An alternative statistical model for predicting salinity variations in estuaries

Ronghui Ye[1], Jun Kong[1], Chengji Shen[2], jinming zhang[2], and Weisheng Zhang[2]

[1]State Key Laboratory of Hydrology-Water Resources and Hydraulic Engineering
[2]Hohai University

August 28, 2020

Abstract

Accurate salinity prediction can support the decision-making of water resources management to mitigate the threat of insufficient freshwater supply in densely populated estuaries. Statistical methods are low-cost and less time-consuming compared with numerical models and physical models for predicting estuarine salinity variations. This study proposed an alternative statistical model that can more accurately predict the salinity series in estuaries. The model incorporates an autoregressive model to characterize the memory effect of salinity and includes the changes of salinity driven by river discharge and tides. Furthermore, the Gamma distribution function was introduced to correct the hysteresis effects of river discharge, tides and salinity. Based on fixed corrections of long-term effects, dynamic corrections of short-term effects were added to weaken the hysteresis effects. Real-world model application to the Pearl River Estuary obtained satisfactory agreement between predicted and measured salinity peaks, indicating the accuracy of salinity forecast. Cross-validation and weekly salinity prediction under small, medium and large river discharges were also conducted to further test the reliability of the model. The statistical model provides a good reference for predicting salinity variations in estuaries.

Hosted file

`A statistical model for the prediction of salinity time series in estuaries.docx` available at https://authorea.com/users/354543/articles/478086-an-alternative-statistical-model-for-predicting-salinity-variations-in-estuaries

Hosted file

`Figures.rar` available at https://authorea.com/users/354543/articles/478086-an-alternative-statistical-model-for-predicting-salinity-variations-in-estuaries