A fully predictive model for salt intrusion in estuaries applied to the Yangtze estuary

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Understanding the way the salinity distribution in an estuary reacts to external drivers (e.g., tide, fresh water discharge, dredging etc.) is important for both water quality and water resources management in estuaries. The salinity distribution depends strongly on the geometry of an estuary, but also on the fresh water discharge that counteracts the salt intrusion. In estuaries it is notoriously hard to estimate this discharge and subsequently to predict the parameters that determine the mixing behaviour depending on it. Recently a method has been developed to predict the fresh water discharge on the basis of water level observations. In addition predictive equations for tidal mixing have been updated and revised. In this paper, these two predictive methods are combined and subsequently applied to the Yangtze estuary under a wide variation of fresh water discharge. The predicted salt distribution appears to be in good agreement with observations. To provide insight into the optimum use of water resources (e.g., to determine the amount of fresh water discharge required to maintain a specific salt intrusion length), we further studied the salt intrusion pattern under different fresh water discharge conditions.