Isolating the Physical Drivers of the Fall 2019 Southeast U.S. Flash Drought: Links to an Extreme IOD

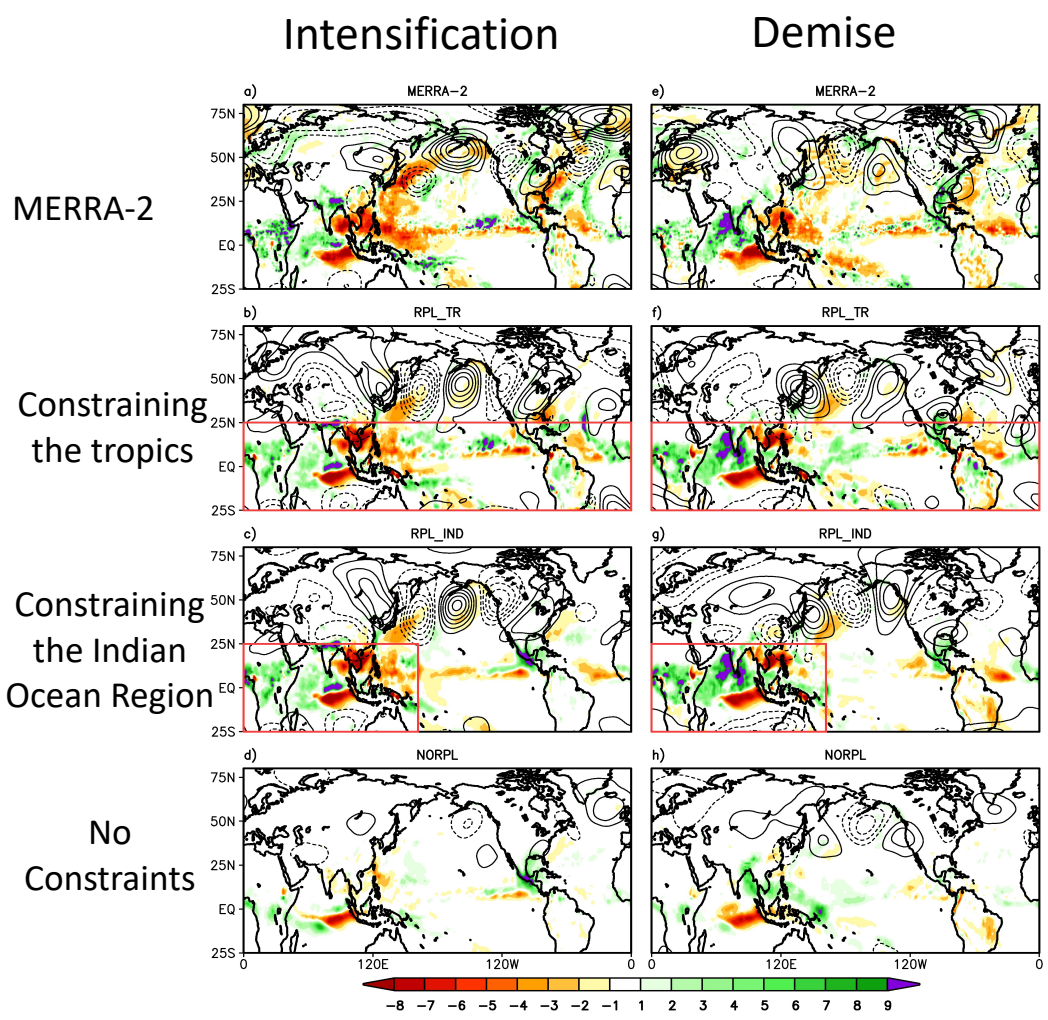
Under MAP funding we employed MERRA-2 and the GEOS-5 AGCM to diagnose the underlying physical mechanisms involved in the onset, maintenance, and demise of the 2019 fall flash drought over the southeastern United States. This was accomplished by performing a series of AGCM simulations in which the model was constrained (replayed, RPL) to remain close to MERRA-2 over pre-specified areas (see red boxes in the figure) that are external to the drought region. Key results are:

1) An anomalous ridge associated with a Rossby wave train was found to be the main source of the most intense temperature and precipitation anomalies that developed over the southeast during the last week of September (left panels of Figure).

2) A second Rossby wave train is responsible for the substantial rain that fell during the second half of October to end the drought (right panels of Figure).

3) Both of the above Rossby waves were shown to have their source in the Indian Ocean region, and appear to be associated with precipitation anomalies linked to an extreme positive Indian Ocean Dipole (IOD)

Schubert, S.D., Y. Chang, A. M. DeAngelis, H. Wang, and R.D. Koster, 2021: On the Development and Demise of the Fall 2019 Southeast U. S. Flash Drought: Links to an Extreme Positive IOD, 2021., *Journal of Climate*, *34*(5), 1701-1723.



Left panels: The 250mb eddy height (contoured) and precipitation anomalies (shaded, mm/day) for a) MERRA-2, b) constraining the tropics, c) constraining the Indian Ocean region and d) without constraints, averaged for the period Sep 24-Oct 7, 2019. Right panels: same as left panels, but for the period Oct 14-Oct 27, 2019. Height contours are 40m for MERRA-2 and 20m for the model.