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Subsidence of River Delta Systems and Enclosed Basins Caused by Multi-decadal to Millennial Scale Sediment and Ocean Loading

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The causes of multi-decadal coastal subsidence that exceed the rate of 20^{th}-21^{st} Century mean sea-level rise are numerous. A host of causal relationships between anthropogenic activity and coastal erosion and subsidence are both compelling and well understood. A short list of these processes should include: fluid extraction, reservoir compaction; fluid-induced motion of shallow growth-faults; decomposition of organic sediments (left in the wake of major water diversion projects) and sediment empoundment and/or diversion. Non-anthropogenic post-glacial sediment loading-induced subsidence has also been demonstrated to be a candidate mechanism that could dominate the GPS-mapped subsidence in the Mississippi-Atchafalaya Rive Delta system (Ivins, Dokka and Blum, *GRL*, **34**, L16303, 2007). More recent changes in sediment load can also have a substantial impact on the active subsidence of the crust and mantle. These can be of both anthropogenic and natural origins. Here we examine, in varying degrees of detail, the world's major delta systems wherein the necessary and sufficient conditions are met that allow sediment plus water load to drive gravitationally-layered, hydrostatically pre-stressed viscoelastic Earth model simulations far enough away from gravitational equilibrium that a detectable geodetic signal in tide-gauges and GPS vertical position would be predicted. Sediment-load-induced subsidence occurs over horizontal length scales, λ, comparable to thickness of the lithosphere: $\lambda \geq$ 40-60 km and has amplitudes ranging from of 0.5 to 8 mm/yr (Ivins et al. *GRL34,* 2007; Syvitski *Sustain. Sci.,* ***3***, 2008). The cases of the pan-Arctic deltas, the Atchafalya –Mississippi River Delta system, the Yangzte River and Yellow River Deltas of China, the Danube River Delta Plain, and the generally complex postglacial water-sediment loading of the Black Sea and Caspian Sea.