



## Impact of surface warming over Equatorial Pacific ocean in western disturbances precipitation

**Asiya Badarunnisa Sainudeen** and Prasanta Sanyal

Indian Institut of Science Education and Research Kolkata, Earth sciences, Kolkata, India (asiyaishal@gmail.com)

Indian subcontinent receives precipitation from the southwest monsoon, northeast monsoon, and western disturbances. Unlike southwest and northeast monsoon, precipitation by western disturbances is less studied in terms of understanding its forcing factors and future behavior. Synoptic weather phenomena that originate in temperate north-Atlantic and the Mediterranean sea are primarily responsible for the moisture convergence towards the Indian landmass through an eastward movement and cause Western Disturbance Precipitation (WDP) in Turkey, Iran, Pakistan, Afghanistan, and northwestern India during winter (December-March). Long term (116 years) WDP shows an increasing trend over most of the regions. To understand the forcing factors in WDP, a long term pressure gradient between the Indian landmass and northern Atlantic has been calculated. This pressure gradient also shows an increasing trend, thereby suggesting its direct influence on WDP. This influence is observed not only in the long term WDP but for each winter month as well. Previous studies showed the impact of Pacific ocean sea surface temperature (SST) on the modulation of northern Atlantic ocean SST and surface pressure. However, no quantitative estimation on the relation of Pacific SST with WDP is known. Here, an attempt has been made to understand the role of Pacific SST in the long term trend of WDP.

Changes in SST and convection in the tropical Pacific region determines the interannual variability as well as seasonal climate forecasting all over the world by modulating the air-sea coupling and sea level pressure. Therefore, the potential impact of Pacific SST on WDP has been tested, and a significant correlation between them has been observed. To understand the causal factors behind such relation, statistical analysis like Pearson's correlation analysis was performed by taking the SST of the Nino 3.4 region with the surface pressure of the northern Atlantic and Indian subcontinent. This analysis gave a significant positive correlation ( $R=0.24$ ) among NINO 3.4 SST and surface pressure over the northern Atlantic and negative correlation ( $R=-0.28$ ) between NINO 3.4 SST and surface pressure of the Indian region. From this analysis, it is inferred that the Pacific warm pool primarily drives the lower and higher surface pressure over Indian landmass and northern Atlantic, respectively, by modulating the local meridional and zonal circulation, which further dictates WDP.

### References

Dimri, A. P., et al. "Western disturbances: a review." *Reviews of Geophysics* 53.2 (2015): 225-246.

Enfield, DAVID B., and ALBERTO M. Mestas-Nuñez. "Global modes of ENSO and non-ENSO sea surface temperature variability and their associations with climate." *El-Niño and the Southern Oscillation: multiscale variability and global and regional impacts* (2000): 89-112.