(SS04) Tropical coastal environments: Drivers and consequences of ecological change in the late Quaternary

Date: August 24
Place: Room 5335 (oral)
Organizers: Ulrike Proske & Hermann Behling
Contact email address: ulrike.proske@anu.edu.au
Purpose: Coastal ecosystems, such as peat forests, mangroves and salt marshes, play a key role along tropical shorelines. Due to their position as link between the terrestrial and the marine system, these ecosystems are known to prevent the erosion of sediments and thus stabilise coastlines, dampen the impact of storm surges, cycle nutrients, store carbon and provide a unique habitat for numerous marine and terrestrial organisms. Throughout the late Quaternary changes in a variety of local, regional and global parameters as well as human impact forced these ecosystems to adapt constantly to new environmental conditions. The continuous reconfiguration of these ecosystems is reflected in their biodiversity pattern and the variance of their spatial extent, which in turn had consequences for the coastal system as a whole.
This session welcomes contributions from scientists researching the palaeoecology and palaeoenvironment as well as drivers and consequences of ecological change in pan-tropical coastal ecosystems.

Oral Presentation

Aug. 24 [PM2] Room: 5335

Chair: Ulrike Proske

14:30-14:50 **Holocene coastal ecosystem dynamics and sea-level changes in northern Brazil** SS04-O01 (23)

Hermann Behling

14:50-15:10 **Plant and animal remains analysis of mangrove sediments in identifying the change of environment during holocene in Sundarbans, South Bengal Basin, India** SS04-O02 (459)

Prasanta Kumar Sen, Argha Sarkar, Manju Banerjee

15:10-15:30 **Environmental impacts of mid-20th Century human depopulation of island landscapes: A case study from the Gulf of Carpentaria, northern Australia** SS04-O03 (353)

Patrick Moss, Sean Ulm, Craig Sloss, Lynley Wallis, Lydia Mackenzie, Lynda Petherick, Lincoln Steinberger

Chair: Hermann Behling

15:30-15:50 **Holocene mangrove history reflecting coastal evolution in Northern Australia** SS04-O04 (416)

Ulrike Proske, Simon G. Haberle

SS04-O01 (23)
Holocene coastal ecosystem dynamics and sea-level changes in northern Brazil

Hermann Behling

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More then 10 radiocarbon dated sediment cores, studied by pollen, spore and sediment analysis, provide a detailed insight on past environmental changes and give an outline of sea-level changes and human impact in northern Brazil. The records document its influence on coastal ecosystems including mangrove development and dynamics during the Holocene. An overview of palaeoecological data from the coastal region in the Amazon mouth region will be given. The results indicate that the hydrology of the coastal Amazonian wetlands is strongly influenced by the Atlantic sea-level. Rapid sea-level rise during the early Holocene stabilized near modern levels at ca. 8400 cal yr BP and mangroves start to develop at the modern coastal area. The retreat of mangroves after about 7500 cal yr BP reflects a lower relative sea-level. The modern mangroves developed mostly between 4000 and 3500 cal yr BP or somewhat later at the present-day coastline.

Keywords: Holocene, coastal ecosystem dynamics, mangrove, sea-level, human impact.

SS04-O02 (459)

Plant and animal remains analysis of mangrove sediments in identifying the change of environment during holocene in Sundarbans, South Bengal Basin, India

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Palynological, megaplant, animal remains analyses of mangrove sediments exposed in two sections of southern part of Bengal Basin, India have gained information about the history of vegetation and environment of deposition during Holocene. The study area lies between 50-60 km inland from the present coastline. Critical eco-climate analysis of multi proxy data of biological remains of specific environment recovered from the sediments has revealed the stages of change of environment of the lower Bengal delta, India during last 5000 yrs. Correlation of the biozones identified in two sections at Dakshin Harishpore, Kachukhali near Gosaba, 22º12' N 88º55' E and Kumirmari near Bagna forest, 22º19' N 88º51' E of Sundarbans, South Bengal, India has established four Biostratigraphic zones viz. SBH.BZ. I to IV (Sundarbans Holocene Biostratigraphic Zone). These zones are - (I) *Avicennia - Sonneratia* - Rhizophoraceae - *Palaeocirrenalia - Ammonia -Bubalus bubalis - Rucervus duvancelii* Assemblage Zone; (II) *Avicennia - Sonneratia* - Rhizophoraceae - *Callimothallus - Meliola - Telescopium telescopium- Bankia* Assemblage Zone; (III) *Heritiera - Pandanus - Chenopodium - Amaranthus* - Poaceae – *Typha - Acrostichum aureum* - Fern - Assemblage Zone and (IV) *Heritiera - Potamogeton - Typha* - Fern - *Bellamya bengalensis - Pila globosa - Thiara tuberculata -Lymnaea acuminata* Assemblage Zone. The study reveals four phases of environment of deposition since 5000 yrs.B.P. namely (1) Swampy mangrove vegetation and near shore environment with regular inundation; (2) Tidal mangrove vegetation with high precipitation; (3) Brackish water-mixed-freshwater vegetation and colonization of non littoral species condition and (4) Supra-tidal freshwater vegetation. Seaward migration of the coastline due to regression of the sea caused progradation of the delta; the area transformed to delta top fresh water condition by ca 3000 yrs. B.P. The coastline migrated 50 to 60 km south by ca 2000 yrs. B.P.

Keywords: mangrove sediments, biological remains, Holocene, biostratigraphic zones, Indian Sundarbans.

SS04-O03 (353)

Environmental impacts of mid-20th Century human depopulation of island landscapes: A case study from the Gulf of Carpentaria, northern Australia

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The South Wellesley Archipelago in the Gulf of Carpentaria, northern Australia, contains a wealth of palaeoecological and archaeological information from the Holocene period. The ten islands of the archipelago, dominated by Bentinck Island (150 km^2), formed between 8,000 and 6,500 years ago, as rising sea-levels isolated them from mainland Australia. The local climate of the islands is strongly influenced by the summer monsoon, with more than 98% of the precipitation occurring between November to April and in turn being strongly impacted by the El Niño/Southern Oscillation phenomenon, which enhances climatic variability (i.e. droughts and floods) for the archipelago. Linguistic and archaeological research demonstrated that Aboriginal occupation of the islands occurred within the last 2,000 years and prior to this time period the archipelago was devoid of a human presence. Furthermore, depopulation of the islands occurred in 1947-48, when the traditional owners, the Kaiadilt people, were forcibly removed from the islands and they did not return (on a semi-annual basis) until 1984. This 35 year absence of people provides a unique opportunity to examine the environmental impacts of abandonment on a tropical island landscape. In particular, high-resolution pollen and charcoal analysis of several 100 to 200 year old sediment cores offers insight into the potential alterations in vegetation and fire regimes associated with clear periods of human occupation and abandonment, which may have important implications for understanding prehistoric alterations in human occupation for the Dry Tropics of northern Australia.

Keywords: palynology, fire regimes, abandonment, environmental impacts, Holocene.

SS04-O04 (416)

Holocene mangrove history reflecting coastal evolution in Northern Australia

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Palaeoecological records from mangrove deposits have previously been used to reconstruct Holocene sea-level fluctuations and the local geomorphological development of the coast. By

studying the evolution of mangrove forest species diversity, more detailed information concerning the impact of cyclones and/or tsunamis and alterations in the freshwater input into the coastal region can be gathered. We present two records from northern Australia with the first one documenting 8000 years of mangrove development in the highly biodiverse region of northern Queensland and the second one covering the Holocene history of the spatially more restricted and species poorer forests of the north-eastern Kimberley. The early Holocene mangrove development on northern Queensland's Lizard Island is driven by the postglacial rise in sea-level which led to the landward migration of mangroves. In the mid-Holocene mangroves reach their maximum Holocene spatial extent, a phenomenon that has been recognised throughout Australia and beyond and has been coined the 'big swamp'-phase. At the end of this phase, however, a profound disturbance of the forest is documented and we argue that this signal originates from a catastrophic flooding event that followed the landfall of a cyclone/storm. After the event the mangrove species dominance changed with Sonneratia and Bruguiera being more abundant indicating enhanced estuarine conditions in the altered environment. The late Holocene sea-level fall and stabilisation induced mangrove forest progradation and contraction, however, general environmental instability led to the extinction of the previously dominant Sonneratia on the island. This study shows that especially in spatially restricted settings mangrove forests are very sensitive to environmental changes implying that records from these ecosystems can be used to unravel catastrophic and gradual landscape alterations. In the region of Wyndham, north-eastern Kimberley, mangroves are restricted to a narrow fringe along the major rivers reflecting the reduced and highly seasonal freshwater input in the area. We hypothesize that during the mid-Holocene sea-level highstand coastal mangroves extended much further inland inhabiting areas currently covered by barren salt flats and freshwater wetlands. We further test whether enhanced freshwater input during the Holocene climatic optimum is reflected in a greater species diversity in these forests.