

EGU2020-7674

<https://doi.org/10.5194/egusphere-egu2020-7674>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



## Current Risk of Extreme Monsoon Rainfall over India using Large Ensemble Simulations

**Shipra Jain**<sup>1,2</sup>, Adam A Scaife<sup>3,4</sup>, Nick Dunstone<sup>3</sup>, Doug Smith<sup>3</sup>, Saroj K Mishra<sup>2</sup>, and Ruth Doherty<sup>1</sup>

<sup>1</sup>School of Geosciences, University of Edinburgh, Edinburgh EH9 3FF, United Kingdom of Great Britain and Northern Ireland (shipra.npl@gmail.com)

<sup>2</sup>Centre for Atmospheric Sciences, Indian Institute of Technology Delhi, Hauz Khas, Delhi, India

<sup>3</sup>Met Office Hadley Centre, Fitz Roy Road, Exeter, Devon EX1 3PB, United Kingdom

<sup>4</sup>College of Engineering, Mathematics and Physical Sciences, University of Exeter, Exeter, Devon, UK

India suffers from severe social-economic losses due to floods and droughts during boreal summer (June-September) and therefore there is a growing interest in the current risk of extreme monsoon rainfall. In this analysis, we estimate the risk of flood, drought and unprecedented (outside the range of present observational record) rainfall over India using UNprecedented Simulated Extremes using ENsembles (UNSEEN) method. The UNSEEN is a statistical framework under which the risk of unprecedented rainfall extremes can be estimated using a large ensemble of initialized climate simulations to sample a broad range of internal variability. This is the first application of the method to the hindcasts from multiple coupled atmosphere-ocean models. Under this method, we first test individual models against the observed rainfall record over India and select models that are statistically indistinguishable from observations. The risk of floods, droughts and unprecedented rainfall is then estimated using a large ensemble of summer precipitation simulated by the selected set of models. We note that in present climate the risk of drought is higher than the flood, with droughts being more frequent and intense than the floods. This asymmetry in rainfall extremes is found to be partly due to the asymmetry in El-Nino Southern Oscillation (ENSO) phase, with El Nino reaching higher magnitude more frequently than La Nina. The current risk of record breaking drought (>23% deficit w.r.t climatological mean) is 1.6% whereas the risk for record-breaking flood (>16% excess) is 2.6%. There is even a risk of 30% rainfall deficit that could occur once in two centuries, which is not yet seen in observations and would have a catastrophic influence on India.