H11N-1455 Comparison of Reconstruction Methods of Instantaneous Peaks from Daily Mean Observations for Enhanced Flood Frequency Analysis

Monday, 11 December 2023

08:30 - 12:50

Poster Hall A-C - South (Exhibition Level, South, MC)

Abstract

Flooding is a recurrent natural disaster causing substantial property damages and causalities all around the world. Flood frequency analysis (FFA) provides insights into the behavior, magnitude, and likelihood of these extreme events that are important for mitigation strategies. The accuracy of FFA is critically dependent on the availability of extensive peak flow records. The United States Geological Survey (USGS) has been collecting daily mean discharge observations across the U.S. extending to the early 20^{th} century, while instantaneous (15-minute) records are only available since the 1980s. In this study, we tested several empirical methods for the reconstruction of instantaneous peak flows from daily mean observations at nearly 700 locations across the country with near-natural streamflow conditions. In addition to testing existing techniques, we developed a multi-linear regression based on the identification of independent streamflow events through peak-over-threshold (POT) methods, and predictors accounting for the antecedent, current, and subsequent daily flow, as well as the antecedent precipitation. We found that two (three) predictors are sufficient in 43% (33%) of the cases. The predictors based on streamflow explain most of the variability, while the information on the antecedent precipitation is important in coastal parts of California, Florida, Oregon, and the Northeast. Our proposed technique for data reconstruction performs overall quite well both in the calibration and validation periods, with $R^2 > 0.7$ (median of 0.96). The worst reconstruction occurs in the Southwest. The utility of the reconstructed

data was further evaluated by comparing the quantiles derived from the FFA on the annual peak flow and POT series.

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