

Impacts of Anthropogenically Driven Changes in Sediment Dynamics on Depositional Records in the Pearl River Estuary, China

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INTRODUCTION & AIM

Understanding impacts of anthropogenic changes in sediment dynamics on sediment records is crucial for studying land-sea interactions and deciphering estuarine environmental responses. Over the past few decades, direct anthropogenic interventions in the Pearl River Estuary (PRE) have far surpassed the influence of natural processes. Changes in discharge and sediment fluxes, driven by anthropogenic activities such as large-scale sand excavation and extensive coastal reclamation, have markedly reshaped the estuarine morphology. Notably, these perturbations have induced measurable transformations in estuarine bathymetric configuration, particularly through channel narrowing and deepening. These modifications have reshaped the estuarine sediment dynamic regime, leading to fundamental shifts in the interaction between riverine and tidal forcing. Besides, the geomorphological and tidal-dynamic responses on the eastern and western PRE exhibit pronounced spatial and temporal heterogeneity.

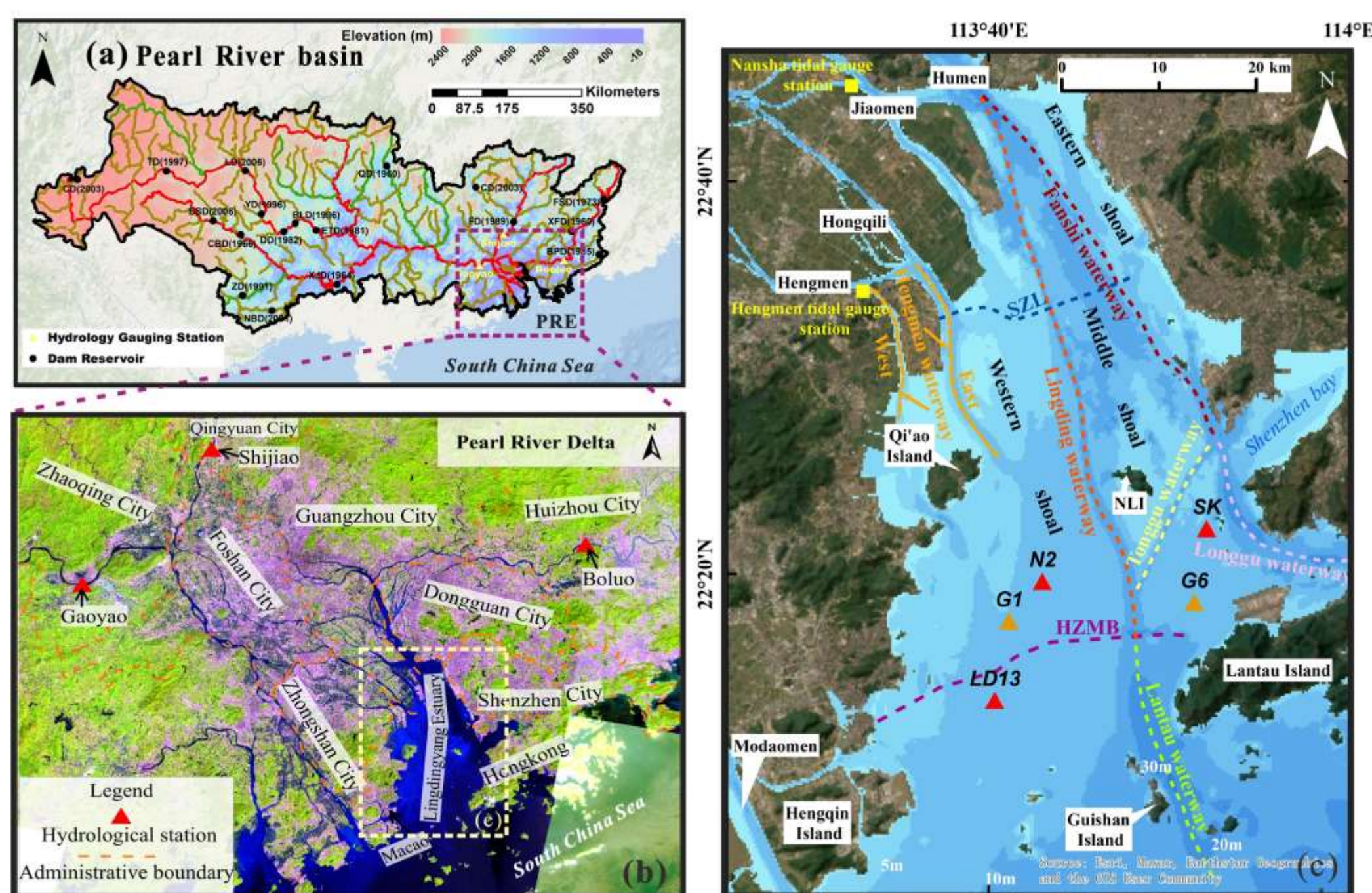


Fig. 1. Sketch of basin-scale wide and strongly anthropressure and sampling sites in the PRE

METHOD

Two sediment cores, designated as Core SK and Core LD13, were collected from the eastern and western PRE.

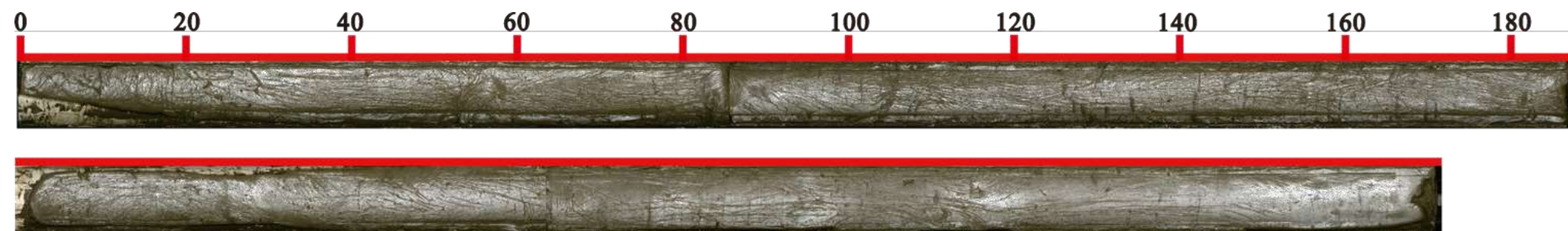


Fig. 2. Scanning imagery of two cores

Comprehensive analyses including laser grain size measurement, organic matter content determination, and ^{210}Pb dating were performed on all drill holes.

I RESULTS & DISCUSSION: Anthropogenic Changes in Sediment Dynamics in the PRE

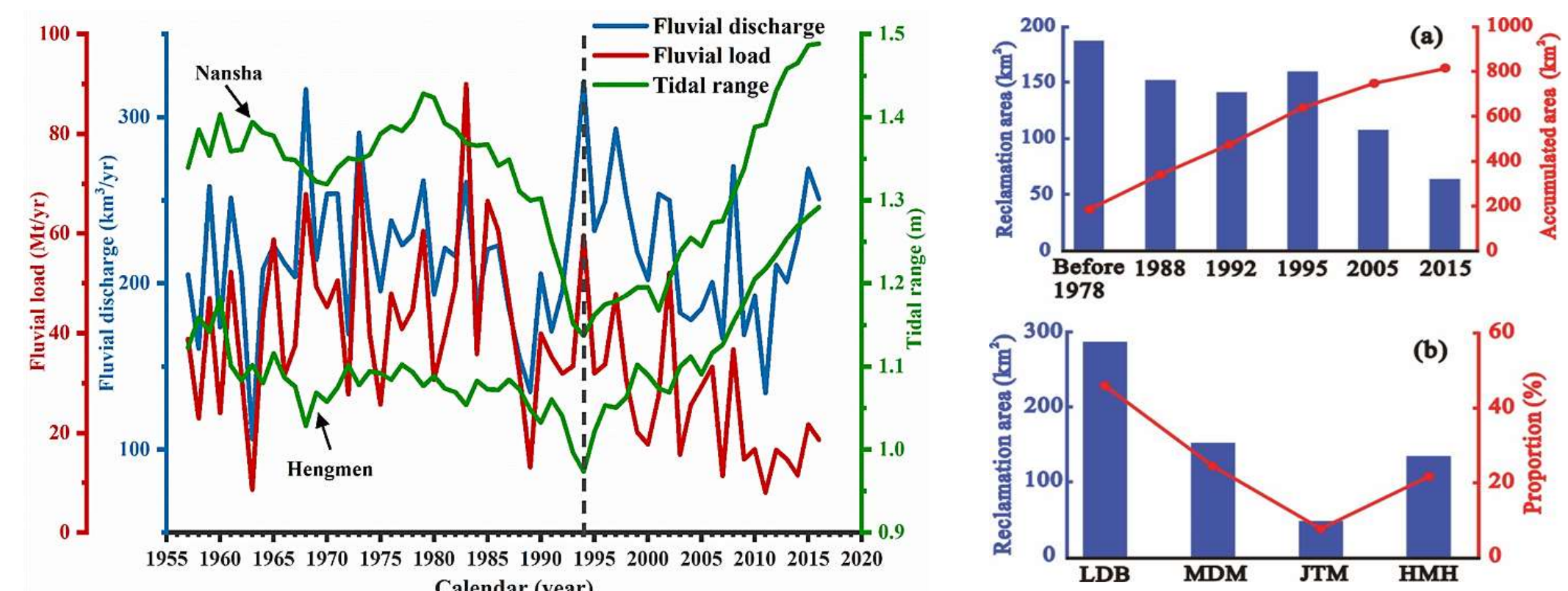


Fig. 3. Long-term variations of hydrology correspondences to the different phase of human activities in the PRE

II RESULTS & DISCUSSION: Spatio-temporal Response of Sedimentary Records to Changes in Sediment Dynamic

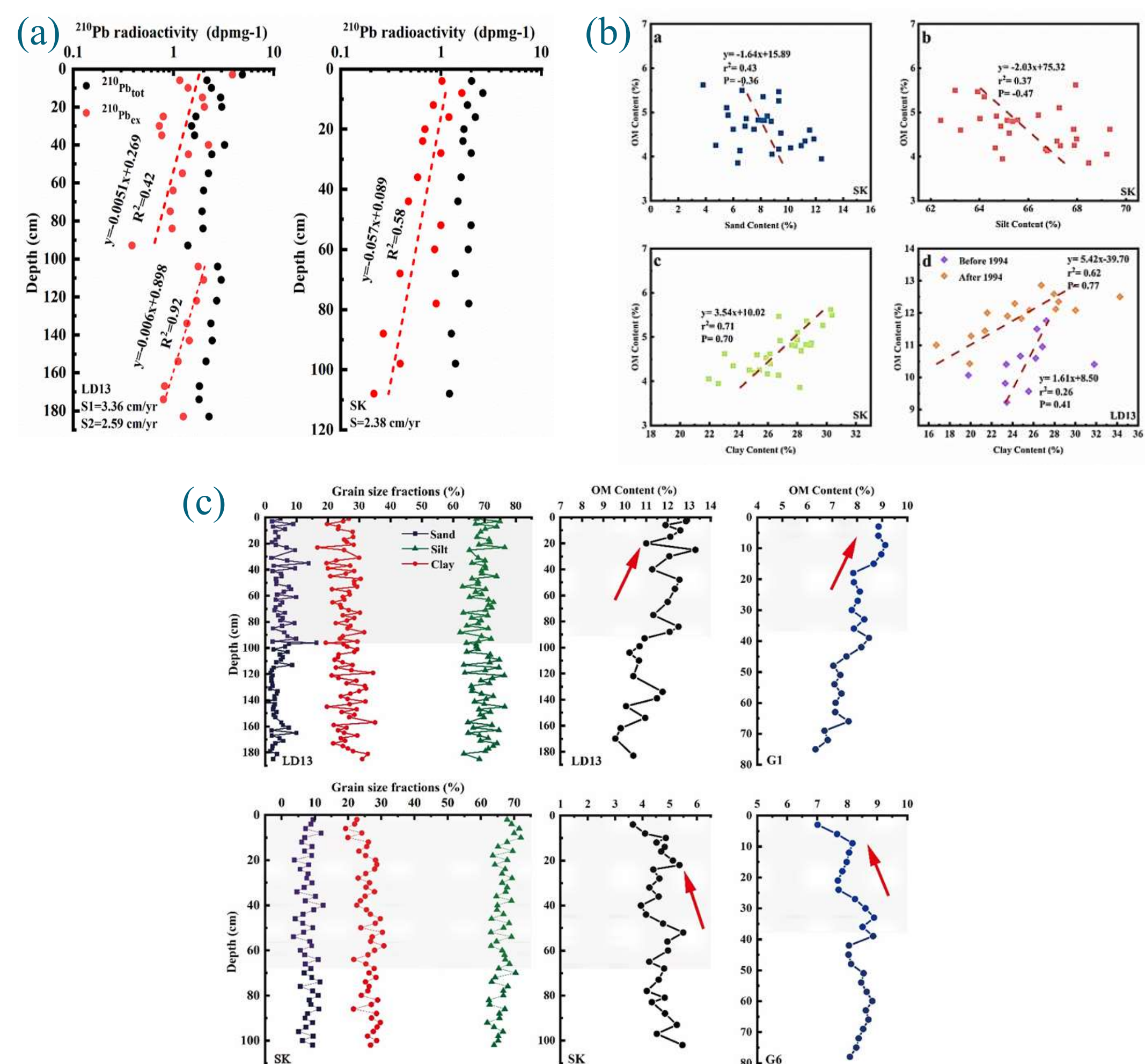


Fig. 6. Differential characteristics of multiple sedimentary record proxies (radiometric dating (a), correlation (b) and distribution (c) of OM and gran sizes) pre- and post-sedimentary dynamics changes

CONCLUSION

- Anthropogenically Induced Hydrodynamic Tipping Point: Since 1994, human activities (combined effect of upstream and local factors) has drastically amplified tidal energy.
- West (fine-grain, lower OM) VS. East (coarse-grain, higher OM)