River salinity on a mega-delta, an unstructured grid model approach

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Abstract

With an average freshwater discharge of around 40,000 m3/s the BGM (Brahmaputra Ganges and Meghna) river system has the third largest discharge worldwide. The BGM river delta is a low-lying fertile area covering over 100,000 km2 mainly in India and Bangladesh. Approximately two-thirds of the Bangladesh people work in agriculture and these local livelihoods depend on freshwater sources directly linked to river salinity.

The finite volume coastal ocean model (FVCOM) has been applied to the mega river delta of India and Bangladesh in order to simulate river salinity under present and future climate conditions. Forced by a combination of regional climate model predictions, and a basin-wide river catchment model, the 3D baroclinic delta model can determine river salinity under the current climate, and make predictions for future wet and dry years. The river salinity demonstrates a strong seasonal and tidal cycle, making it important for the model to be able to capture a wide range of timescales.

The unstructured mesh approach used in FVCOM is required to properly represent the delta's structure; a complex network of interconnected river channels. The model extends 250 km inland in order to capture the full extent of the tidal influence and grid resolutions of 10 s of metres are required to represent narrow inland river channels. The use of FVCOM to simulate flows so far inland is a novel challenge, which also requires knowledge of the shape and cross-section of the river channels.