



Flood Hazard Trends in the Mekong River during the 20th century due to monsoon variability

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Flood trends were investigated in four stations of the lower Mekong River. Two types of changes were accounted for: trend in the mean and trend in the variance of the time series. A trend in the mean implies that the average flood events changed with time. A trend in variance implies that the frequency of low and high magnitude floods changed with time (Merz et al., 2012).

Results showed that average flood events decreased during the 20th century. However, due to an increase in variance, the frequency of high magnitude floods increased towards the end of the 20th century (Delgado et al., 2010). This increase could not be detected by usual trend tests like Mann Kendall test or the ordinary least squares regression. The results agree with Katz and Brown (1992), who showed that variance changes are more important than changes in mean, when it comes to flood frequency trends.

To investigate possible causes for the detected changes in flood variance, we looked at several large scale atmospheric circulation patterns cited in the literature. The Western Pacific monsoon index (Wang, 2001) showed the greatest resemblance with the flood data. A test of step change in variance was conducted which revealed a coinciding step change in variance between annual maximum discharge and the Western Pacific monsoon.

A statistical model where monsoon variance forces flood frequency in the 20th century was tested. The results were statistically significant. This has the advantage of bypassing the use of precipitation, which in this region is collected in a rather sparse network. Concerning climate change projections, a dynamic index like the Western Pacific monsoon index is better simulated by climate models than tropical precipitation (Wang, 2004, Douville et al. 2005).

Another important result is the attribution of the detected changes. The Mekong River basin is located in a transition zone between the Indian and the Pacific oceans. Our results showed that the interannual variability of floods in the lower Mekong are significantly more affected by the Western Pacific ocean than by the Indian ocean. Another important potential forcing was found in the Pacific Decadal Oscillation, although further research is still necessary to validate the hypothesis.