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Understanding the future Monsoon activity across the Ganga-Brahmaputra-Meghna basin using CMIP6 HighResMIP models

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The pattern of Monsoon rainfall across the Ganga-Brahmaputra-Meghna (GBM) basin is crucial for supporting various farming and ecological systems and play a significant role in affecting the basin's food-water security, well-being, and prosperity. However, the understanding of Monsoon activity is limited due to the poor representation of large-scale processes in the climate models and their coarser resolution. This study utilises sub-daily precipitation from finer resolution CMIP6 HighResMIP models to study the changes in properties of monsoon rainfall based on the timing (onset/offset/duration) of the Monsoon and the trend in rainfall (total and extreme rainfall). All models show a delay in the monsoon but there is disagreement in trends in retreat and duration of the monsoon. Also, CMCC models project a decline in magnitude of rainfall whereas NERC models project an increasing trend. The models output is also evaluated against the reference datasets like MSWEP and ERA5 reanalyses. Our study highlights the uncertainty in climate models to capture the monsoon rainfall and disagreements in results across different horizontal resolutions and nature of models. Importantly, the delay in future Monsoon supported by all models have a strong implication on agriculture and economy of the delta.