

Modeling sediment dynamics near sandy spit under wave-induced currents

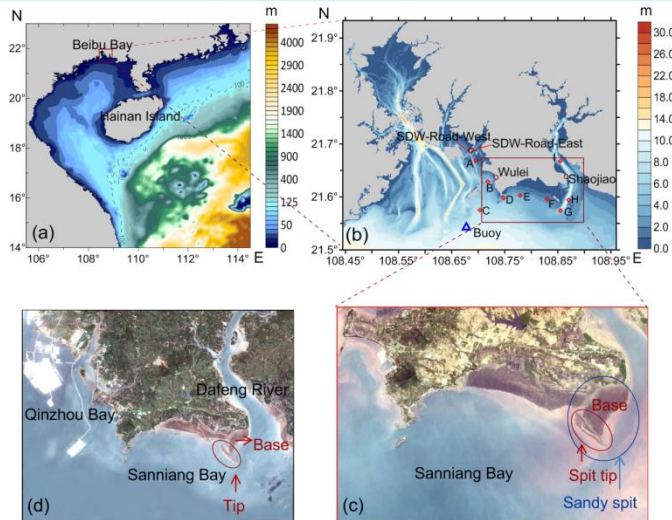


Fig. 1(a) Large model domain with horizontal resolution of $(1/30)^\circ \times (1/30)^\circ$. (b) Bathymetry in small domain model with $0.001^\circ \times 0.001^\circ$ resolution and observation stations (units: meters). Red circle: current; red circle: elevation; blue triangle: wave. Aerial photographs of the western sandy spit with a relatively low water level (c) and with a relatively high water level (d).

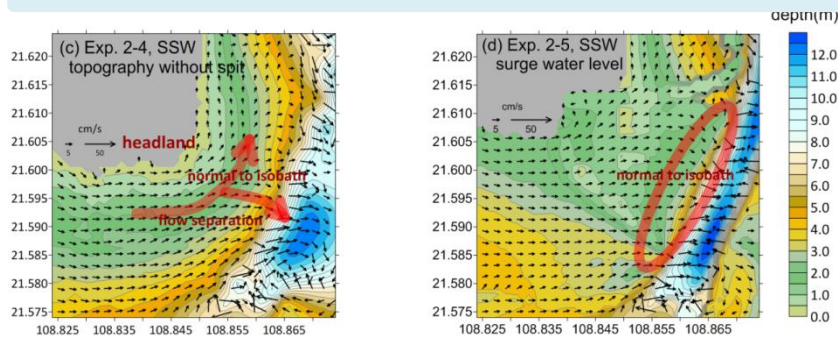
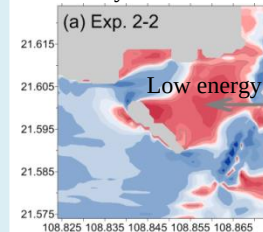
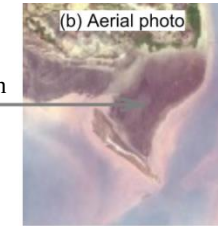


Fig. 3. Wave-induced current vectors in the bottom layer overlying the filled contours of water depth (units: cm/s). (c) Exp. 2-4 by setting topography without spit, and (d) Exp. 2-5 under water level of surge.

Case: high water level

Only SSW wave



Case: low water level

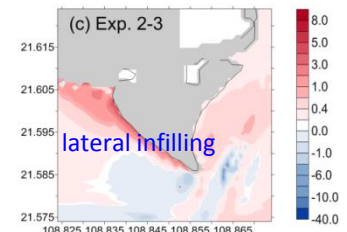
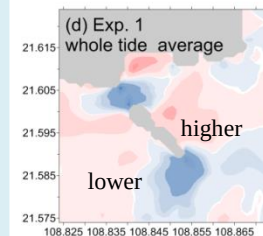
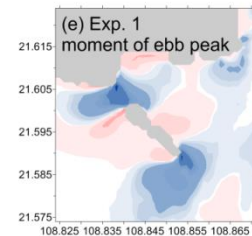
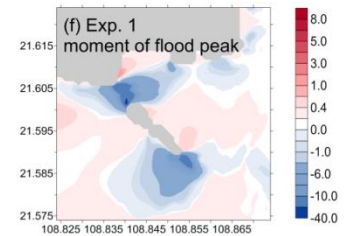


Fig. 2. Simulated deposition rates. Units: $10^{-6} \text{ kg/m}^2/\text{s}$

wave-induced currents dominate the maintenance of the sandy spit.

The spit tip was shown to be a barrier to the dominant wave-induced current, and the spit base was simulated to form via sand accumulation in the shelter of the spit tip.

The deposition pattern is attributed mainly to the low-energy region behind the tip of the spit, which can counter the erosion effect of dominant wave-induced currents.

The process by which the spit tip was formed can be explained by the separation of wave-induced coastal flow.

The sediment is deposited along the flow branch of separation and forms the spit tip, which indicates that the sediment is deposited where the longshore current changes into offshore current.