

**0100****The glacio-eustatic contribution to sea-level rise in the mid to late Holocene constrained by relative sea-level data from western Denmark**Katie Szkornik<sup>1</sup>, Roland Gehrels<sup>1</sup>, Sarah L Bradley<sup>2</sup>, Glen A Milne<sup>2</sup><sup>1</sup>*School of Geography, University of Plymouth, UK, United Kingdom*<sup>2</sup>*Department of Earth Sciences, University of Durham, UK, United Kingdom*

The eustatic contribution to global sea-level change during the mid to late Holocene (post 7000 yrs) has been the subject of great debate within the scientific community. Modelers of the glacio-isostatic adjustment process (e.g., Lambeck, Peltier and others) in particular, are in disagreement about estimates of late Holocene ice melt. This study aims to provide further constraints on this process by use of relative sea-level data from the Ho Bugt embayment in western Denmark. The area is of interest because certain areas of Denmark lie close to the hinge line between the uplifting and subsiding coastlines. This means that, potentially, very little land movement has occurred in these areas in the past millennia. A sea-level history from this region is therefore relevant for testing geophysical and empirical models of glacio-eustatic sea-level change in the late Holocene. The evolution of the salt marshes around the Ho Bugt embayment was investigated using litho- and biostratigraphical (diatoms) analyses and AMS <sup>14</sup>C and optically stimulated luminescence (OSL) dating. In addition, diatoms were sampled from the modern salt-marsh environment to establish their relationship to contemporary water levels. From 39 calibrated AMS <sup>14</sup>C ages and 3 OSL ages, a mid to late Holocene relative sea-level history for the embayment was reconstructed using two methods: (1) a qualitative, lithology-based approach and (2) a quantitative, transfer function approach. Both methods document around 7 m of sea-level rise in the last 7000 yrs however, the transfer function approach was found to over-estimate relative sea level prior to 2000 cal. yr BP. Relative sea-level data produced by both methods are compared with a series of relative sea-level curves, predicted by models which stimulate the glacial isostatic adjustment of the Ho Bugt embayment. Results show that the Ho Bugt relative sea-level data are best matched by a glacial isostatic adjustment model that includes a zero eustatic function for the last 5000 cal. yr BP. The dominant process controlling relative sea-level change in the Ho Bugt embayment during the mid to late Holocene appears to be glacio-isostatic rebound, following decay of the Fennoscandian Ice Sheet.

**0284****Differentiating records of recent climate change from anthropogenic impact in the coastal margin: an example from eastern Australia**

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Coastal lakes are under increasing pressure from a rising global human population living in the coastal zone. Management of these areas is often a focus as their ecological values are recognised despite often being degraded from a multitude of anthropogenic activities. Coastal lakes contain important records of recent climate change and anthropogenic impact that can assist future management of coastal resources. In Australia, the eastern coastal margin contains many coastal lakes that retain important records of both recent climate change and anthropogenic activities, which is of significant benefit in a country where historical documentation is sparse and short term. The role of palaeolimnology to provide baseline data to interpret such records is thus

essential yet rarely utilised. This study investigated the paleolimnology of three coastal lakes in eastern Australia. The three lakes were in similar geomorphological locations but had very different anthropogenic influences. The first, Lake Arragan, is located within a national park and remains pristine; the second, Hearn's Lake, is located on the outskirts of a town and in the past received treated effluent which was diverted 6 years ago; the third, Salty Lagoon, is adjacent to a very popular coastal village with a large tourism industry. Sediment cores were extracted from each lake basin from the central, deepest section of the lake using a mini Glew gravity corer. Sub-samples were extracted using the core extruder at 0.25 cm intervals. Sub-samples were processed using the method of Parr et al. (2002) for diatom extraction. Chronology of the samples was obtained using Pb210 dating techniques. The selection of these lakes allowed the recent climate change signal to be differentiated from anthropogenic impacts. Lake Arragan, contained a record of climate change over the past 80 years reflecting changes in precipitation and ocean influence. Hearn's Lake showed signs of both climate and anthropogenic impact, with a marked change in diatom assemblage in the past 10 years, relating to its recovery from eutrophic conditions. Finally Salty Lagoon showed signs of increasing eutrophication over time. This study has enabled the recent climate signal for this area of eastern Australia to be differentiated from anthropogenic impacts and also determine remediation targets for coastal lakes affected by human activities. Therefore this study is a useful example of how palaeolimnology can aid management of coastal resources, particularly where recent and long term environmental records are not available.

**1204****Pollen record over the last 450,000 years dated by widespread tephra layers from Kamiyoshi Bashin, Kyoto, western Japan**Hikaru Takahara<sup>1</sup>, Ryoma Hayashi<sup>1</sup>, Kyoko Tanida<sup>1</sup>, Toru Danhara<sup>2</sup>, Hideo Sakai<sup>3</sup><sup>1</sup>*Graduate school of Agriculture, Kyoto Prefectural University, Japan*<sup>2</sup>*Kyoto Fission Track Co., Ltd., Japan*<sup>3</sup>*Faculty of Science, Tayama University, Japan*

We have taken a long core over the last 450,000 years from Kamiyoshi Basin, about 20 km northwest of Kyoto City in western Japan (altitude 335 m, 35°06'08"N, 135°35'10"E, the diameter of the basin is 0.5–0.8 km). This core will provide a continuous vegetation history of the glacial-interglacial cycles from the Marine Isotope Stage (MIS) 2 to MIS 12. The chronology was based on widespread tephra (AT: 29 ka, Aso4: 87 ka, K-Tz: 91 ka, Aso-1: 24.9 ka, Ng-1 29.4 ka, Kkt 33.4 ka, BT72, 34.9 ka and B271 and B277-2, the age of tephra after Nagahashi et al., (2004)) and several AMS <sup>14</sup>C dates. Detailed pollen analysis of this core has been conducted. In this paper, we present the pollen data since MIS12. Also, detailed pollen data since MIS5 will be presented in Hayashi et al. (this congress). During the glacial/interglacial cycle, characteristic taxa in the cycle are as follows. Quercus subgenus Cyclobalanopsis (evergreen oaks) in the maximum of the interglacial (warm and wet condition), temperate conifers such as Cryptomeria japonica, Sciadopitys verticillata in the next stage (cool/wet), pineaceous conifers such as Picea, Tsuga, Abies and Pinus (cold/dry), and then Fagus (cold/wet) occurred in this order. In the late-glacial (MIS2), pineaceous conifers were replaced by beech (Fagus) and deciduous oak, then in the early Holocene (around 8 ka), Celtis/Aphananthe increased in western Japan. After the mid-Holocene, without the stage of strong human disturbance (almost after 2000–1000BP), evergreen broad-leaved trees such as Cyclobalanopsis became dominant with Cryptomeria japonica. Prominent increase of Cyclobalanopsis pollen were

recognized in MIS5.5(5e) and MIS11. For other interglacial periods, in MIS7, *Cryptomeria japonica* and *Fagus* are dominant pollen taxa with very low percentages of *Cyclobalanopsis*. For MIS9.3, *Fagus* pollen was dominant with several percentages of *Cyclobalanopsis*. After the dominance of pinaceous conifers in MIS12, *Cyclobalanopsis* increased in MIS11.3. *Cryptomeria japonica* became dominant with *Sciadopitys verticillata* and *Fagus* quickly after MIS11.3. The period of the dominance of *Cyclobalanopsis* was relatively short. This pollen data can be compared with the data from Lake Biwa (BIW 95–4, Miyoshi et al. 1999) using tephra layers. (References : Hayahi et al. (this congress) Vegetation response to past climate changes since the last interglacial based on long pollen records from the Kamiyoshi Basin and Lake Biwa, western Japan. Miyoshi et al., (1999) Rev. Palaeobot. Palynology 104, 267–283. Nagahashi et al. (2004) The Quaternary Research (Daiyonki-Kenkyu) 43, 15–35)

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### Effects of Radiation and Convection on the Near-Surface Air Temperature

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Simulations of the near-surface air temperature for the present climate performed with one-dimensional (in the vertical) non-convective and radiative-convective coupled models. The three types of convection models employed were the dry convection, the 5K/km adjustment, and the 6.5K/km adjustment models. The necessary parameters used in the numerical experiments were provided by the conditions based on January standard atmospheres at 30N and 60N, and those of July, at 30N and 60N. The results demonstrated that the simulated near-surface air temperatures are higher and the tropopause heights lower in order of the model results of the 5K/km adjustment, the 6.5K/km adjustment, the dry convective, and the non-convective models. This was due to the upward transport of convective heat being less active in the same order of the model results. The differences in the near-surface air temperatures among the models under January conditions were much larger than those in July. This resulted because under January conditions, the downward longwave radiation emitted by the atmosphere was greater than the downward shortwave radiation at the surface. In addition, the downward longwave radiation at surface varied due to the differences in simulated temperatures which were strongly affected by the convective activity associated with water vapor evaporation at the vicinity of surface. These results suggest that the modeling of radiation and convection are crucially important when simulating the near-surface air temperature, especially for numerical experiments of the past climate using a simple heat budget model.

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### Late Holocene climate changes recorded in composition of benthic microfossils from the Laptev and Kara seas

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In order to understand the natural instability and development of the Arctic climate system which is not assessable by the short-term

observational data solely, it is necessary to study long-term geological records with millennial to centennial resolution. In the marginal Laptev and Kara seas the primary concern is the high-resolution investigation of sediments accumulated after the sea-level stabilization at 5–6 cal.ka. The postglacial and early Holocene sediment sequences accumulated on the continental margin under rapid sea-level rise and high sedimentation rates document past environments, which were non-analogue to the present ones due to the absence of shelf water masses, stronger inflows of Atlantic derived waters, and direct shelf-to-coast coupling. Although accumulated under lower sedimentation rates, sediment sequences which correspond to the last 5–6 cal.ka possess evidence of climate induced changes, i.e. variations in atmospheric and water circulation patterns, sea-ice extent, freshwater runoff. High-resolution paleontological investigations (foraminifers, ostracods) of several AMS14C-dated sediment cores from both seas revealed well-pronounced changes in the composition of benthic microfossil assemblages after 3.5–3 cal.ka, which indicate climate cooling and intensification of water mass circulation. On the middle and outer shelf this is manifested by abundant river-proximal ostracods and foraminifers ice-rafted from the inner-shelf regions, and re-introduction (for the first time after the early Holocene) of deep-water species due to the advection of offshore and possibly Atlantic-derived water with wind-induced reversed bottom currents. Enhanced advection of these saline bottom waters was recorded between 3 and 1.5 cal.ka even in the river-affected inner-shelf region as shown by the occurrence of rare planktic foraminifers and deep-water species. On the upper slope, enhanced abundances of planktic foraminifers, benthic foraminifer *Cassidulina neoteretis*, ice-rafted river-proximal species, and iceberg-rafted rock fragments, all point to an increase in Atlantic-derived water inflow in association with climate cooling, probably as a consequence of a major change in the general pattern of the atmosphere-ocean circulation regime after approximately 3.5–3 cal.ka.

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### Late Holocene shoreface erosion in response to rapid sea-level fall along a tectonically-uplifted strand plain, Pacific coast of Japan

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A relative sea-level fall in response to either uplift or a eustatic sea-level fall has an important impact on coastal deposition. This study documents two rapid relative sea-level falls along a tectonically-uplifted coast during the late Holocene that caused lowering of the surf zone (i.e., the upper shoreface) leading to intra-shoreface erosion, and the characteristics of the resultant prograding shoreface deposits. These findings are based on high-resolution analysis and radiocarbon dating of three new drill cores obtained from the Kujukuri strand plain, Pacific coast of eastern Japan, combined with a previously published borehole data and information on modern shoreline profile adjustments. A shallowing-upward sandy succession composed of lower and upper shoreface facies, foreshore and backshore facies was recognized in the drill cores. Two rapid falls in relative sea level at 2.3–2.6 ka and 1.8–2.0 ka are recorded by downstepping of the base of the foreshore facies, and farther seawards by the lowering of an erosional boundary between the upper and lower shoreface facies. Superimposed bed profiles of an adjacent modern beach define an envelope, the base of which reflects shore-normal migration of longshore bars and troughs. The base of the envelope represents a composite erosional surface that separates the mobile bar sediments above from preserved deposits beneath. The surface is concave upwards and steeper than the mean beach profile, and exhibits a flat platform approximately at the lower limit of