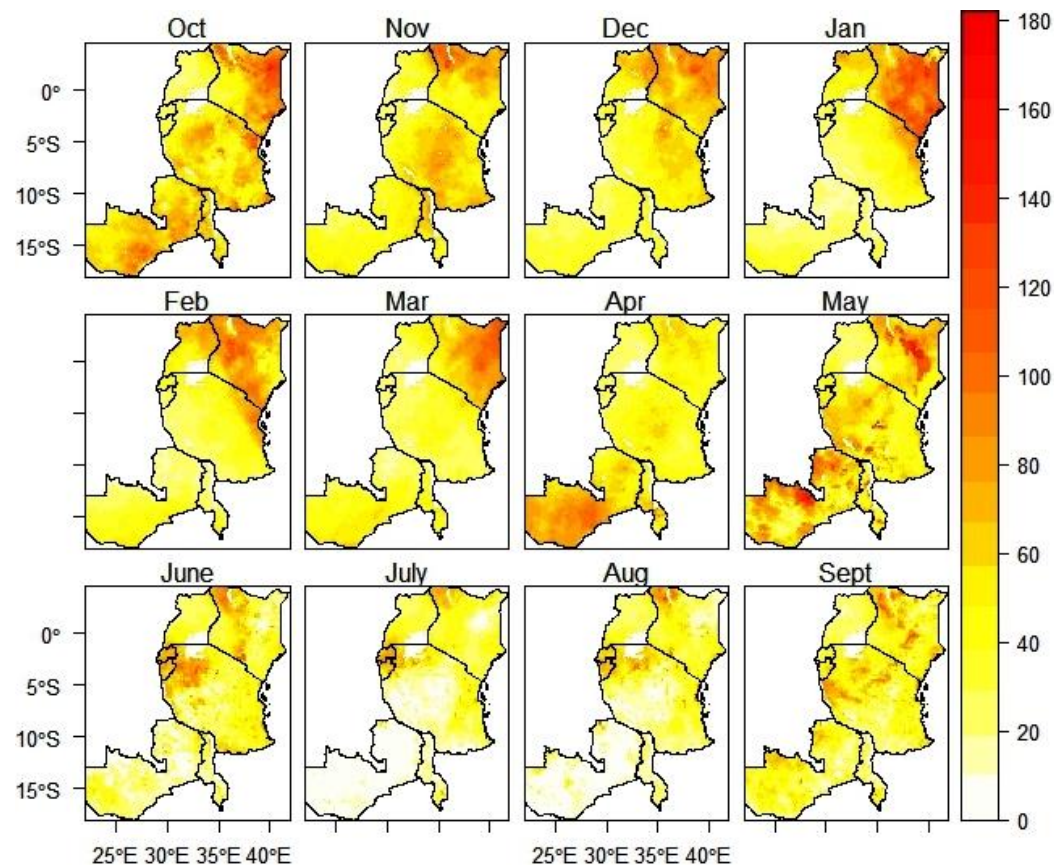
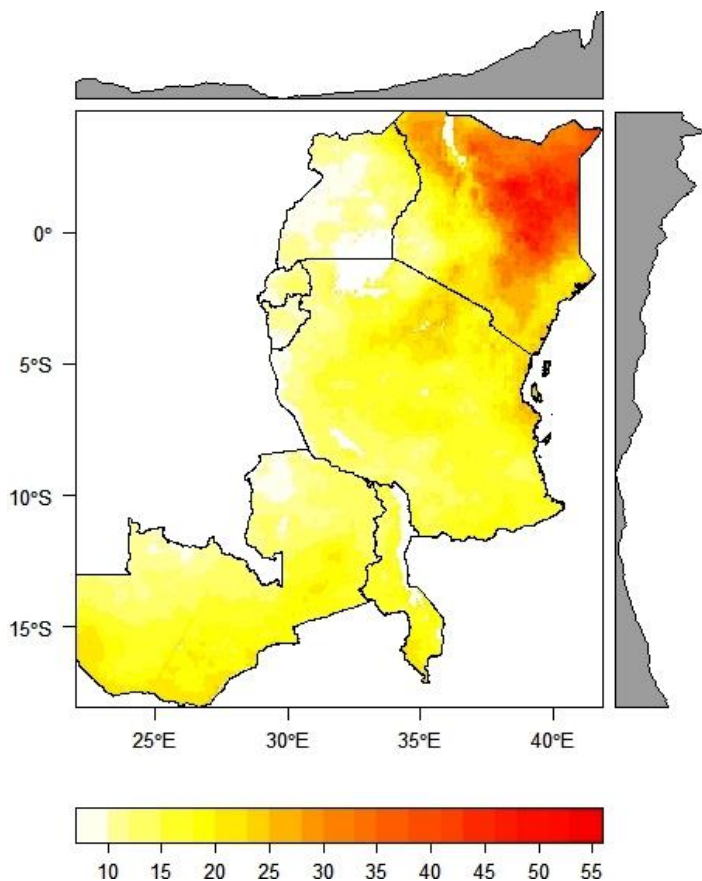
Long-term trends in monthly rainfall

- June to September is dry season (<30 mm) except in Uganda and western Kenya
- Understanding long term patterns in monthly rainfall inform agro-advisory services on cropping calendar activities



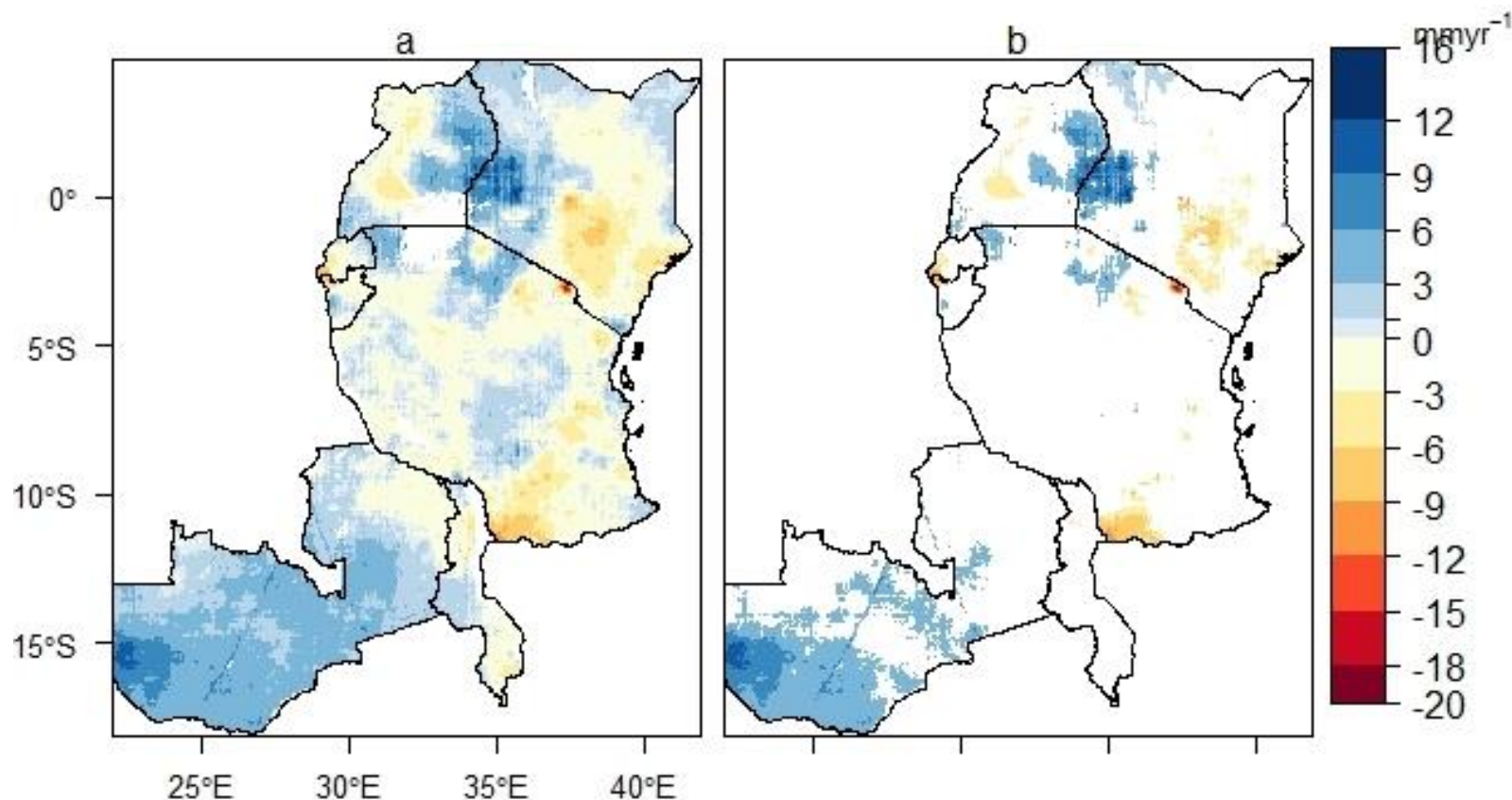
Variability (CV) in annual and monthly rainfall

- High seasonality especially in drier regions indicative of frequent extreme events like droughts



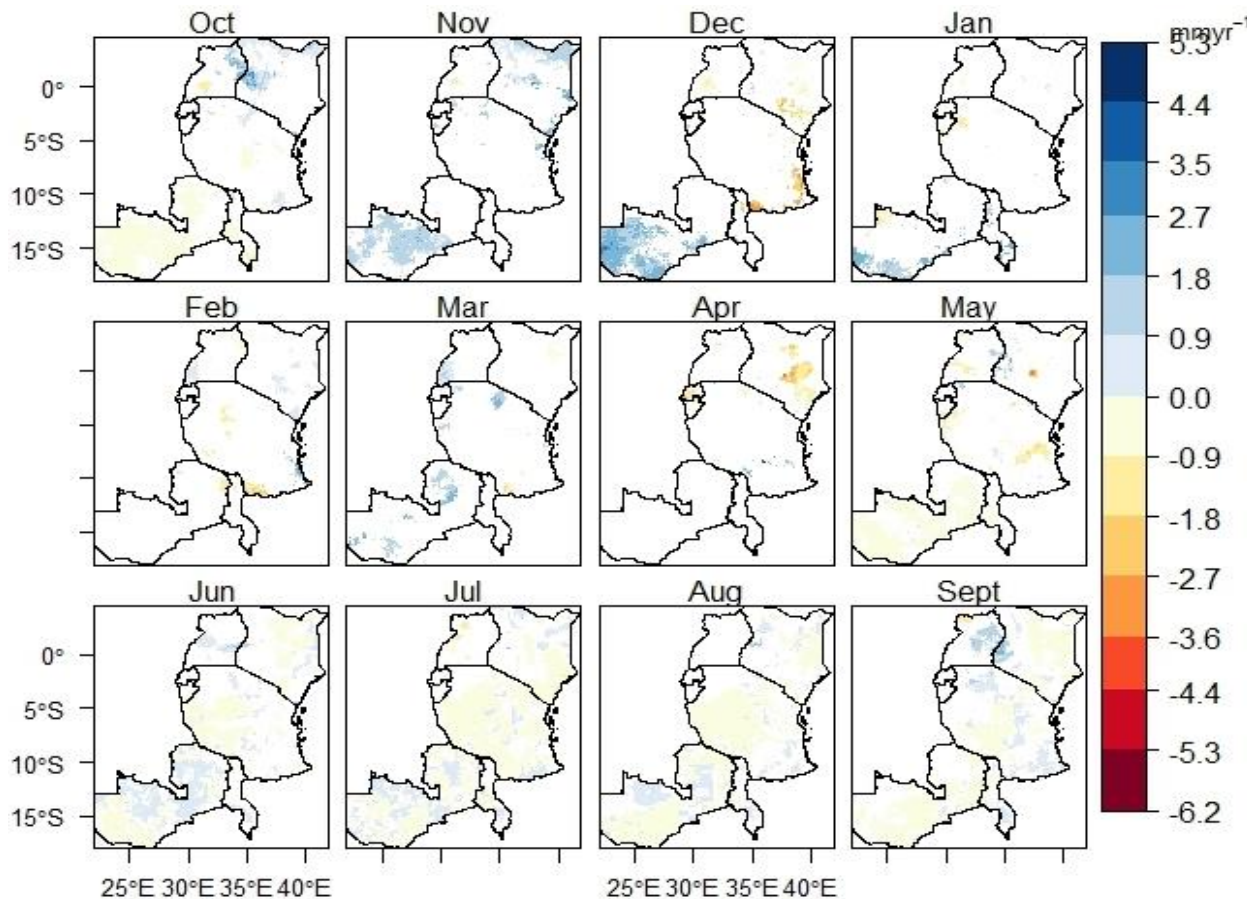
Monotonic trends for annual rainfall

- Largest contiguous zones with significant increase in annual rainfall occurred in SW. Zambia and Lake Victoria basin between Kenya and Uganda.
- Highest significant decrease in annual rainfall recorded at Mt Kilimanjaro in Tanzania



Trends for monthly rainfall

- Increasing trend for NDJ rain in South-west Zambia coincide with main planting season
- Increase trend in northern Lake Victoria basin in October during short rain season



- Pronounced decrease in December and April rains in Central and Southern Kenya
- Decrease in JJAS rain reveals more drier seasons in Tanzania and Zambia



Conclusions

- CHIRPs-v2 provide accurate high spatial-temporal resolution data on rainfall distribution patterns in ESA region
- High inter-annual variability in rainfall is indicative of increasing frequency of extreme rainfall events in ESA region
- Annual rainfall in Zambia revealed an increasing trajectory compared to decreasing trajectory in the other 6 countries
- Observed magnitude and direction of rainfall trends provide spatial evidence for targeting appropriate CSA technologies



*Enhancing partnership among Africa RISING and NAFKA
Programs for fast tracking delivery and scaling of agricultural
technologies in Tanzania*





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