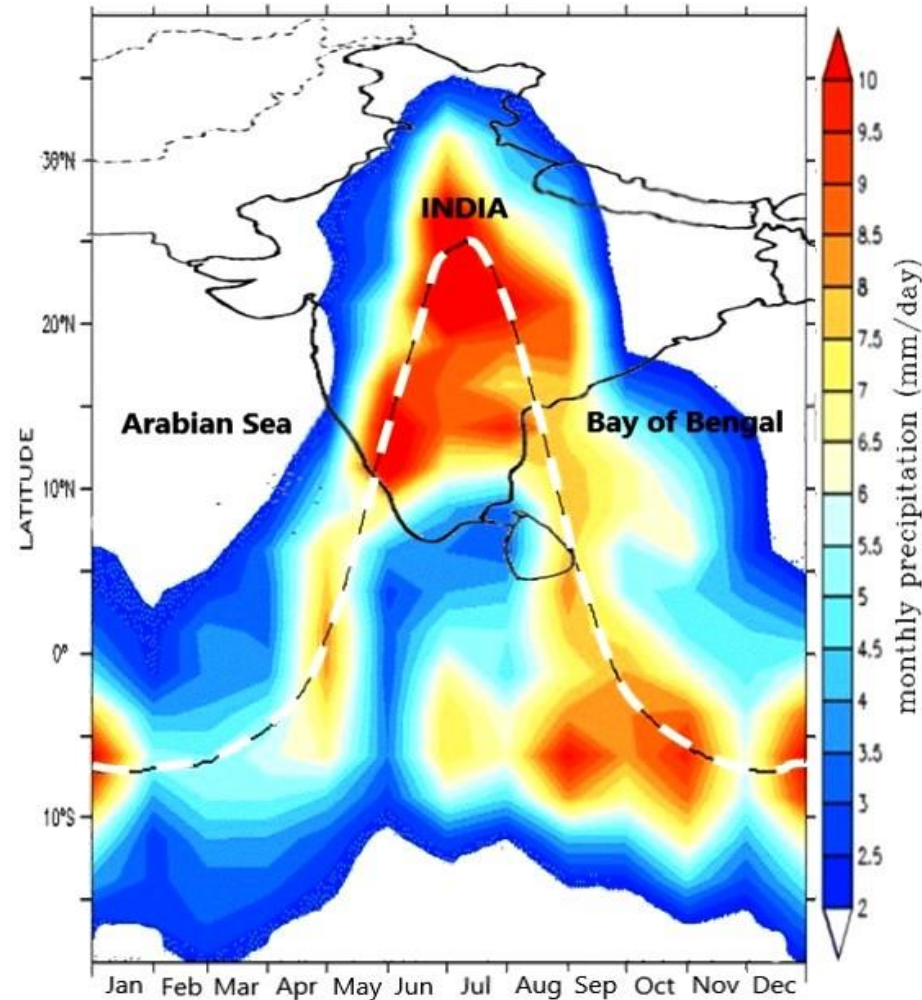


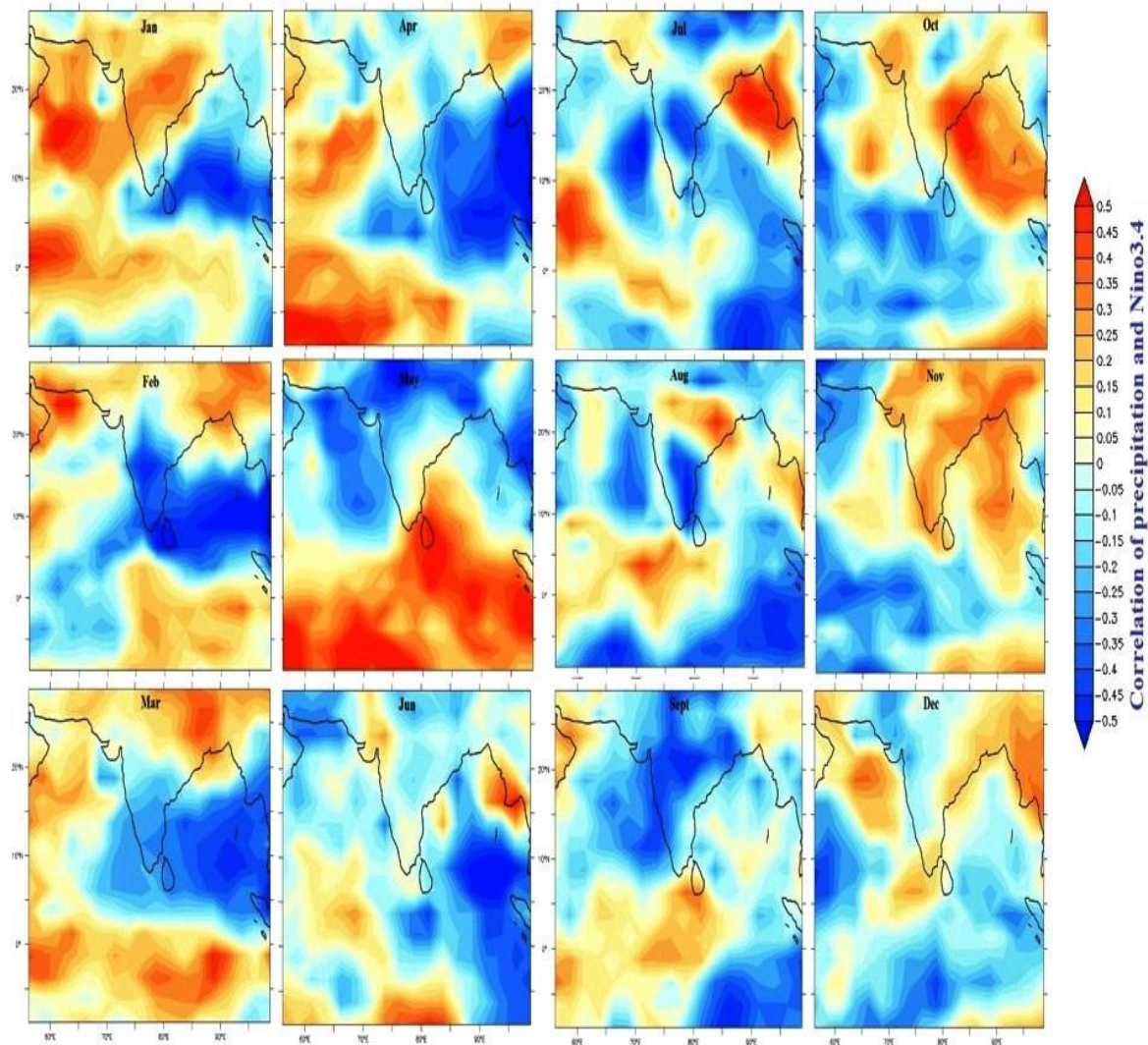
# **Increase in summer monsoon rains in northeast India during ENSO periods**

**Arvind Singh\*, P. Kiran Kumar and R. Ramesh**  
**Physical Research Laboratory, Ahmedabad**

# HavmÖller diagram of the climatological annual migration of peak rainfall band

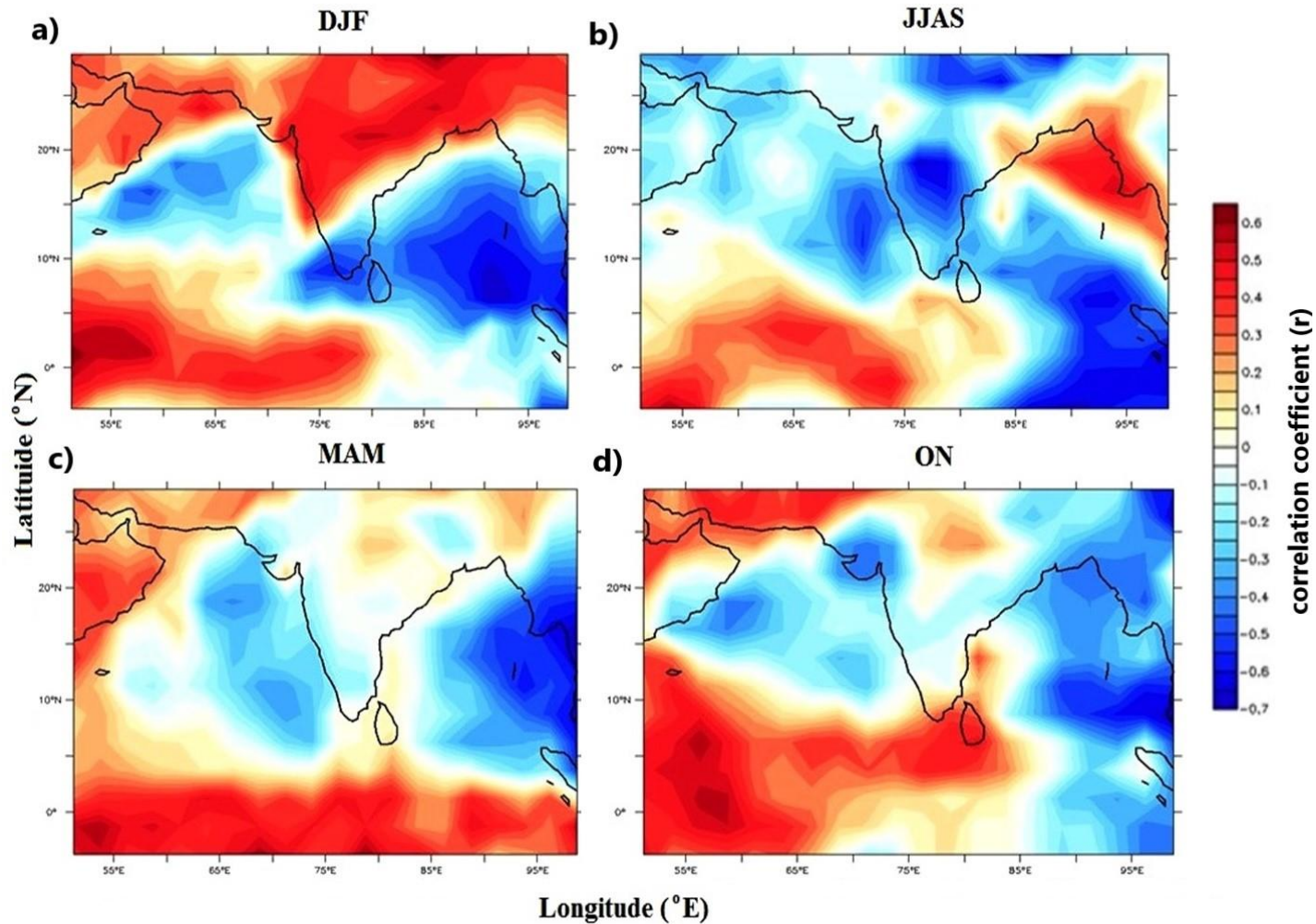


# Correlation between Rainfall and Nino 3.4



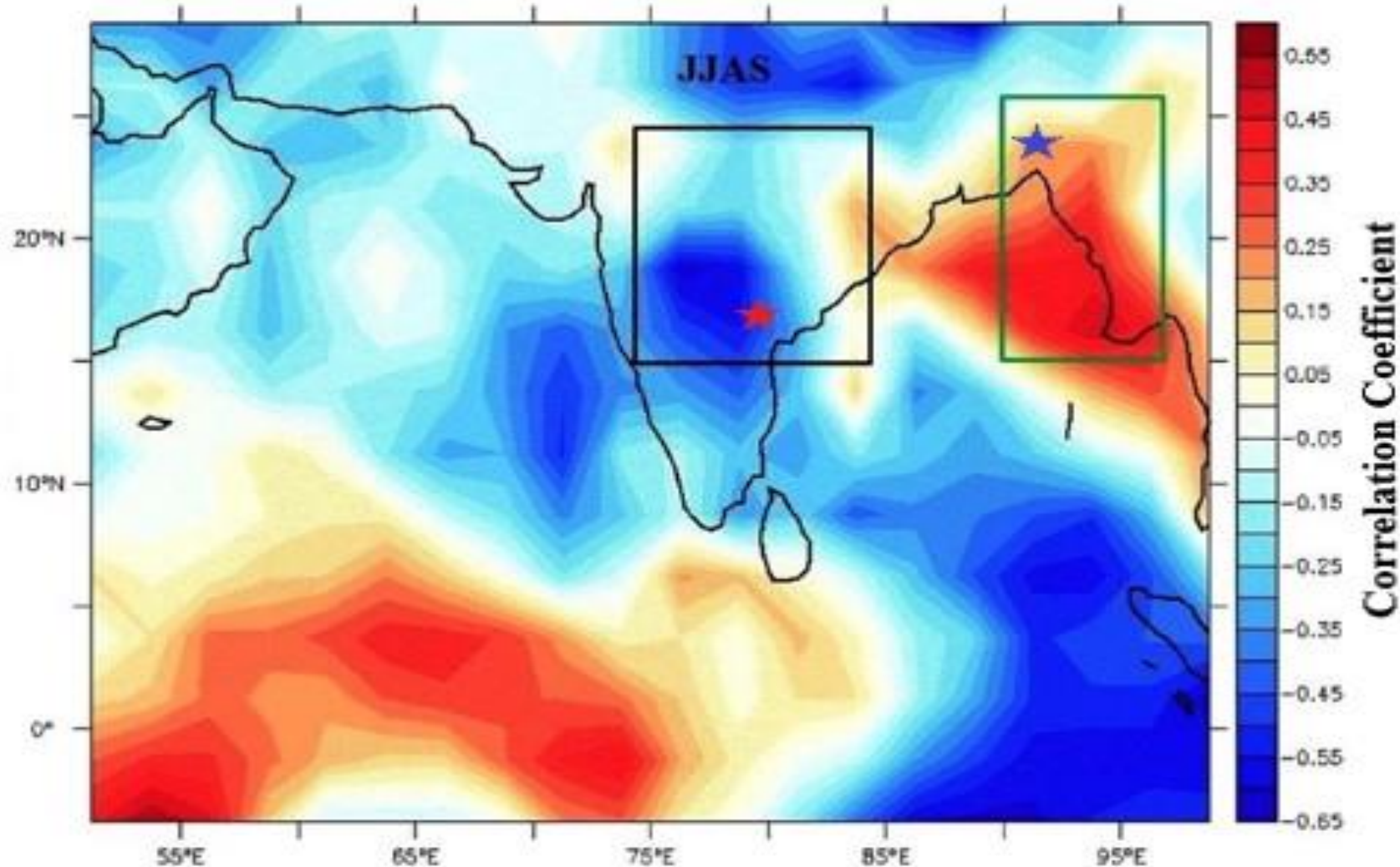
1979-2013 mean values

# Rainfall vs Nino3.4 index

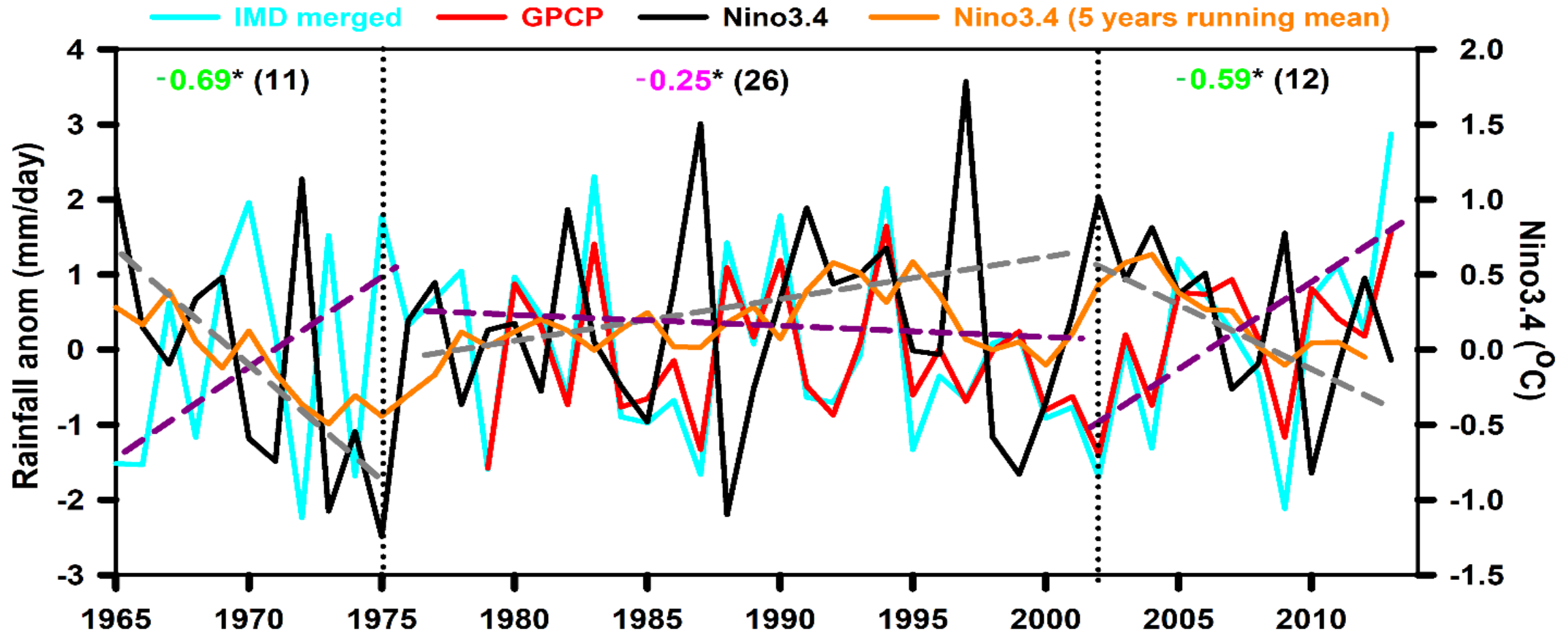




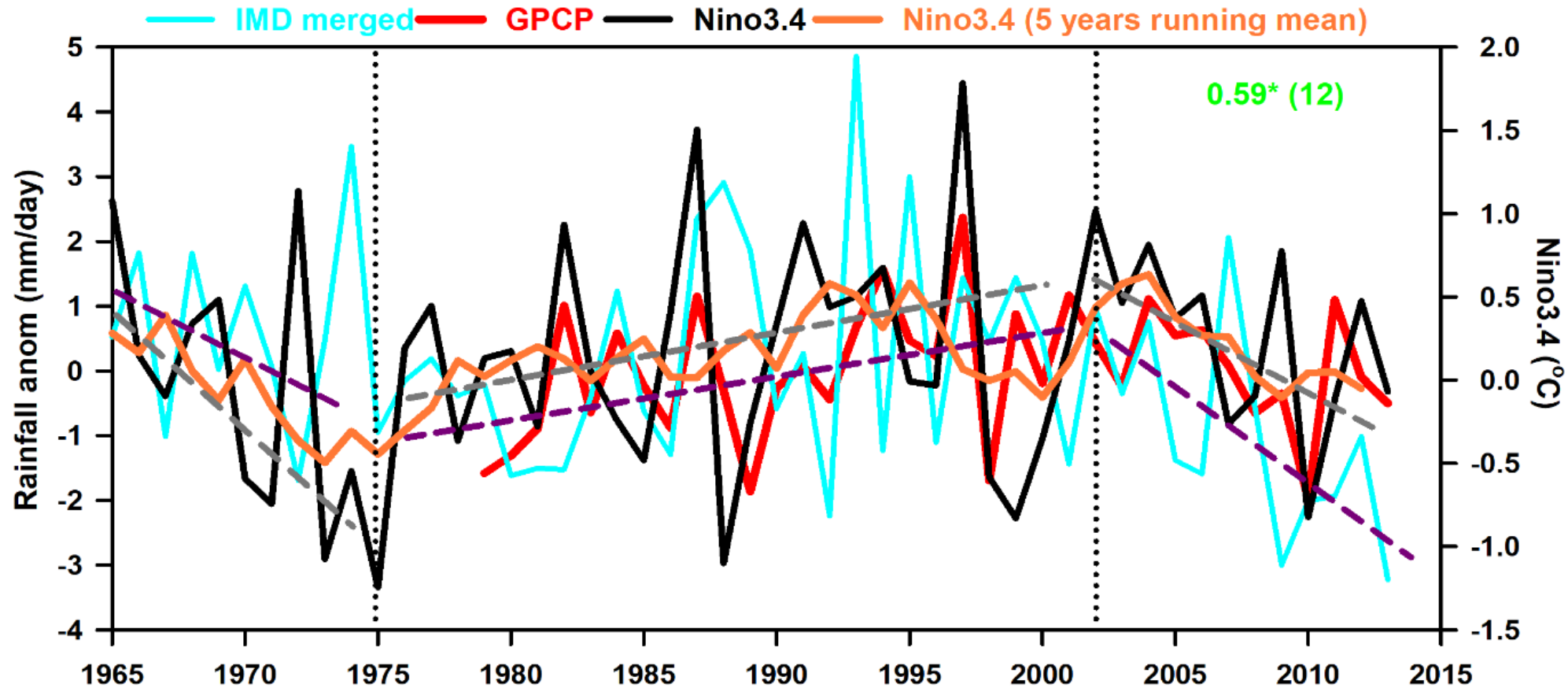
# JJAS rainfall vs Nino 3.4



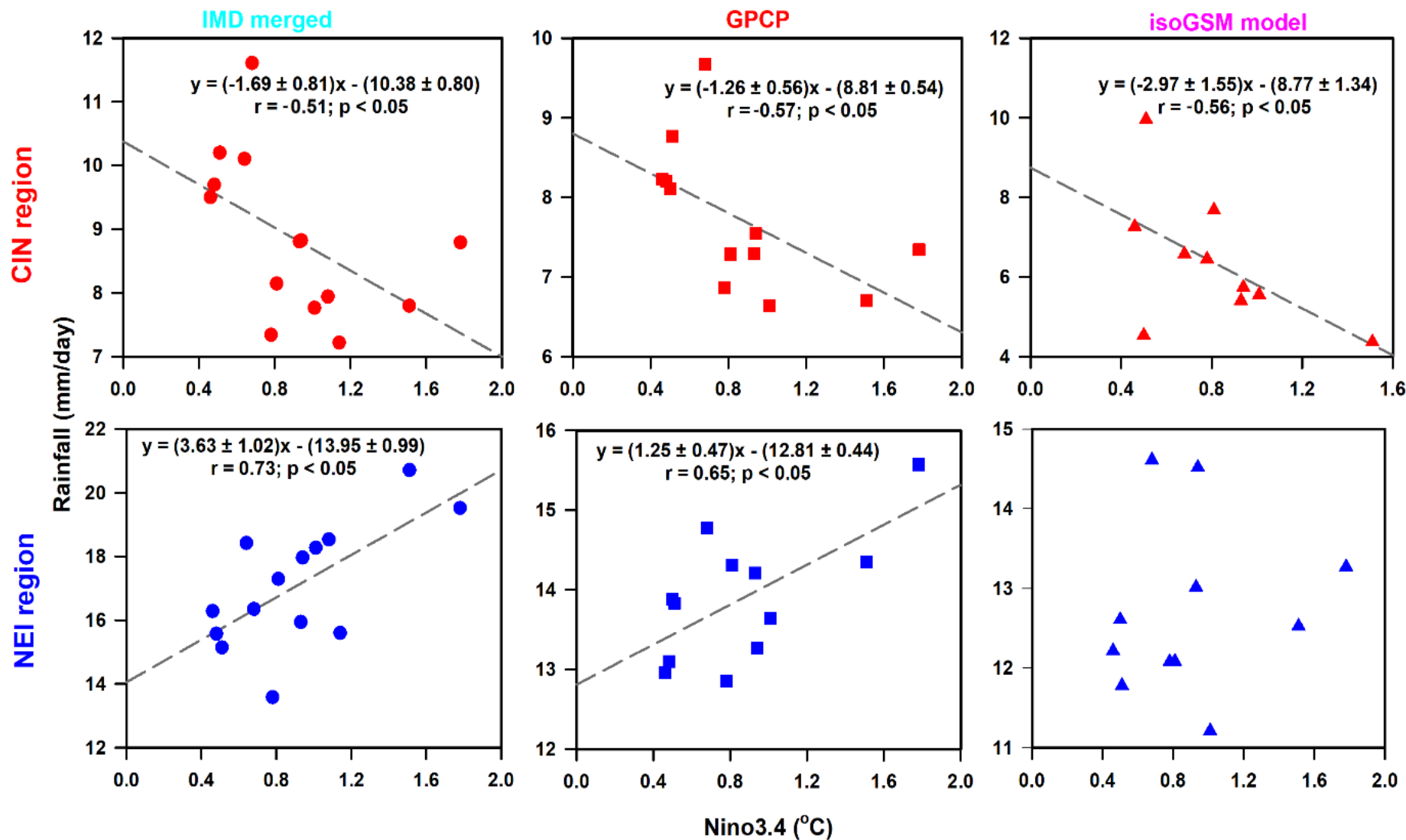
# JJAS rainfall variation over central India



# JJAS average rainfall variation over NEI

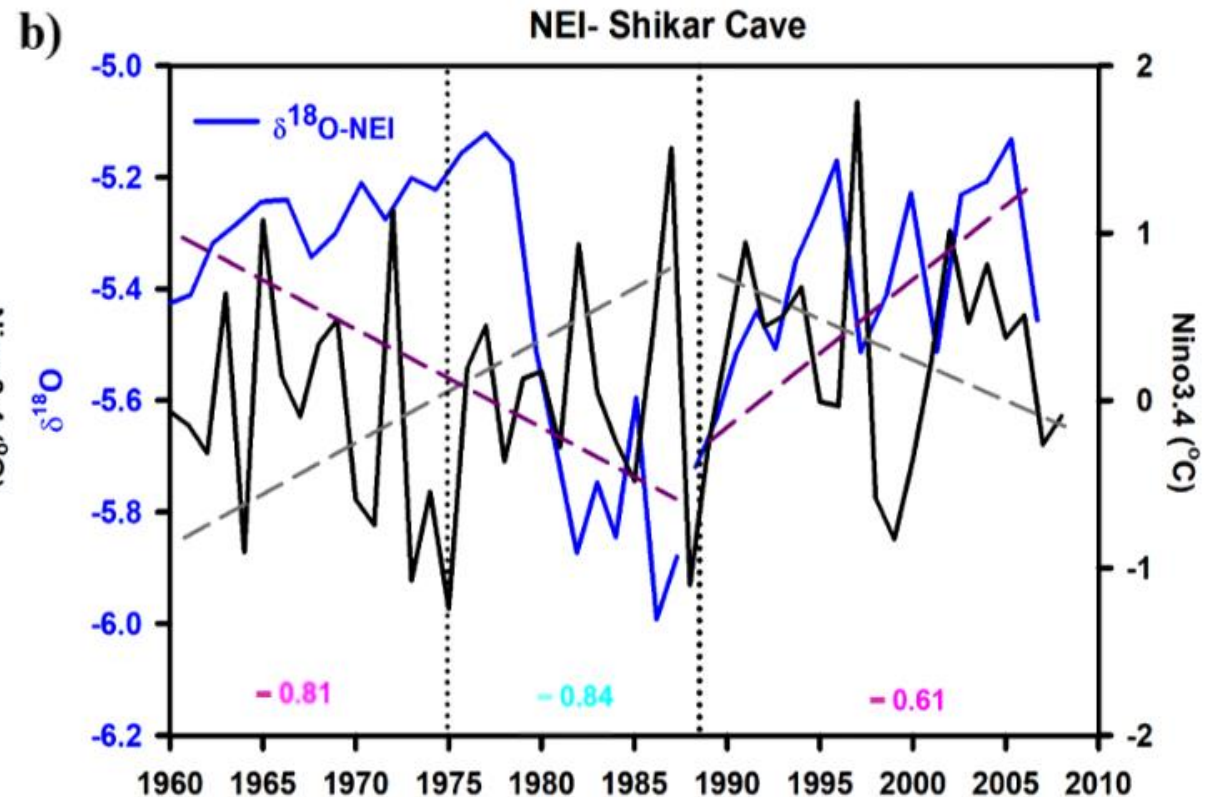
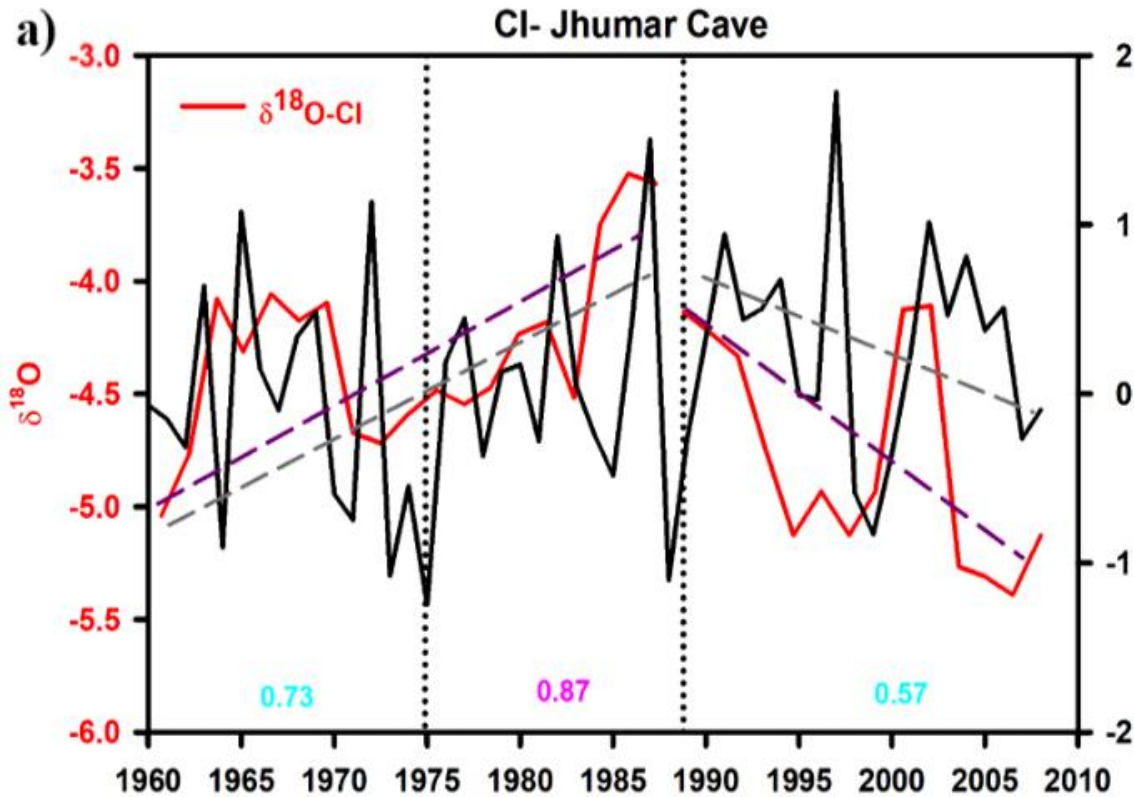


# Rainfall and Nino3.4 over CI and NEI

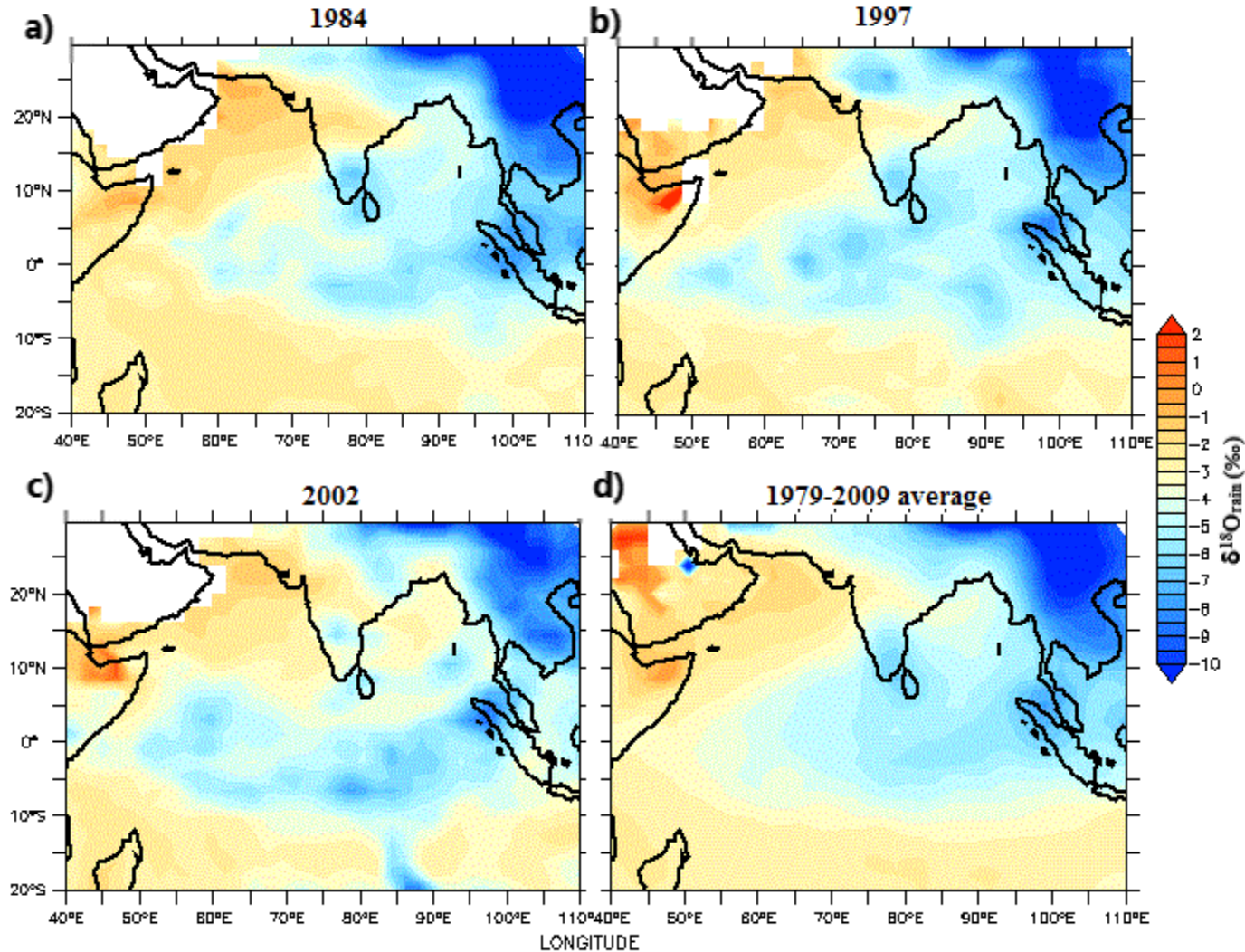




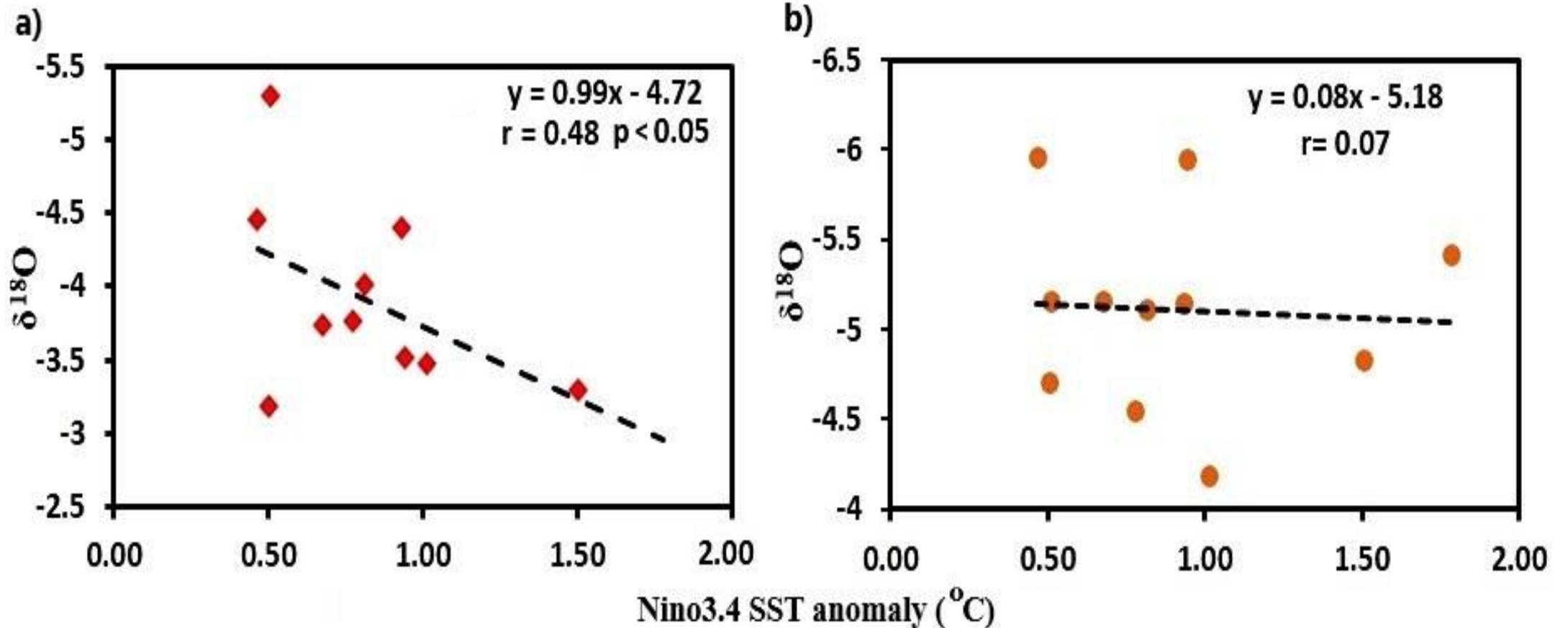
# $\delta^{18}\text{O}$ of cave deposits and Nino 3.4



# JJAS $\delta^{18}\text{O}_{\text{rain}}$ (‰) from the isoGSM model



# $\delta^{18}\text{O}_{\text{rain}}$ (isoGSM model-derived) vs Nino3.4



# Summary

- A strong negative and positive correlation over CI and NEI, respectively, with moderate to strong El-Niño events, were observed during the summer monsoon (JJAS).
- The isotope-enabled general circulation model derived rainfall showed similar negative and positive correlations with the Niño3.4 index over CI and NEI region rainfall, respectively.
- Our results suggest that the strong El-Niño events cause significantly stronger/above normal rainfall over the NEI.
- $\delta^{18}\text{O}$  (model-derived) of rain over CI and corresponding moderate to strong El-Niño events showed a positive correlation, which mimics the observations.
- Both observational and proxy records showed short term decadal variation in the ISM concurred with El-Niño.
- High-resolution speleothem records from CI and NEI showed an absence of long term El-Niño or stronger La-Niña like conditions during 1625 – 1715, which were associated with stronger (weaker) rainfall over CI (NEI).