



Estimating water availability over India using a bottom-up probabilistic Budyko approach

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Quantifying the dependence of future water availability on changing climate remains a challenge for India as long-term streamflow data are scarce and there are significant uncertainties regarding future climate change. Here, we present a framework to estimate long-term water availability and its vulnerability to climate change across India using only three hydro-climatic variables: long-term precipitation (P), potential evapotranspiration (PE) and actual evapotranspiration (AE). We assimilate these variables within a probabilistic Budyko framework that relates aridity index (PE/P) of chosen control volumes to their evaporation ratio (AE/P). For each value of aridity index, the probabilistic framework provides a way to determine uncertainty in the projected values of the evaporation ratio. Then, we explore a large range of possible future climates and identify critical climate thresholds across India. Based on this exploratory analysis, we find that southern India is most susceptible to changing climate with less than 10% decrease in precipitation causing a 25% decrease in water availability.