

Yangtze River System Loaded by the Three Gorges River Dam Water and Sediment

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The sediment and water transport into the basin valley floors of the Yangtze River due to the construction of the Three Gorges River Dam is without precedent in human history. Sediment catchment basins at the mouths of the world's largest rivers generally do not have substantial seismicity, as they occur at 'passive' continental margins. The rates of sediment transport to these basins can be substantial: in the near shore zone, of order 1 meter per kyr; and in deltaic deposition centers, of order 10-20 meters per kyr. While such systems generally have faulting associated with them, these are generally manifested as shallow growth faults having relatively low levels of seismicity. With a viscoelastic layered model that matches local GPS array data we determine the Coulomb stresses in the crust that are generated by the water plus sediment loading of the Yangtze River in China. Here the Three Gorges Dam impedes sediment transport to the mouth of the river, by roughly 0.5 cubic kilometers per year, the perturbation is about a half MPa, or the same magnitude as the stress perturbations that link large earthquakes in active interplate deformation regimes. We present predictions of time-dependent failure Coulomb stress evolution for the latitude 30 N and east west profile: 100 – 120 E, central to coastal China. We also examine the loading Coulomb stress changes caused by water impounded by the Zippingpu Dam near epicenter of the 19 km depth 7.9 Mm Sichuan Earthquake of May 12 2008.