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Fluid Mud: Worldwide Importance in Rapid Coastal Dispersal of Fine-Grained Sediments

Fluid muds are high-concentration near-seabed suspensions of fine sediments, and have been recognized in continental-margin sedimentary systems for many years. However, in the past decade, the dispersal and emplacement of fluid-mud layers has been documented in an increasing diversity of marine environments. It has been shown that the combination of high-energy benthic hydrodynamics and sufficient fine sediment can result in gravity-driven flows (on very low slopes) that can blanket hundreds of square kilometers to thicknesses exceeding 10 cm. This recognition prompts an important question: how widespread is this phenomenon, and have we misinterpreted the origin of many fine-grained deposits?

Two modern contrasting examples are examined here: the Atchafalaya River/Chenier Plain system of southwest Louisiana, and the Eel River Shelf of Northern California. The Eel River pulses abundant sediment to the California margin during floods that are closely coupled with extreme coastal wave activity. Northward flow in a coastal sediment plume is confined to the breaker zone. Sedimentation within the plume accompanies diminishing wave action, and resultant fluid muds flow down the shelf gradient to create mid-shelf mud layers 10-30 km offshore. In contrast, The Atchafalaya system is modulated by the larger Mississippi River, and has a shallow, low gradient shelf with a low-energy wave climate. Here, sediment is deposited seasonally near the Atchafalaya mouth, and is then redistributed by wave energy and currents generated during intense and frequent winter fronts. The resultant deposits form a prograding inner-shelf wedge of fine-grained sediments blanketing older sandy deposits.