[Speaker Zoom video]

Using global climate model and remote sensing data to identify extreme precipitation, climatological, and NDVI trends in the Deccan Region of India

Carnotaurus_Macarena_Vivace

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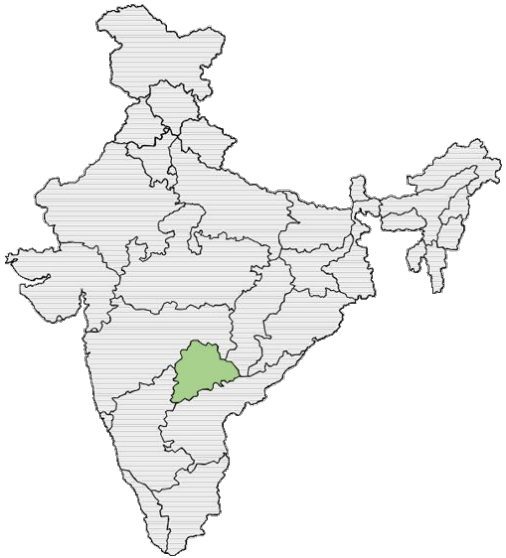
Background



- Telangana
- Climate change vulnerability
- Extreme precipitation

[Speaker Zoom video]

Our Project

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Considering:

- Extreme precipitation indices: CDD, CWD
- Wet and dry days of ISMR rainfall with threshold at 2.5mm/day (IMD)
- NDVI trend
- Seasonal 10th and 90th percentiles with spatial variation for light/heavy rain

Methods

[Speaker Zoom video]

-Shapefile for Telangana

-NDVI from MODIS

-Extreme Precipitation intensity and longevity from CHIRPS

-Looking for trends using MK tests

Methods

[Speaker Zoom video]

- Shapefile for Telangana used to mask precipitation dataset (data.telangana.gov.in)
- Monthly NDVI from MODIS resampled over 6 month intervals spanning 2000-2023
- Daily precipitation from CHIRPS spanning 1982-2022
- Wet days are considered ≥ 2.5mm/day, Dry days are considered < 2.5mm/day (IMD)
- Consecutive Dry/Wet Days calculated regionally over the 4 month interval June-September
- Seasonal 10th and 90th percentiles with spatial variation for light/heavy rain days
- 4 Modified MK tests used (Yue Wang, Trend-Free Prewhitening, Prewhitening, Hamed Rao) as well as Original MK test (since some time-series show autocorrelation in 1st lag)

[Speaker Zoom video]

Results

Code:
https://colab.research.google.com/drive/1T4ceCKJKEXNUqBeQklqkFVgtkGKFJ0Im?usp=sharing

https://colab.research.google.com/drive/1fDKPkyRPzVAYDCZj6AfTCxHWqwJET_tL

-NDVI

-Consecutive Dry/Wet Days

-Annual Precipitation

-Seasonal Precipitation Quantiles

-Light/Heavy Rain Days

Normalized difference vegetation index (NDVI)

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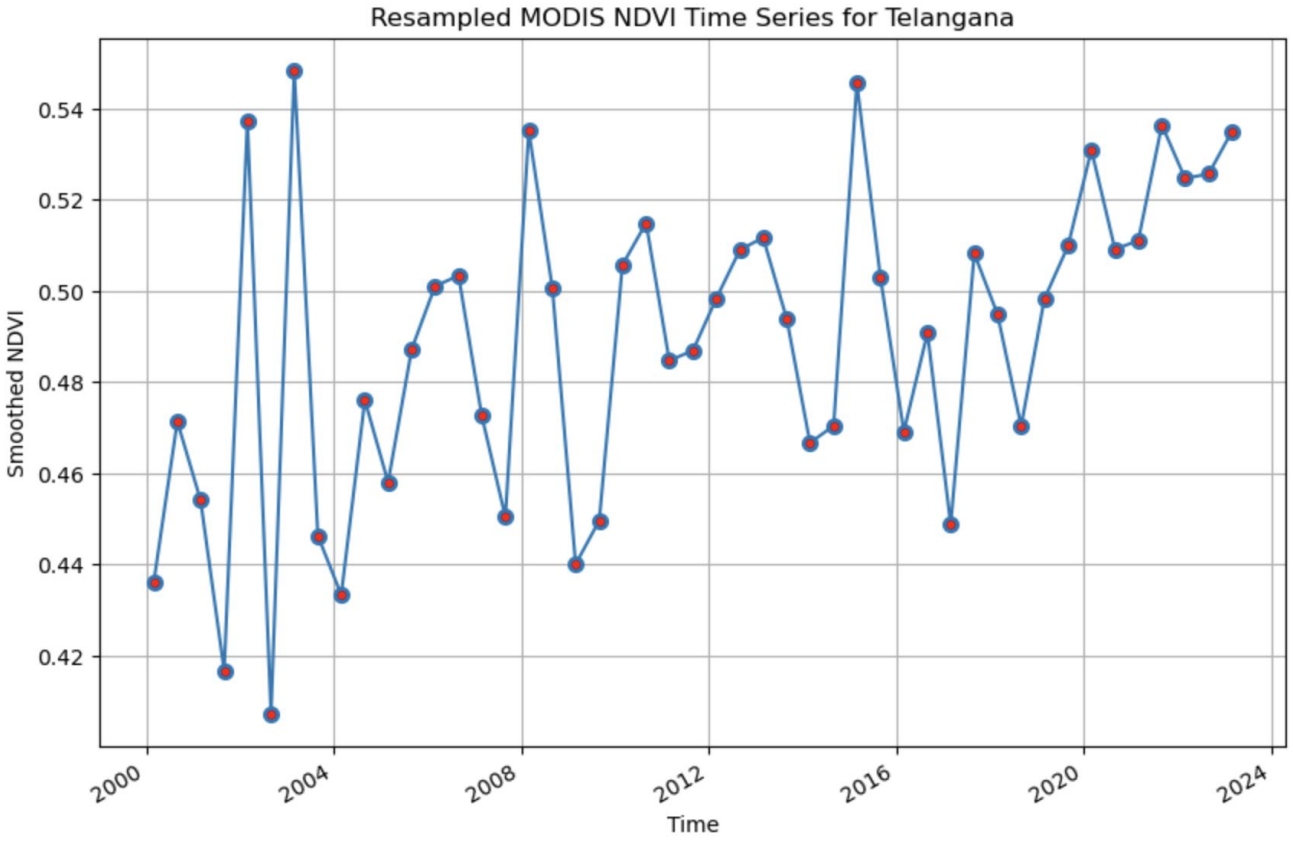


MK: significantly increasing

MK test for NDVI

[Speaker Zoom video]

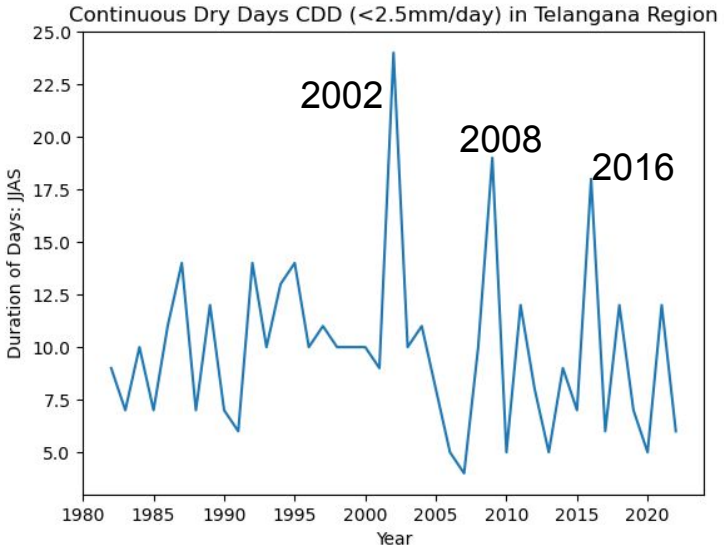
	Test	Trend	h	p
0	Modified Mann-Kendall (Yue-Wang Approach)	increasing	True	0.000000
1	Modified Mann-Kendall (Trend-Free PreWhitening Approach)	increasing	True	0.001728
2	Modified Mann-Kendall (PreWhitening Approach)	increasing	True	0.005393
3	Modified Mann-Kendall (Hamed-Rao Approach)	increasing	True	0.000252

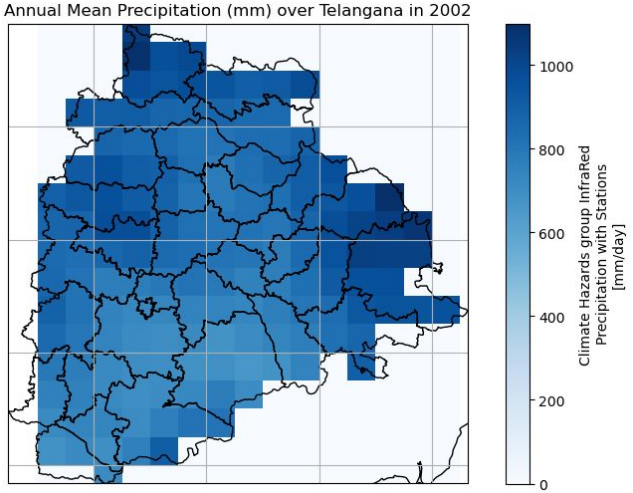
z	Tau	s	var_s	slope	intercept
11.533122	0.235157	1006.000000	7593.435648	0.000572	0.436022
3.133332	0.222169	930.000000	87906.000000	0.000572	0.436022
2.782561	0.197324	826.000000	87906.000000	0.000572	0.436022
3.659802	0.235157	1006.000000	75407.932442	0.000572	0.436022

Variability of CDD (<2.5mm/day)

[Speaker Zoom video]

Plot below shows the duration of dry spells in the JJAS (ISMR season)

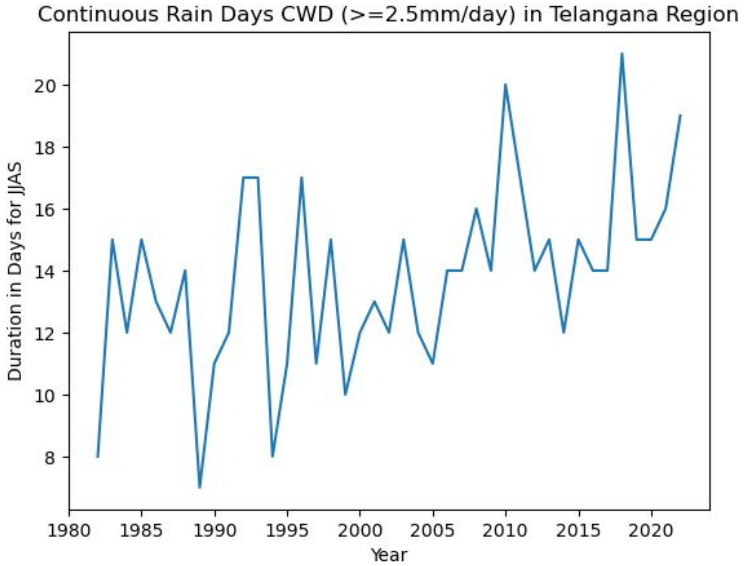


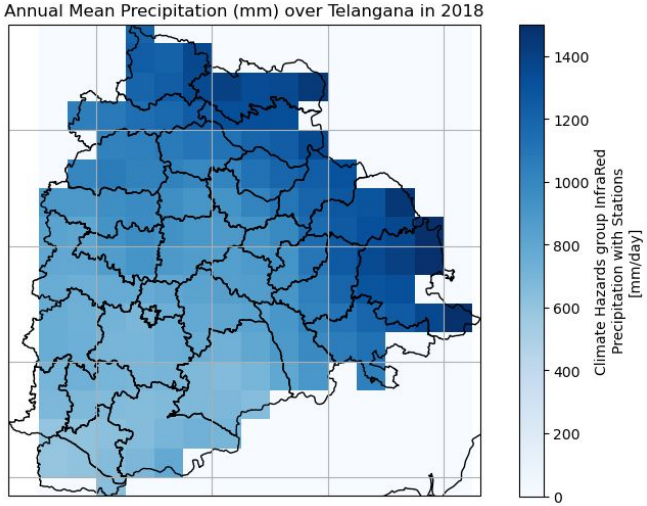


Variability of CWD (≥ 2.5mm/day)

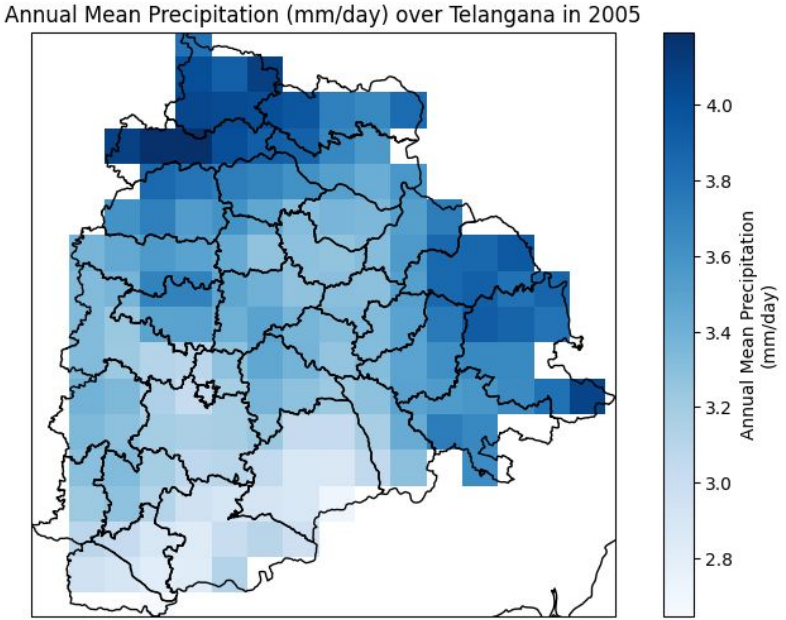
[Speaker Zoom video]

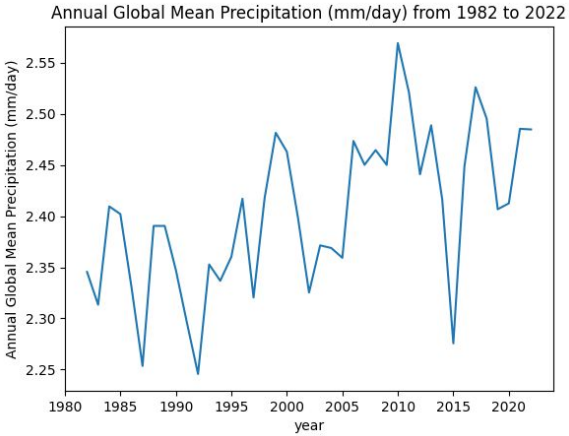
The duration of wet spells show an increasing trend for Telangana



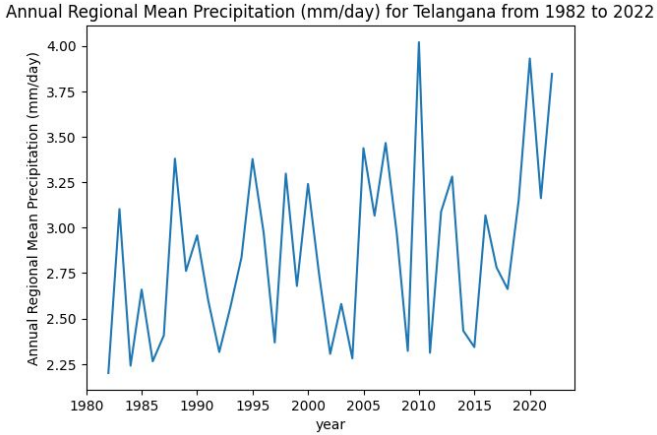


Annual Precipitation





MK: significantly increasing



MK: significantly increasing

[Speaker Zoom video]

Seasonal Precipitation Quantiles

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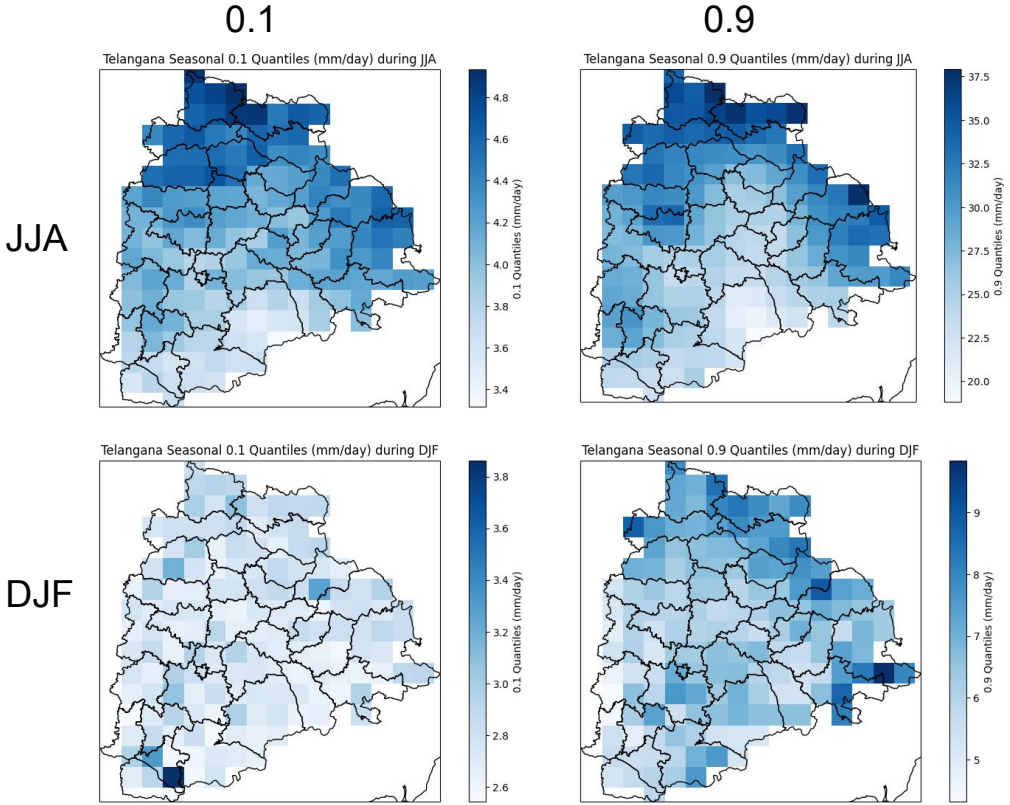
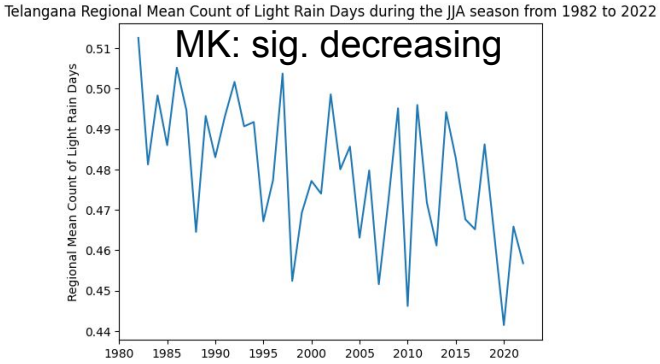
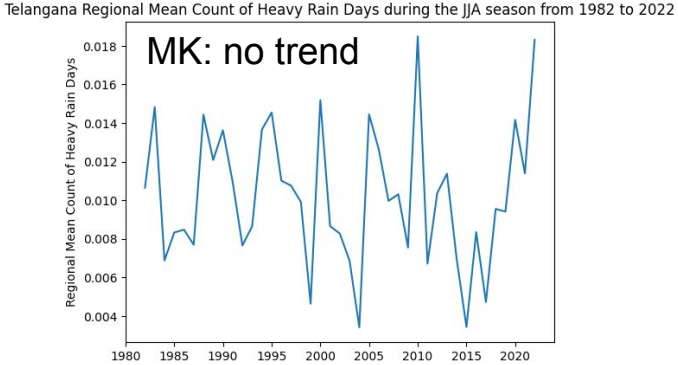
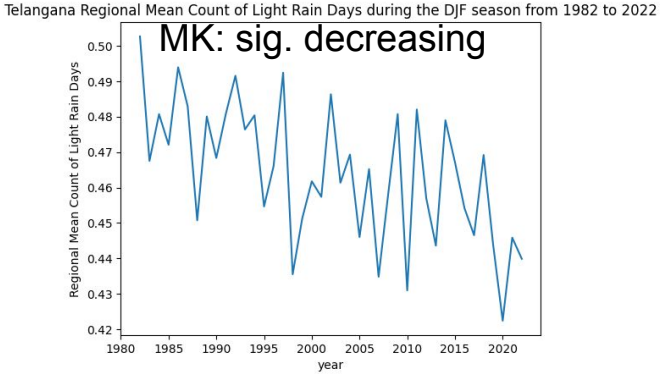
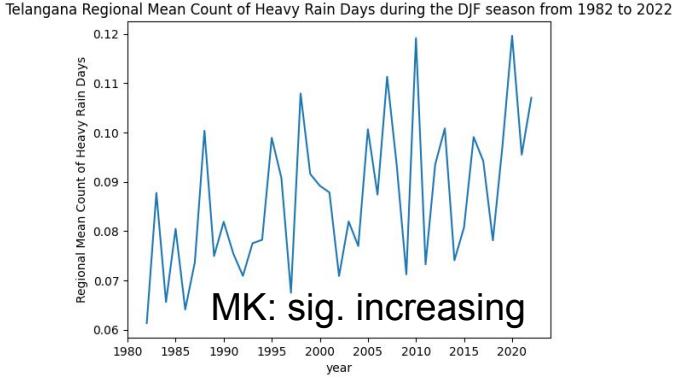


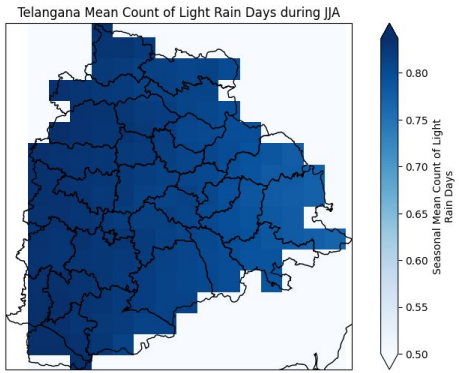
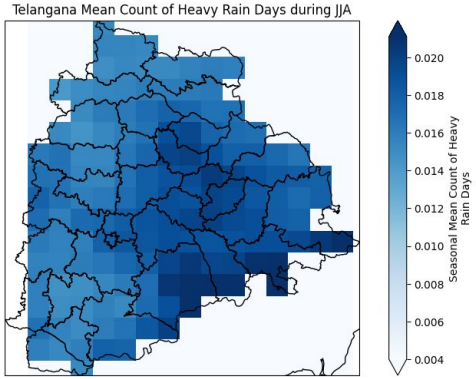
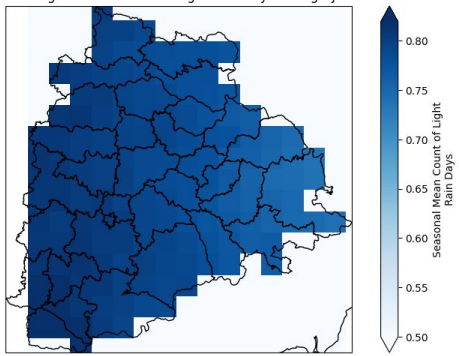
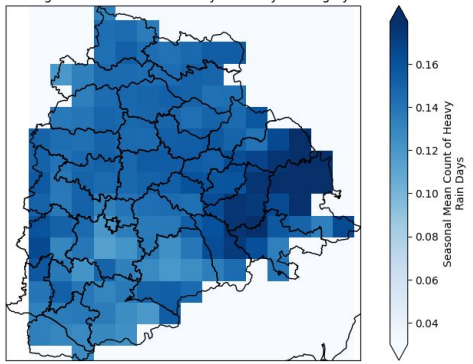
Light/Heavy Rain Days

[Speaker Zoom video]

	Light Rain	Heavy Rain
JJA		
DJF		

Light/Heavy Rain Days

[Speaker Zoom video]

	Light Rain	Heavy Rain
JJA		
DJF		

[Speaker Zoom video]

Conclusion & Future Research

-Increasing trend in NDVI

-Increasing trends for continuous duration and intensity

-Generally higher normal precipitation north

-E/SE most affected with heavy rains

-Indication of drought vulnerability

Conclusion & Future Research

[Speaker Zoom video]

- Significantly increasing trends for high intensity and continuous duration rainfall. Though spatial trends in CWD were not performed, the seasonal variations in the 10th and 90th percentile clearly indicate that the northernmost region generally has the highest quantiles, it generally has greater precipitation normally compared to other areas especially during JJA
- Eastern region is the one affected by more heavy rains for DJF, shifts to southeastern for JJA
- CDD confirms the state is affected by droughts and regional studies of ETCCDI would be necessary for mitigation and adaptation
- Closely-spaced extreme precipitation events are observed in the indices. What may be driving this pattern?
- Preliminary MK tests point to an increasing trend in NDVI. It would be useful to assess impacts on the cropping season of *Rabi Sorghum*, dependent on soil moisture after the rainy season

References

[Speaker Zoom video]

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