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Future projection of extreme Hot and Wet events over Huang He, Yangtze and Mekong river basins under RCP8.5 scenario

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The Southeast Asian (SEA) region, particularly the Huang He, Yangtze and Mekong river basins are home for large share of the global population and are experiencing rapid socio-economic development, urbanization and industrialization. Simultaneously CO_2 emissions due to fossil fuel burning are on the rise, which makes the region highly vulnerable from the risk of extreme climate change. Using CESM large ensemble data the average summer temperatures in the SEA river basins may will increase by $\sim$6°C under RCP8.5 scenario. As a consequence, the record-breaking extreme hot summers will projected higher in future by $\sim$90-100%. The wet extremes on the other hand are projected to increase by $\sim$60-70% and the Huang He/Yangtze/Mekong river basins are getting wetter at a rate of 0.4/1.225/1.1875 mm/d/30 years.
The relative strength of external forcings and internal climate variability are estimated by the Signal to noise ratio (SNR) in SAT, which is less than 1 until 2000/1998/2000 , i.e. internal variability dominates over external forcings for in the Huang He/Yangtze/Mekong river basins. From 2001/1999/2001 onwards external forcings strongly override the internal climate variability. It is worthy to mention that the width of standard deviation curve at 50th and 95th percentile will decrease significantly as climate warms in future. This is contradictory to the existing hypothesis that as climate warms, SAT variability will increase and weather will get more volatile everywhere, particularly in the SEA river basins. But, our results show that SAT variability will decrease in the SEA river basins, which is opposite to the current understanding. We also analyze the temperature-precipitation relationship under RCP8.5 scenario, which display a peak shaped structure, i.e. increasing precipitation at low–medium range of temperature rise but decreases at high temperatures. Initially precipitation extreme increases due to increasing moisture holding capacity at high temperature, while the primary mechanism for the decrease in precipitation extremes after a threshold temperature (3.5-5.0°C) can be thought as moisture limitation for precipitation at higher temperatures.