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Water Stage Forecasting in Tidal streams during High Water Using EEMD

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There are so many factors may affect the water stages in tidal streams. Not only the ocean wave but also the stream flow affects the water stage in a tidal stream. During high water, two of the most important factors affecting water stages in tidal streams are flood and tide. However the hydrological processes in tidal streams during high water are nonlinear and nonstationary. Generally the conventional methods used for forecasting water stages in tidal streams are very complicated. It explains the accurately forecasting water stages, especially during high water, in tidal streams is always a difficult task. The study makes used of Ensemble Empirical Model Decomposition (EEMD) to analyze the water stages in tidal streams. One of the advantages of the EEMD is it can be used to analyze the nonlinear and nonstationary data. The EEMD divides the water stage into several intrinsic mode functions (IMFs) and a residual; meanwhile, the physical meaning still remains during the process. By comparing the IMF frequency with tidal frequency, it is possible to identify if the IMF is affected by tides. Then the IMFs is separated into two groups, affected by tide or not by tide. The IMFs in each group are assembled to become a factor. Therefore the water stages in tidal streams are only affected by two factors, tidal factor and flood factor. Finally the regression analysis is used to establish the relationship between the factors of the gaging stations in the tidal stream. The available data during 15 typhoon periods of the Tanshui River whose downstream reach is in estuary area is used to illustrate the accuracy and reliability of the proposed method. The results show that the simple but reliable method is capable of forecasting water stages in tidal streams.