THE IMPACT OF VEGETATION ON MONSOON RAINFALL

As the land surface is more heterogeneous than the oceans, and the monsoon over land matters the most for humans, understanding the drivers of monsoons over land is more challenging and important. In a recent paper, Samuel et al. (2023) performed several idealistic simulations of an ocean-atmosphere coupled general circulation model with various distributions of vegetation cover over Indian land. The results show that an increase in vegetation cover generally increases monsoon rainfall. The monsoon rainfall is not, however, a linear function of the fraction of the area covered by vegetation. A fully vegetation-covered India receives less rainfall than when the vegetation cover is only over the eastern side of India and bare soil over the western side of India. This signifies the vital role of the east-west gradient in vegetation cover observed over India. The study used an energy balance model to identify three different primary factors that control the monsoon rainfall over various parts of the Indian subcontinent. These are evaporation from the surface, the net energy input into the atmosphere, and vertical stability. While evaporation exhibits a linear relationship with vegetation cover and reveals minimal spatial heterogeneity, the influence through the other two pathways is found to be region-specific.

Reference: Samuel, J. B., and Chakraborty, A and Paleri, A., Deciphering the relationship between vegetation and Indian summer monsoon rainfall. In: Environmental Research Letters, 18 ,2023, DOI 10.1088/1748-9326/acc263

- Change in rainfall from bare soil condition (bottom panels) due to introduction of tall trees (green shaded regions in top panels) in two different experiments of a general circulation model.
- Note that the increase in rainfall over the western Indian region is far less compared to increase in rainfall over the eastern Indian region when vegetation is introduced over these regions.