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147th Estuaries Open Seminar (Coastal Sedimentology)

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場所：エスチュアリー研究センター 2階セミナー室, Seminar Room 2F, EsReC

Sedimentology of the fluvial to marine transition zone in Asian river deltas

Dr. Marcello Gugliotta Estuary Research Center

The fluvial to marine transition zones (FMTZs) of the Mekong, Ganges-Brahmaputra, Fly, Irrawaddy, Yangtze, and Dong Nai river deltas in Asia extend for several hundred kilometers from their river mouths. Here, the interaction of riverine and tidal processes control channel morphology, sedimentation, and multiple other geological and non-geological aspects. All these systems show matching trends in channel width, sinuosity, and bed elevation, which are locally complicated by valley confinements, bifurcations, and confluences. Channel bed sediment samples are available from the Mekong and Dong Nai and highlight a link between channel morphology and sediment distribution. The downstream tracts of the channels are largely controlled by the tidal dynamics and are thus characterized by seaward-widening, straightening, and shallowing channels and by rhythmic or cyclic alternations of sand and mud. The upstream tracts are instead entirely controlled by the river dynamics and show a more simple channel morphology and sand sediment.

Process response to marine transgression recorded by the submerged landscapes of the North Sea

Prof. David Hodgson University of Leeds, UK
& Natasha Barlow, Andrew Emery, Stephen Eaton, Claire Mellett

Sea-level rise is one of the greatest threats to the global community, but constraining large-scale landscape response to marine inundation is restricted to short-duration observational data. By comparison, the palaeo record provides the opportunity to understand long-term responses of terrestrial and coastal areas to periods of past sea-level rise. During the last ice age, the southern North Sea comprised a terrestrial environment beyond the limit of the ice sheets, which extended across much of Europe. As the ice sheets melted, sea level rose, submerging this palaeolandscape to become the modern North Sea. Therefore, beneath the modern seabed of the southern North Sea is a terrestrial archive containing a wealth of information about environmental responses to changing climate and rising sea level. This archive is now more accessible since site investigations for new windfarms in the southern North Sea have provided a wealth of seismic reflection and borehole data. Integration of these data are being used to better understand process responses to marine transgression in order to improve forecasts of future coastline response to changing sea level.

The landform assemblage preserved in the North Sea since the Last Glacial Maximum (~27ka) is highly variable, which is related to the local sediment supply and rates of relative sea-level change. In the English Channel, there is a highly incisional unfilled fluvial landscape, with sedimentation concentrated in well-preservation gravel beach barrier systems that indicate rapid relative sea-level rise. In the southern North Sea, there are extensive peat horizons that form a tributive fluvial network. The buried peats can be used to show there was widespread erosion and redistribution of sediment during Holocene transgression. Farther North, the Dogger Bank area originally formed form moraines close to the site of maximum ice advance of the British and Fennoscandian Ice Sheets. Here, a rich assemblage of subglacial landforms, proglacial lake-fills with outwash fans, fluvial networks, and sandy barriers and lagoon-fills have been preserved, marking the evolution from ice marginal through coastal plain to fully marine conditions.

It is striking that the coastline during most of the transgression was E-W, whereas the present-day coastline is N-S. This realignment shows how dynamic the position of the coastline is during marine transgression, and the problems involved in accurately forecasting changes during accelerated sea level rise that are needed to inform policies.

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