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Monthly streamflow reconstruction for the Chao Phraya River Basin with tree rings and $\delta^{18}\text{O}$

Hung Nguyen¹, Stefano Galelli¹, Chenxi Xu², and Brendan Buckley³

¹Singapore University of Technology and Design, Engineering Systems and Design, Singapore (tanthaihung_nguyen@mymail.sutd.edu.sg)

²Institute of Geology and Geophysics, Chinese Academy of Science

³Lamont-Doherty Earth Observatory, Columbia University, New York, USA

The Chao Phraya River Basin covers a third of Thailand's area and is also home to a third of the country's population. The Chao Phraya River serves multiple purposes: water supply, irrigation, hydropower production, cooling for thermoelectric power plants, among others. Water management in the basin could benefit from long term streamflow records that extend beyond the instrumental period. But to acquire practical relevance, streamflow reconstructions should have a sub-annual resolution—in line with the time step characterizing water management decisions. To this end, we reconstruct 253 years of monthly streamflow at all four major tributaries (Ping, Nan, Yon, and Wang) of the Chao Phraya. The reconstructions are developed using a network of tree rings and $\delta^{18}\text{O}$ chronologies in Southeast Asia. Importantly, our reconstruction method ensures that the total monthly flow matches the annual flow closely. This mass balance criterion is necessary to avoid misleading water management decisions, such as the allocation of water rights. All reconstructions are skillful. Better skills are obtained in the pre-monsoon months (March to May) than in the peak monsoon season (September, October). Overall, this work presents the most comprehensive record of high resolution and long term streamflow variability in the basin.