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Suspended Sediment Transport and Geomorphic Processes at a Breached Delta Island: Implications for Restoration Management and Planning

Abstract: Long-term planning for the Delta has identified habitat restoration as a key element for reconciling human impacts with ecosystem function in the Delta. However, the linkages between physical processes and the resulting habitat evolution are not well understood. As part of the BREACH III project team, we have developed hydrodynamic, wind-wave, and sediment transport models for Liberty Island, a former diked area now breached to restore flow, to understand these linkages. We have represented the northwest portion of the Delta, encompassing Liberty Island and surrounding channels, with a two-dimensional hydrodynamic model (Delft3D) coupled with a wind-wave model (SWAN). These two models are used to predict the re-suspension, transport, and deposition of suspended sediment. The models are forced with a range of inputs, including tides, wind, and river discharge, including the Yolo Bypass. By analyzing the predicted response to different forcing conditions and ambient sediment conditions, we assess the implications for restoration management and planning. Applications include: circulation, residence time & export; waves and levee erosion; sediment budget and pathways; the proposed Yolo Bypass conservation measure; and vegetation expansion and habitat evolution.