Numerical model for the growth of distributary channel bifurcation on river delta

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We propose a numerical model to describe the growth of distributary channel networks on river deltas. The model uses the Laplace equation to describe shallow, unchannelized flow on the delta front and a moving boundary to describe the evolving channel network. The boundary element method is applied to solve the Laplace equation to obtain the outflow flux on the distributary boundary. Movement of the channel network boundary ($\mathbf{u} = (u_x, u_y)$) is a function of the outflow flux along the boundary (q). The relation $\mathbf{u} \sim q^{\alpha}$ with α=1.5-2.5 is consistent with common sediment transport formulae. The model produces emergent channel bifurcations which are similar to processes observed at the prograding Wax Lake Delta, Louisiana, USA. Furthermore, as α increases, the emergent width of distributary channels is reduced. Further comparisons with experiments and field data will be used to validate the numerical results. The model provides a new tool for investigating channel spacing and bifurcation dynamics in complex distributary channel networks.

Keywords: channel networks, channel bifurcation, river delta

