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Enhanced future variability during India's rainy season

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The Indian summer monsoon shapes the livelihood of a large share of the world's population. About 80% of annual precipitation over India occurs during the monsoon season from June through September. Next to its seasonal mean rainfall the day-to-day variability is crucial for the risk of flooding, national water supply and agricultural productivity. Here we show that the latest ensemble of climate model simulations, prepared for the IPCC's AR-5, consistently projects significant increases in day-to-day rainfall variability under unmitigated climate change. While all models show an increase in day-to-day variability, some models are more realistic in capturing the observed seasonal mean rainfall over India than others. While no model's monsoon rainfall exceeds the observed value by more than two standard deviations, half of the models simulate a significantly weaker monsoon than observed. The relative increase in day-to-day variability by the year 2100 ranges from 15% to 48% under the strongest scenario (RCP-8.5), in the ten models which capture seasonal mean rainfall closest to observations. The variability increase per degree of global warming is independent of the scenario in most models, and is 8% +/- 4% per K on average. This consistent projection across 20 comprehensive climate models provides confidence in the results and suggests the necessity of profound adaptation measures in the case of unmitigated climate change.