

Increasing drought frequency in 1.5 degree and 2.0 degree warming world over South Asia

Saran Aadhar¹, Vimal Mishra¹

¹ *Civil Engineering, Indian Institute of Technology (IIT), Gandhinagar, India.*

Historical observations suggest that the severe drought frequency has been increasing in recent decades over South Asia. Using the CMIP5 simulations, the information of drought in future warming climate can also be assessed and helpful to develop the mitigation and adaptation policies in this region according to Paris agreement to holding the increase in global average temperature by 2° and pursue the effort to limit by 1.5° from Pre-industrial time (1.5° and 2.0° warming world). In recent studies, future CMIP5 simulations reported the large uncertainties in drought condition and monsoon rainfall in this region. Here we reduced the uncertainty in the CMIP5 models by selecting the two GCMs groups (better performed GCMs and poor performed GCMs) to provide the robust information about drought condition at 1.5° and 2.0° warming world. Our analysis showed the increase in the drought frequency during 1.5°, and 2.0° warming condition in the better performed GCMs whereas the poor performed GCMs projected the decrease in the drought frequency over South Asia. This significant dissimilarity between the results was analyzed and found the poor coupling between the Indian Ocean and land in the poor performed GCMs. The poor performed GCMs showed an inconsistent relation between land-sea thermal gradient and precipitation. The second mode of MCA analysis between SST and precipitation data also reported the weak linkage of Indian Ocean SST with precipitation (ISMR) in poor performed GCMs. Overall, better performed GCMs provided consistent information for future projection while poor performed GCMs showed poorly linkage between IO SST and precipitation and the contrary relation between thermal gradient and precipitation. Hence, this study suggests that the severity of drought will increase in 1.5° and 2.0° warming world over South Asia. This information can be used to develop the policies related to the adaptation and mitigation of climate change in this region.

Key words: Drought, CMIP5, GCMs, South Asia.

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