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Evolution of coastal depositional systems in response to rapid and slow sea-level rises during the last deglaciation: examples from Asian rivers

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Sea-level changes control the accommodation space in coastal depositional systems and affect their stacking. In an estuary system, the depositional system migrates landward because the accommodation space created by the sea-level rise is not filled completely by sediments supplied by the river. Sea-level rise induces river channel instability and flooding, resulting in thick sediment accumulation in fluvial and coastal plains. On the other hand, in regressive systems under falling or stable sea levels, sediments supplied by rivers are transported to the sea, bypassing fluvial and coastal plains because of their limited accommodation space, resulting in the lateral accretion of deltaic systems (progradation). The main difference between estuarine and deltaic systems is depocenter location; in an estuary system, the depocenter is on the fluvial to coastal plains, including the intertidal zone, whereas in a delta system, it is in coastal to offshore areas. Once delta initiation has occurred, sediments accumulate widely in subaerial to subaqueous areas, resulting in both aggradation and progradation as the sea level rises. The Ganges-Brahmaputra and Mahakam (Borneo Is) deltas are examples of broad deltas of this type.

Sea-level rise after the Last Glacial Maximum is characterized by a series of rapid rises in response to meltwater pulses followed by a slow rise. These millennial-scale sea-level changes have affected coastal depositional systems and are recorded in the sediment facies and stacking. The transgressive succession in incised valleys in Asian large rivers consists of a series of backstepping aggradational estuarine deposits. The rapid retreat (backstepping) is correlated with a rapid sea-level rise: e.g., incised valley fills of the Changjiang (Yangtze), Huanghe (Yellow River), Red River (Song Hong), and Mekong River. Three backsteppings recognized in these incised-valley fills might be correlated with MWP-1a, 1b and 8-9 ka event. The delta initiation of these rivers occurred just after the last event, followed by aggradational delta development during the last phase of sea-level rise.

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Ages of the upstream Paraná River Quaternary deposits in Brazil

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La Plata river hydrographic basin is the second biggest one of the planet and is formed by three most important rivers: Paraná, Paraguay and Uruguay. The upstream Paraná river in Brazil represents the second major drainage system in South America. Sedimentary deposits correlatable in time with phases of Quaternary geological evolution, which marked conspicuously the present landscape in the area, were studied aiming the decipheration of the upstream Paraná river geological history. These deposits are of alluvial and colluvial origins, and are superimposed on sedimentary and igneous (basalts) Mesozoic rocks. Thermoluminescence (TL) and Optically Stimulated Luminescence (OSL) datings indicated their Pleistocene ages. As the colluvial deposits exhibit increasing ages with depths, they certainly represent vertical accretionary deposits. Therefore, these ages were grouped as an attempt to recognize the different colluviation phases related to most important colluvial generations. It was also shown that these deposits are scattered in different geomorphological compartments of this hydrographic basin. The late Mesozoic sedimentation was followed by a long depositional hiatus (nondepositional phase), and these colluvial deposits represent one of the most impressive weathering event of the Late Quaternary in Brazil. The data obtained from the upstream Paraná river deposits show that this hydrographic basin began its activities at least about 1 My ago, and the associated landscape was continuously fashioned throughout successive constructive (fluvial terraces) and destructive (erosional surfaces) phases. This Quaternary deposition was possibly propitiated by paleoclimatic and/or neotectonic events, which changed the drainage baselevels with consequent relief transformations. Possibly the most important colluviations were related to drastic global palaeoclimatic changes during the Pleistocene, when occurred glacial and interglacial episodes of the northern hemisphere. The obtained data must improve the upstream Paraná river evolutionay history, still only a few known in terms of Quaternary geology viewpoint, as well supply data to fight against the problems of accelerated erosional susceptibility.

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Soil and geomorphic evidence for a complex origin of the Nahanni karst landscape, Northwest Territories, Canada

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The subarctic Nahanni karst region of the southern Mackenzie Mountains (Northwest Territories, Canada) contains an assemblage of landforms that is globally unique at latitude 61-62ºN. New soil and geomorphic evidence indicates that this landscape reflects a complex interplay of Quaternary glacial, karst, and aeolian processes. Of particular interest is a 15 km long × 1-3 km wide belt containing a labyrinth of vertical-walled canyons, limestone towers, poljes, and numerous dolines, occupying a saddle between the Nahanni and Ram Plateaus that separates the South Nahanni watershed from the Sundog Basin to the north. On level to gently sloping bedrock-controlled surfaces at 800–900 m elevation within this belt, soils have formed on a discontinuous (< 50 cm thick) veneer of silty sediments overlying limestone and isolated remnants of shale. These weakly-developed soils often consist only of humus-rich A horizons resting directly on bedrock. At similar elevations on the northwestern edge of this belt, and on prominent terraces to the north on the flank of the Ram Plateau, soils have formed on non- or weakly calcareous glaciofluvial deposits containing a high proportion of locally-derived shale clasts. These materials are overlain by a veneer (15–35 cm thick) of stone-free silty sediments containing the most strongly-expressed portions of the yellowish brown B horizons. Similar silty materials occur in higher elevation (> 1100 m) lithic alpine soils on the eastern Nahanni Plateau, and this ubiquitous distribution suggests an aeolian origin. Except where permafrost is present in sheltered depressions or on north aspects, all soils examined in the Nahanni karst region would be classified as Brunisolic in the Canadian classification system (Inceptisols in Soil Taxonomy). This limited degree of pedogenic development is comparable to that of soils formed on Late Quaternary glacial deposits in the southern and central portions of the adjacent Yukon Territory. Extensive glaciolacustrine deposits in the South Nahanni River valley and