The Influence of ENSO on the Variability of Rainfall Over Horn of Africa

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"School and Conference on the General Circulation of Atmosphere and Oceans: A modern Perspective"

Introduction

- It is believed that ENSO is often associated with devastating droughts in Northeast Brazil, Australia, parts of Africa, the failure of the Indian monsoons, hurricanes along the east coast of North America, and so forth (Glantz 1993, 4).

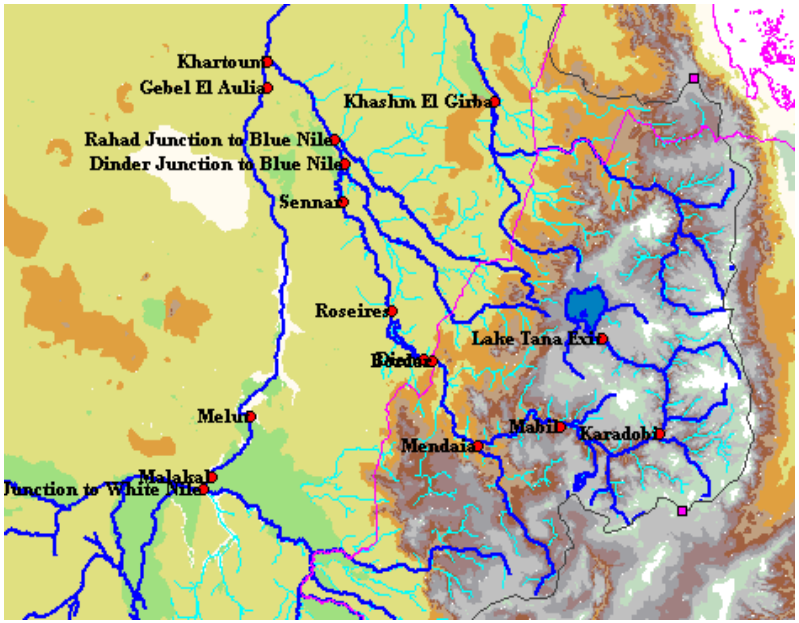
- There have been notable droughts in Ethiopia throughout human history (Haile 1988; Degefu 1987; Pankhurst 1966; Nicholls 1993; Webb and Braun 1994). Previous droughts and the frequency of rainfall deviation from the average suggest that droughts occur every 3-5 and 6-8 years in northern Ethiopia and every 8-10 years for the whole country (Haile 1988, 90).

- Haile (1988, 85) believes that Ethiopian drought is caused by ENSO, along with sea surface temperature (SST) anomalies in the Southern Atlantic and Indian Oceans combined with anthropogenic activities. ENSO events and SST anomalies affect rainfall distribution in Ethiopia by displacing and weakening the rain-producing air masses (1988, 92).

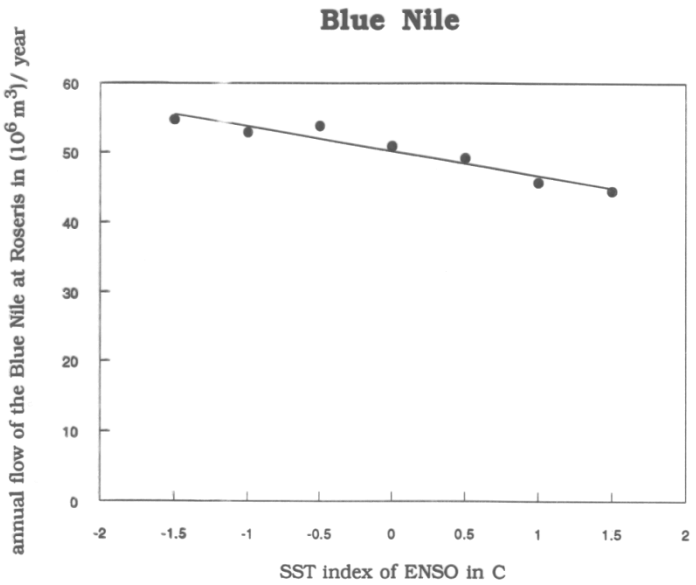
- A statistical analysis by Attia and Abulhoda (1992) shows that "ENSO episodes are negatively teleconnected with the floods of the Blue Nile and Atbara" rivers that originate in Ethiopia.

➢Eltahir (1996) also concluded that ENSO events affect flows of the Nile River (indicating drought in highland Ethiopia, which is a source of 85 percent of Nile water) and that knowledge of these events could be used to improve the predictability of its annual flow.

➢According to Nicholls (1993, 1), 1888 was a major ENSO year that damaged the economies of Brazil and Australia, as well as Ethiopia. Drought struck Ethiopia in 1888, leading to the historic deadly famine of 1888/89.



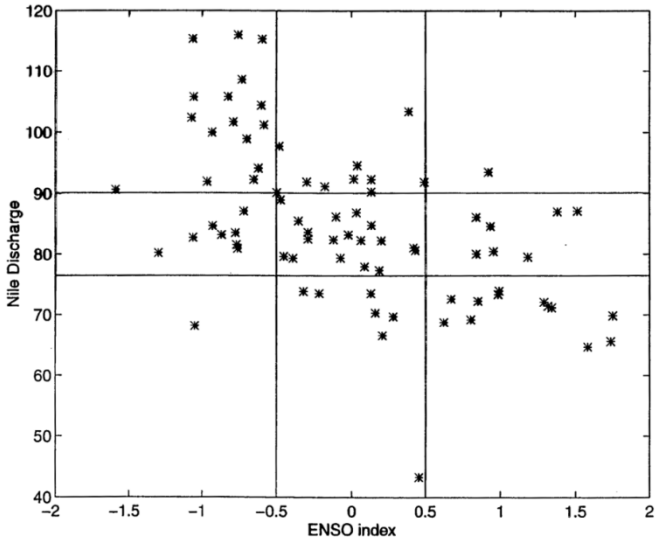
Previous studies



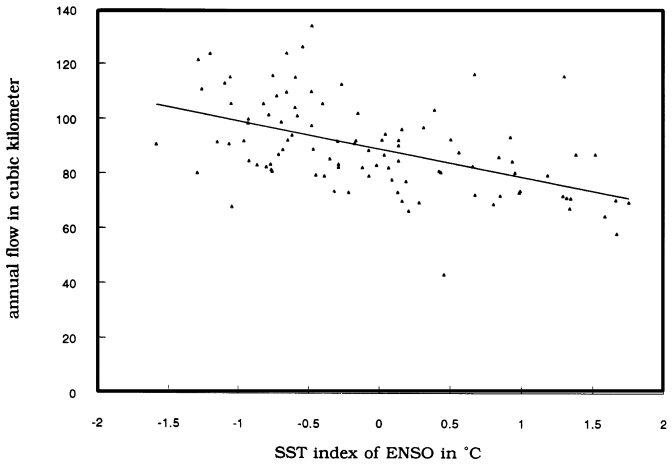
Eltahir,1996

SST	Flow		
	Low	Average	High
Cold	0.02	0.49	0.49
Normal	0.27	0.58	0.15
Warm	0.58	0.34	0.08

Eltahir, 1996



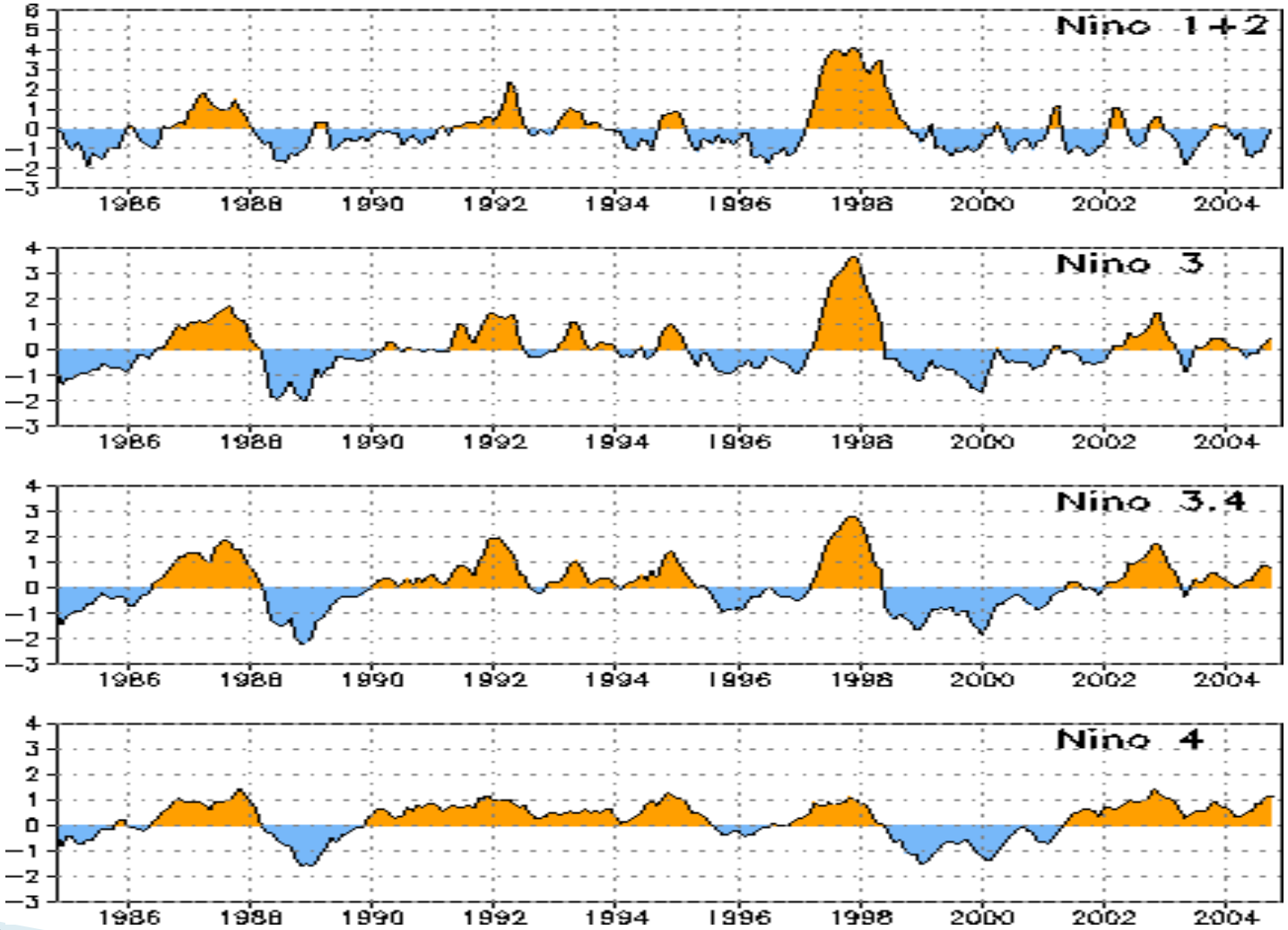
Wang and Eltahir, 1999



Eltahir, 1996

Previous studies Cont'

ENSO SST indices

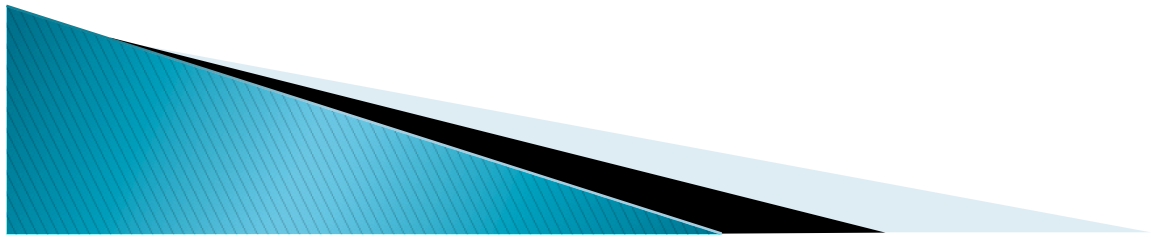


L. Talley 2010

Objective

➢ We want to verify, from the available data, if and how ENSO events affect the precipitations on the Ethiopian highlands

Droughts and floods have effect on rivers, agriculture, economy and society.



Data used (monthly)

Precipitation from GPCP from 1981 2008

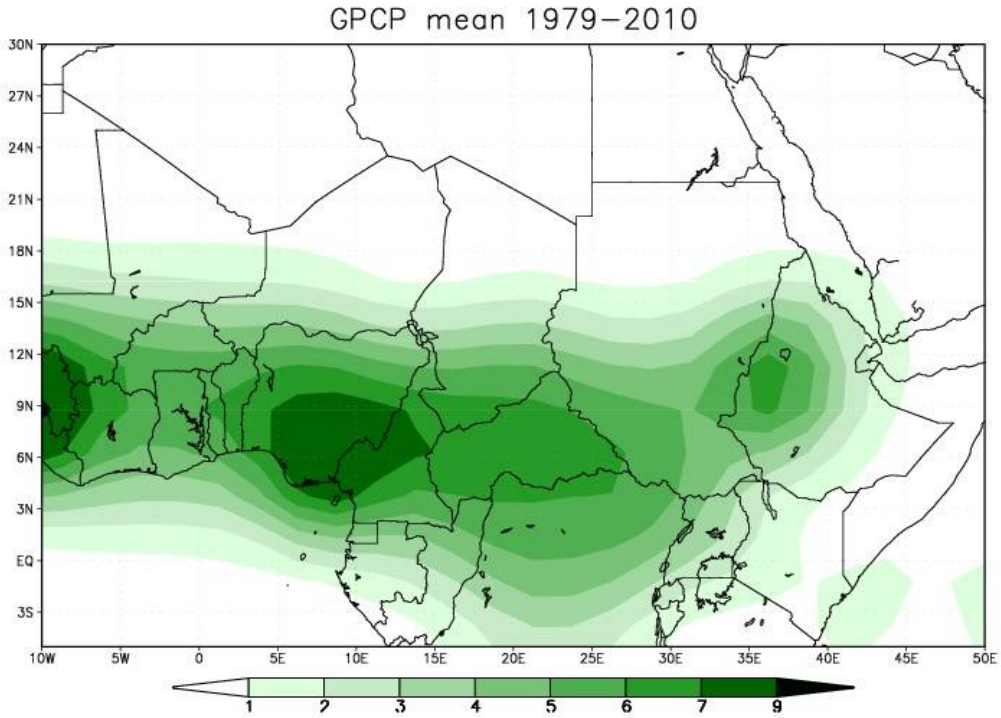
• SST from **Hadley**

Methodology

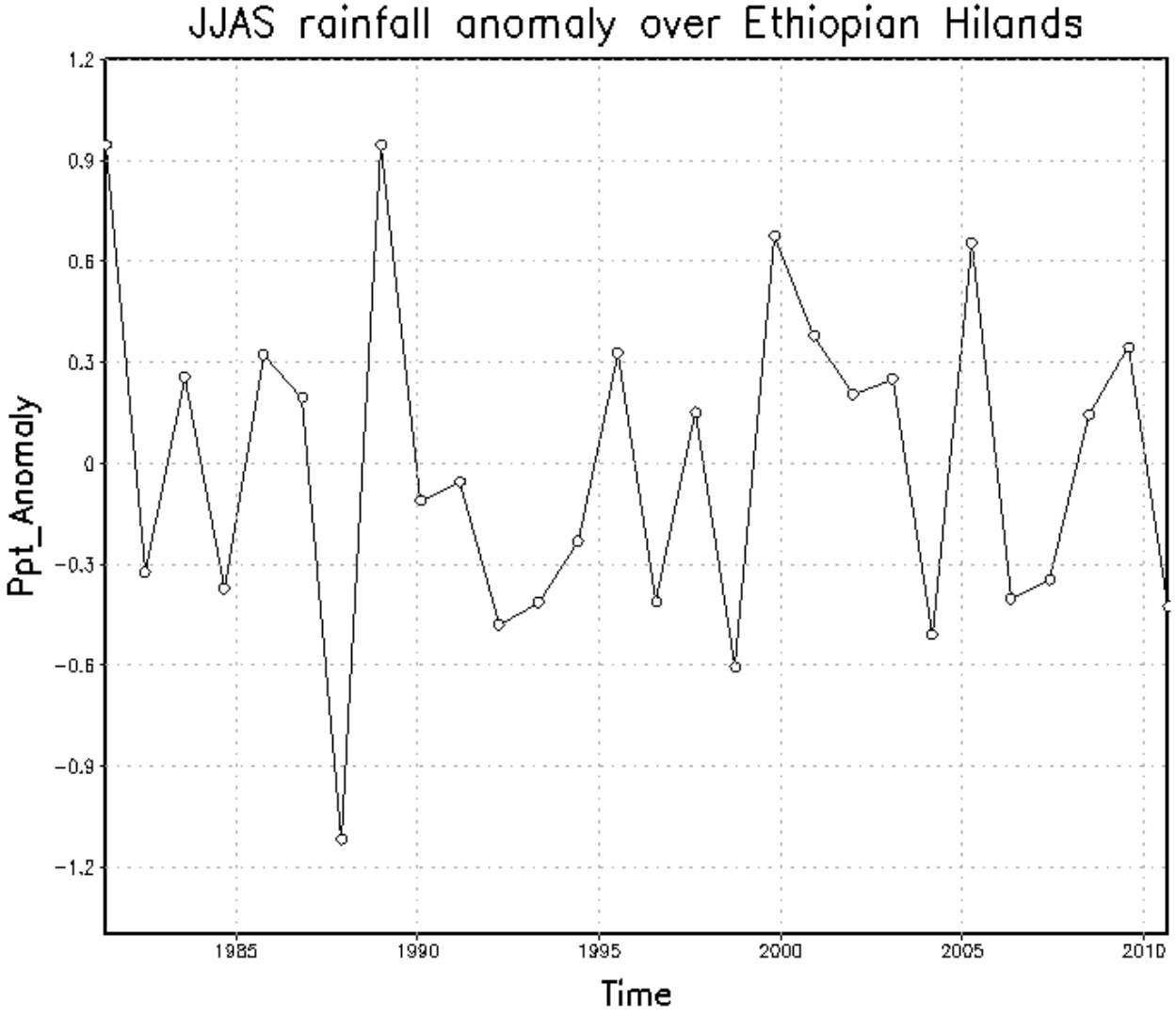
• Compute the anomaly of SST during (JFM, FMA, MAM, AMJ) in the Pacific Ocean
70W 120W 5S 5N (Elnino 3.4)

• Compute the anomaly of precipitation over Ethiopian Highland **35E 41E 6N 14N** for summer season (JJAS)

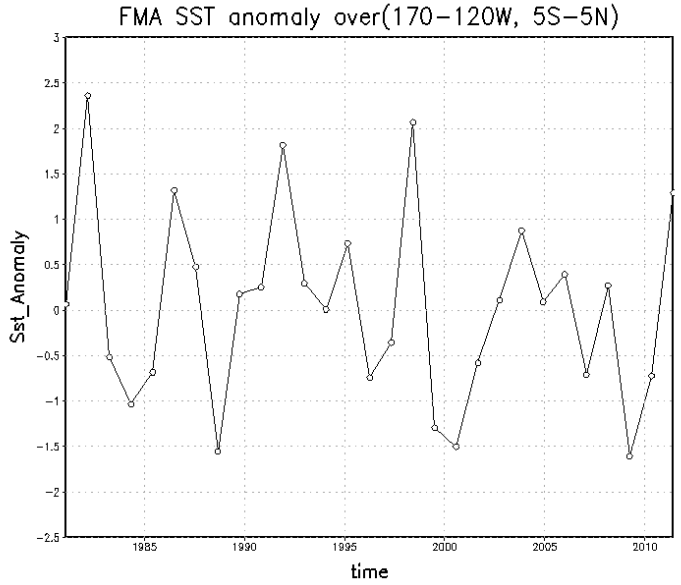
• Correlation between precipitation and each SST

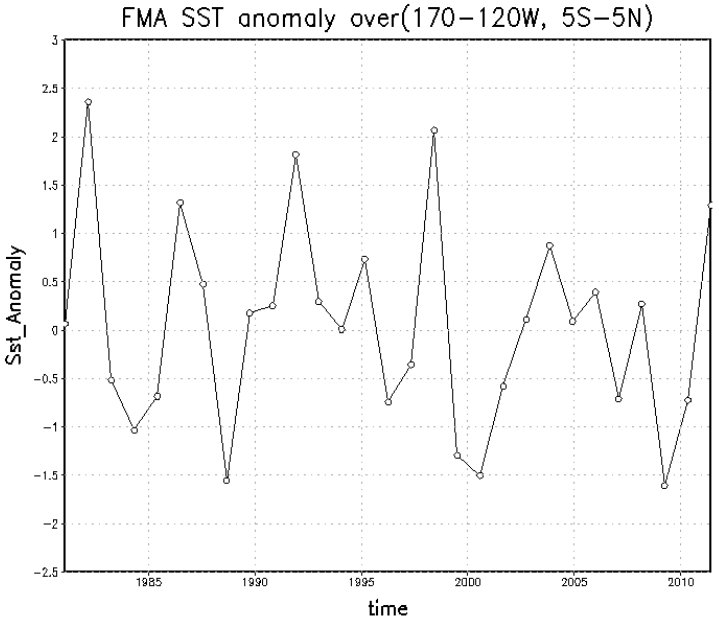


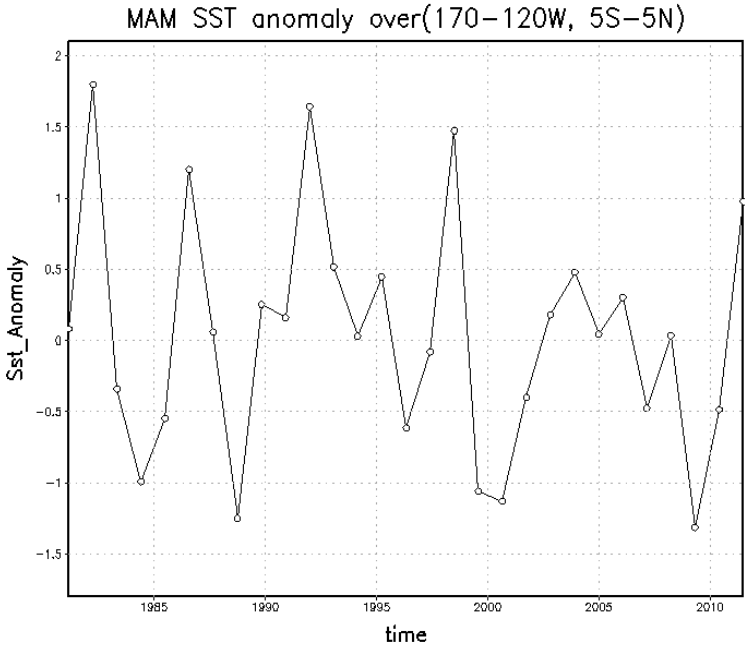
Results

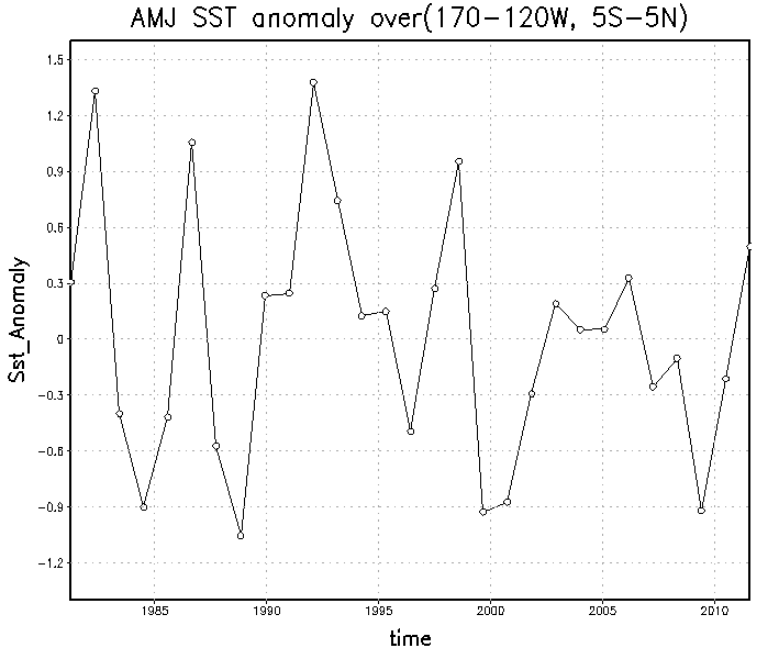

JJAS rainfall anomaly over Ethiopian Hilands
Ppt_Anomaly
1.2
0.9
0.6
0.3
0
-0.3
-0.6
-0.9
-1.2
1985
1990
1995
2000
2005
2010
Time

Results Cont’

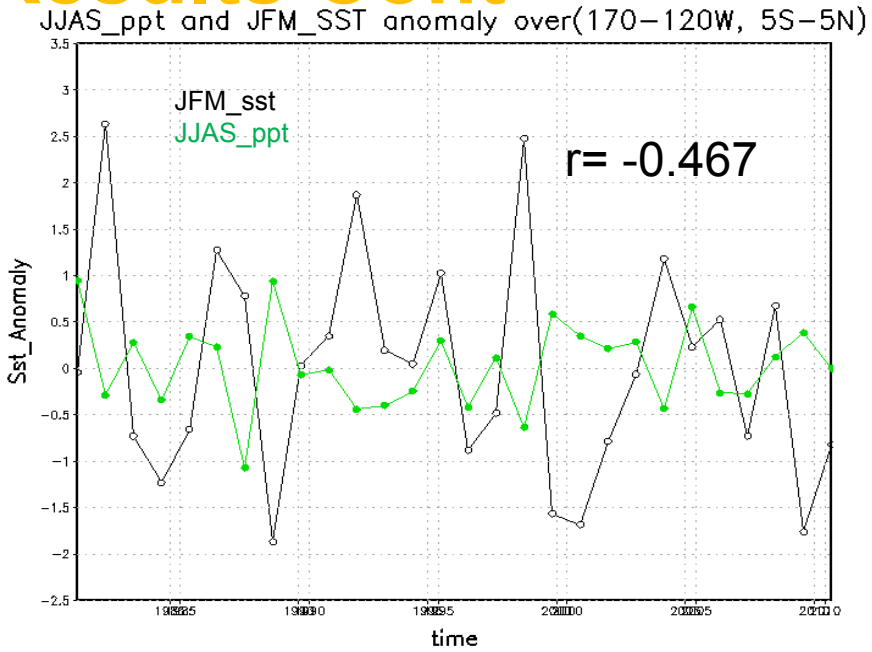


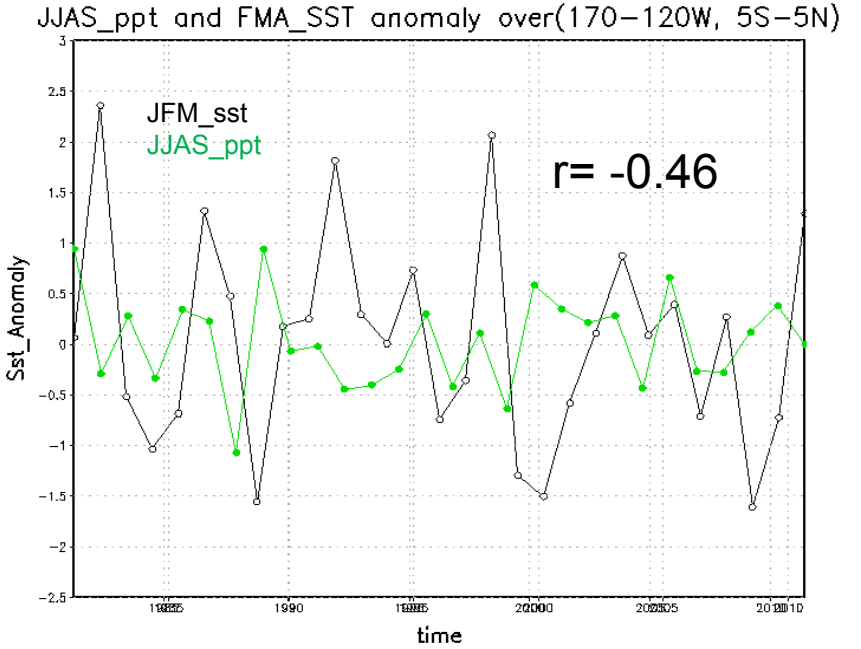


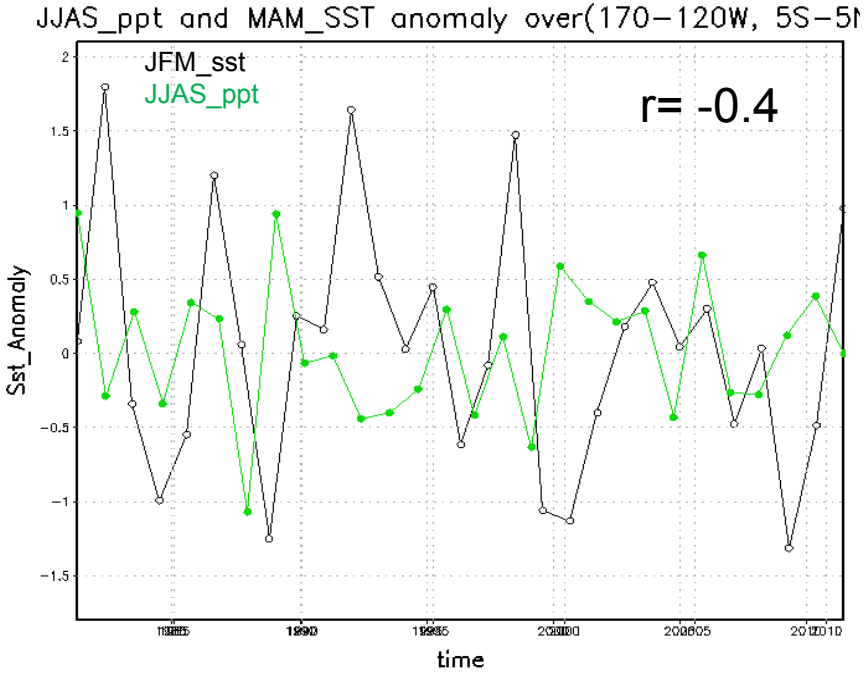


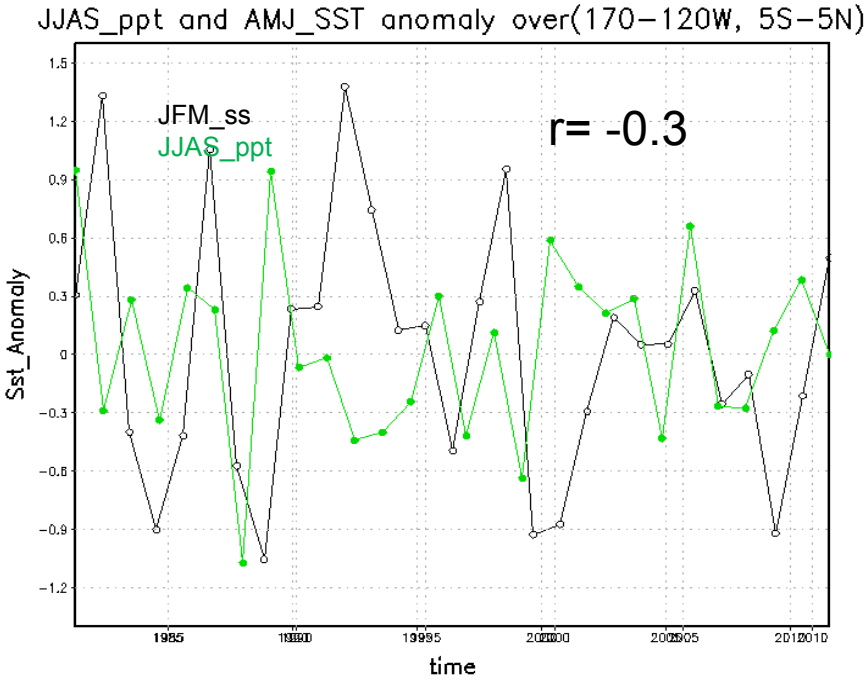


Results Cont'









THANK YOU