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Transport and bottom accumulation of fine river sediments under typhoon conditions and associated submarine landslides: case study of the Peinan River, Taiwan

Alexander Osadchiev (1), Konstantin Korotenko (1), Peter Zavialov (1), Wen-Son Chiang (2), and Cheng-Chi Liu (2)

(1) Shirshov Institute of Oceanology, Physical Oceanography, Moscow, Russian Federation (osadchiev@ocean.ru), (2) Tainan Hydraulics Laboratory, National Cheng-Kung University, Tainan, Taiwan

A combination of a three-dimensional Eulerian ocean circulation model (POM) and a Lagrangian particle-tracking model (STRiPE) is used to study the fate of fine river sediments discharged by the Peinan River at the south-eastern coast of the Taiwan Island. The composite model is verified against in situ measurements and applied to simulate primary sediment deposition under freshet and typhoon discharge conditions of the Peinan River. It is shown that local wind plays a crucial role in sediment transport and settling at the coastal area through its influence on the river plume dynamics and turbulent mixing in the upper layer. Wind forcing conditions generally determine the location of the sediment deposit area, while its final pattern is defined by coastal circulation as modulated by the geometry of the coast and local bathymetry. In the study, region river-born sediments are deposited to the sea floor mainly in the shallow shelf areas. A significant portion of discharged fine sediments is moved offshore to the deeper ocean where it is further advected and dispersed by strong coastal circulation mainly governed by the Kuroshio Current. The performed numerical experiments showed that sediment accumulation rate under typhoon conditions is about two orders of magnitude greater comparing to freshet condition. Basing on the simulation results, we identified areas of continental shelf and continental slope adjacent to the Peinan River estuary which exhibit high risk of formation of submarine landslides during and shortly after the typhoon events.