HOLOCENE SEA-LEVEL RESEARCH AND IGCP – THE LAST 40 YEARS

David Hopley[1] and Roland Gehrels[2]

1. School of Earth and Environmental Sciences, James Cook University, Townsville, Queensland 4811, Australia
2. School of Geography, University of Plymouth, Plymouth PL4 8AA

In 2007 the annual meeting of IGCP Project 495 (*Quaternary Land-Ocean Interactions: Driving Mechanisms and Coastal Responses*) was held during the XVII INQUA Congress in Cairns, Australia. In an evening slide presentation on the accompanying fieldtrip, David Hopley reminded all delegates of the strong historic connection between INQUA and the IGCP sea-level projects by showing a selection of slides which he had taken during a fieldtrip at the VIII INQUA Congress in Paris, held in 1969. At this meeting, IGCP Project 61 was born, the first sea-level project in a line that can be traced all the way to the present IGCP sea-level project 495 (Table 1).

The 1969 INQUA Congress in Paris was a major turning point in Holocene sea-level research. It included a classic conference session with 37 papers that were published in a special volume of Quaternaria (vol 14, 284 pp). Many of these papers discussed sea-level changes over the last 10,000 years at specific locations with wide differences between them. It was at this conference that it was first recognised that a global eustatic sea-level curve did not exist and that there were very good reasons for geographical variations. Edmund Gill (Australia) introduced the Quaternaria volume, noting the need to recognise differences and, rather than agreeing on the reliability of a single site, having a more sophisticated approach which recognises the reasons for differences.

Gill listed 4 hypotheses which were circulated in the pre-sessional circular for the Paris INQUA session. Significantly, these included effects of salinity and local glacial loading but, most importantly, the ideas of continental shelf flexure which subsequently led to hydroisostatic hypotheses. These are now so central to our understanding of recent sea-level change.

Many of the participants in the sea level session also took part in a 12 day field excursion led by Mireille Ters and Jean-Pierre Pinot to the French coast from Calais, along the Channel coast and around Brittany, to Les Sables-d'Olonne (Photos 1-5). Here a further symposium on Holocene sea levels was held, chaired by Rhodes Fairbridge. As a result of these discussions, the subsequent INQUA Sea-Level Committees were formed and IGCP Projects 61 (*Sea-level movements during the last deglacial hemicycle (about 15,000 years)*, Leader A.L. Bloom), and 200 (*Late Quaternary sea-level changes: measurement, correlation and future applications*. Leader P.A. Pirazzoli) were born leading directly to the present INQUA Commission on Coastal and Marine Processes and IGCP Project 495. Two delegates who were present at the 1969 meeting, Cari Zazo from Spain and Nils-Axel Mörner from Sweden, also attended the sessions of IGCP Project 495 in Cairns 38 years later.

Published results of the early IGCP sea-level projects included a number of atlases of sea-level curves and an important publication edited by Orson van de Plassche in 1986 (*Sea*

Level Research: a Manual for the Collection and Evaluation of Data}. In his introduction to this volume van de Plassche recognised the importance of the Paris INQUA Congress in reconciling the ideas of sea-level workers from around the world. Thus, in a matter of a few years, the sea-level community went from intense argument about the global validity of individual, local or regional sea-level curves to the recognition that differences could occur over short distances (e.g. across the 100 km shelf of the Great Barrier Reef) and that differences could tell us much about upper earth rheology and other complex geophysical factors.

The location of the 2007 IGCP Project 495 fieldtrip, along the Great Barrier Reef Coast, was of equal historical significance. It was here that, through debates on the validity of the mid Holocene sea-level highstand, the importance of hydro-isostatic processes in producing sea-level variations was recognised in the 1970s. John Chappell, the 2007 INQUA Congress President, was instrumental in this work, which has since led to the development of highly sophisticated geodynamical models. In subsequent decades these models (e.g. those by Kurt Lambeck, Dick Peltier, Jerry Mitrovica and Glenn Milne) have been responsible for a step change in the understanding of global sea- and land-level changes.

For more information on IGCP Project 495 visit the web site:
http://www.geography.dur.ac.uk/projects/igcp495

Table 1. IGCP sea-level projects

years	IGCP Project No.	Title	Leader(s)
1974-1982	61	*Sea-level movements during the last deglacial hemicycle (about 15,000 years)*	Arthur Bloom (USA)
1983-1987	200	*Late Quaternary sea level changes: measurement, correlation and future applications*	Paolo Pirazzoli (France)
1988-1993	274	*Quaternary coastal evolution: case studies, models, and regional patterns*	Orson van de Plassche (Netherlands)
1994-1998	367	*Late Quaternary coastal records of rapid change: application to present and future conditions*	David Scott (Canada)
1999-2003	437	*Coastal environmental change during sea-level highstands: A global synthesis with Implications for management of future coastal changes*	Colin Murray-Wallace (Australia)
2005-2009	495	*Quaternary Land-Ocean Interactions: Driving Mechanisms and Coastal Responses*	Antony Long (UK), Shahid Islam (Bangladesh)

Photo 1. La Pernelle, Cotentin Peninsula, Normandy. Group discussion. In foreground, with back to camera in jacket, Rhodes Fairbridge. To his left Eric Colhoun (Australia). Behind Rhodes' right shoulder is Mireille Ters (France), co-leader of the field trip.

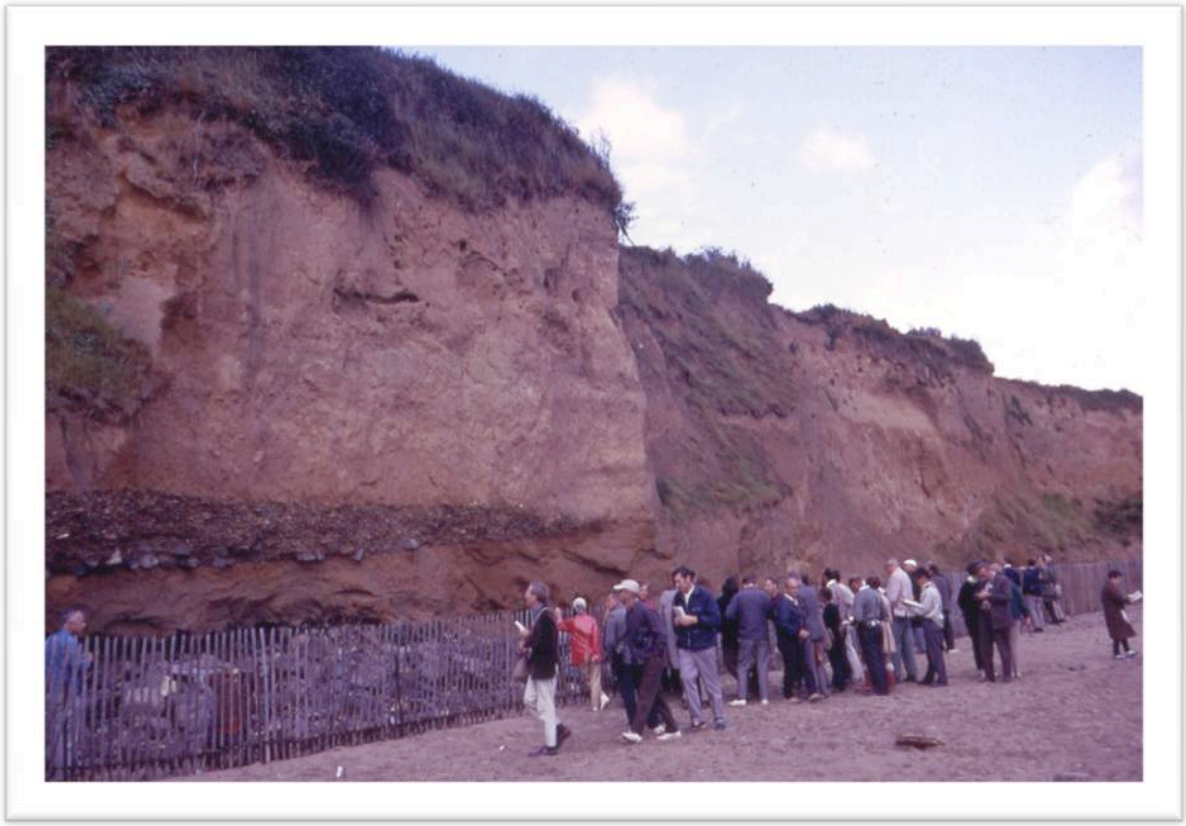

Photo 2. St. Brieuc, Brittany. Last interglacial platform and boulder beach with overlying last glacial loess. Photo of most participants, includes Richard West (UK) and Nils-Axel Mörner (Sweden).

Photo 3. Les Pins. Pleistocene loess and periglacial deposits. Standing at top Art Bloom (USA). Foreground, kneeling with spade, Jean-Pierre Pinot (France), co-leader of field trip.

Photo 4. Near Challans, southern Brittany. Group discussion, listening to Mireille Ters (France) in centre. Next to her with sunglasses on head is Cari Zazo (Spain). At rear is Eric Colhoun (Australia) and face partially covered by person in foreground is Hugues Faure (France), to become President of INQUA in 1982.

Photo 5. Les Pins. Pleistocene aeolian sands. Top left Richard West (UK). Centre with back to camera and with camera strap over shoulder, Art Bloom (USA). Centre, talking to Mireille Ters, is Nils-Axel Mörner.