

# Non-causal non-normal bivariate time series modeling, with an application to river bank erosion assessment

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## Abstract

Extreme river bank erosion may destabilize a river so that the river may change its course, thus posing severe environmental and societal problems. Hence, prediction of river bank erosion is an important problem. River bank erosion is known to be related to river curvature, where the curvature of a river segment is often characterized by the so-called sinuosity index; the sinuosity index is the ratio of the channel length to the down-valley length. While river curvature can be readily calculated via GPS, river bank erosion is very hard to measure and time-consuming. In this paper, we consider non-causal bivariate time series models for the prediction of river bank erosion based on river curvature.

Keywords: river bank erosion, non-causal, non-normal, prediction, river bank erosion, river curvature