

June 2008 Australasian-INTIMATE Meeting

Victoria University of Wellington Field Station, Onekaka, South Island, New Zealand.

Thursday 12th to Friday 13th June, 2008.

Report on proceedings, by Marcus Vandergoes and David Barrell.

INTRODUCTION

Following the first phase of the Australasian (AUS)-INTIMATE project that ended in 2007, twenty two geoscientists representing a range of disciplines met at the Victoria University of Wellington field station at Onekaka, South Island, New Zealand, to evaluate the success and outputs of AUS-INTIMATE I and discuss the second phase, AUS-INTIMATE II, scheduled for the inter INQUA congress period 2007-2011.

List of attendees: Peter Almond, David Barrell, Tim Barrows, Helen Bostock, Martin Brook, John Carter, Giuseppe Cortese, Les Cwynar, Sam Dean, David Hood, Travis Horton, Olivia Hyatt, Andrew Lorrey, Andrew Mackintosh, Jeremy Pugh, Rob Rose, Fiona Shanhun, Jamie Shulmeister, Carol Smith, Sam Taylor, Philip Tonkin, Marcus Vandergoes.

The meeting was opened (Almond - convenor) with a brief acknowledgement to the leadership of AUS-INTIMATE I by J. Shulmeister, B. Alloway, R. Newnham and D. Barrell and the success of the outputs to date. These include the compilation of a poster of New Zealand climate event data for the past 30,000 years (Barrell et al. 2005) and derivative papers presenting these data in conjunction with a draft NZ Climate Event Stratigraphy (NZ CES) (Alloway et al. 2007), along with an updated tephrochronology (Lowe et al. 2008) that underpins the climate data chronology.

A review of AUS-INTIMATE I, from the perspective of INQUA and the INQUA Paleoclimate Commission (PALCOMM), was presented by Jamie Shulmeister. AUS-INTIMATE I was identified as being one of the most active, well disseminated and successful projects in the 2004-07 INQUA inter-congress period. This has led to the continuation of support from PALCOMM for the 2008-11 inter-congress period. This support comes in the form of (i) recognition of the AUS-INTIMATE as a key project under PALCOMM and (ii) a small financial contribution to support invited speakers from low GDP countries, meeting attendance for early career scientists and logistics such as venue hire. (Note added: subsequent to the meeting, formal approval of the project was received by P. Almond in a letter from John Lowe (Vice-President of INQUA) and Sandy Harrison (President of PALCOMM). A grant of €3000 was confirmed). PALCOMM has placed strong emphasis on filling the gap between the paleoclimate community and the modelling community and there are strong recommendations for the paleoclimate community to provide output data in a form that can be easily linked with modelling initiatives such as PMIP-II (<http://pmip2.lsce.ipsl.fr/>). AUS-INTIMATE can play a key role in the generation, transfer and incorporation of data into global or nested (Southern Hemisphere) climate models. This and other emphases provided the platform for outlining the direction and objectives of AUS-INTIMATE II.

Jamie pointed out that PALCOMM tends to support projects for only two inter-congress periods (e.g. Northern Hemisphere INTIMATE did not get funded this year). Accordingly, in 18 months AUS-INTIMATE should aim to come up with new ideas and initiatives if we want other PALCOMM-recognised projects to operate in NZ. Future projects need to be short and snappy and cover 1-2 inter-congress periods.

SUMMARY OF PHASE I

A summary of the AUS-INTIMATE I was presented by Peter Almond who outlined the evolution of the project. This review focused on the development of the NZ CES. A similar construction of the Australian (OZ) CES has been more difficult owing to the broad latitudinal and longitudinal variation of climate-change response across the Australian region. The review outlined NZ adoption of a regionally derived, chronology-based CES rather than an ice core-based CES as had been done for the Northern Hemisphere INTIMATE. The intention is to compare the final NZ output with existing Antarctic CES's and the evolving OZ CES. A summary of the records used to define the NZ CES was given and there was agreement that the goals and outputs of the NZ – INTIMATE-1 had been met successfully. The progress of the NZ CES was discussed, along with the slow progress and difficulties with the OZ CES.

AUS-INTIMATE II

Peter Almond gave a brief outline of the AUS-INTIMATE II proposal (submitted to INQUA in February 2008; accepted mid-June 2008). The proposal includes the following objectives and goals:

Main Objectives:

- Update and test our current NZ CES; improve the Antarctic CES (30 – 8 ka).
- Provide a 'composite' CES for Australia which attempts to address recognized environmental and climatic complexities
- Use the degree of correspondence between the NZ CES, Antarctic CES and records from throughout Australasia and other regions of the Southern Hemisphere to develop robust and testable scenarios of climate drivers, with focus on the following events, which have emerged from the NZ CES:
 - Early onset to the LGM (~30 to 28 ka)
 - LGM variability (~28 to 19 ka)
 - Termination 1 (~19 to 16 ka)
 - Late glacial reversal (~13.5 to 11 ka)
 - Holocene thermal optimum (~11 to 8 ka)

Specific Goals

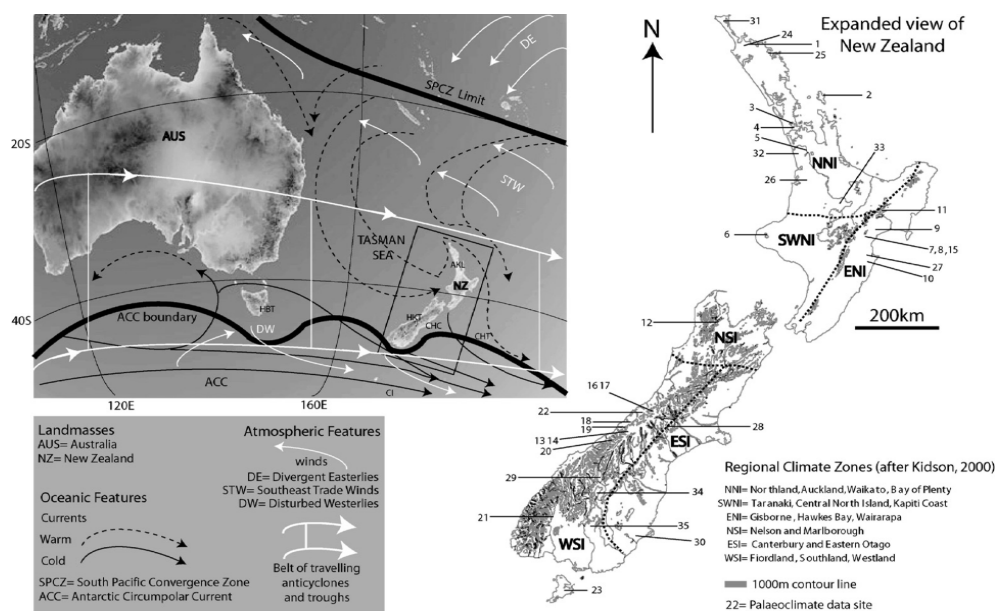
- identify and develop (new) key proxy records that improve the database of regional trends. Test CES against new proxy records.
- extend the Antarctic CES to include new ice-core data (i.e. EPICA Dome Fuji) using segmented linear minimisation codes.
- Provide guidelines for paleo-proxy data handling, chronological control, dating techniques and nomenclature for the delineation of events.
- Setup a working-group of scientists to re-examine available Australian paleo-climate records and provide the optimum process to construct an accepted CES (composite or with respect to region or environment, etc).
- Continue to a) focus and enhance the research activities of the Australasian Quaternary community; b) facilitate a venue for new scientific exchange and education and c) provide an avenue for participation and expression of young career scientists.
- Actively encourage researchers from other Southern Hemisphere countries to engage with AUS-INTIMATE II and to assist them to initiate parallel programs.

PROGRESS FOR THE FUTURE

A discussion was led by David Barrell outlining the development of the NZ CES and ideas for the future.

A first step was the recognition of a need to update the existing key records that contributed to the development of the CES that was presented at INQUA, Cairns, 2007 (Newnham et al. 2007) and to define formally how the climate events were derived. This is to include only those datasets published or in press. The need to include more key marine records to complement and balance the terrestrial records in defining the CES was also identified.

Discussion revolved around how to refine the data presentation to best suit the goals of the AUS-INTIMATE II, in particular, the major objective of developing regional climate scenarios from paleodata in parallel with defining and refining the CES. The proposal of grouping the data by climate regions based on modern terrestrial climate boundary conditions (e.g. Kidson, 2000; Lorrey et al. 2007; 2007 in press, Fig 1) was forwarded. This would allow the development of regionalized paleoclimate database that would help define climate gradients and climate events.



Example of 6 main climate regions defined for New Zealand (from Lorrey et al. 2007)

This proposal was perceived as a positive step for the construction of past NZ climate scenarios and the integration of the paleodata into a form useful for modelling. It was also considered that these climate regions would be broadly applicable to the marine realm and could incorporate the main pattern of ocean circulation around New Zealand. There was concern as to whether the modern or recent Holocene “steady state” synoptic conditions may be appropriate for attempting climate scenario reconstructions for the past (i.e. LGM) when climate boundary conditions are likely to have been different. It was concluded that one of the main controls on NZ regional climate patterns and local oceanography is topography which has been relatively stable for the INTIMATE timeframe with only minor changes relating to LGM sea level lowering and the formation North-South Island land bridge. While this is likely to have caused some disruption in circulation patterns, as long as these assumptions are stated and recognised it would still be a way forward. It was agreed that using the 6-region climate zone model as a template would provide a good start for better definition of NZ climate patterns over time.

The issue of how best to represent these data was raised and the motion was forwarded that a map-based approach to plot the regional climate change through time would be effective. This would convey the regional data and contrasts through time. It could ultimately be developed as a GIS-based system and would then have the capacity to include marine records. There was some discussion as how to plot and represent the paleodata (e.g. variation from present as residuals) but it was agreed that this should involve further discussion from the wider AUS-INTIMATE community.

In conclusion it was agreed in principle that this direction was a useful way forward and achievable. The motion was accepted to a) compile paleoclimate records on a regional basis in a GIS map-based format; b) develop a NZ wide CES in parallel with regional reconstructions to then use the NZ CES to determine regional climate variations through time.

INDIVIDUAL PRESENTATIONS

Talks and posters presented over the two days outlined new and current research being undertaken in the Australasian region and Antarctica that were appropriate to the INTIMATE timeframe. Programme and abstracts are available at <http://www.paleoclimate.org.nz>.

OZ-INTIMATE OVERVIEW

The major output so far from the OZ-INTIMATE initiative has been a collation and assessment of Australia proxy data (Turney et al. 2006). Tim Barrows included an update on the status of the OZ-INTIMATE work in a presentation entitled "How useful will an INTIMATE event stratigraphy be? NZ, Australasia or beyond?" Tim expressed the view that defining an Australian CES is a difficult challenge because of the large land area and widely contrasting climatic zones, complex hydrology and difficulties of dating in organically-poor environments, and progress has stalled since the Turney paper. He also made reference to fatigue and competition amongst the Quaternary community that were putting hurdles in the way of progress. In Tim's opinion, temperature is the climate attribute with the best potential for building a regional climate stratigraphy for Australia, and that marine records from around Australia are more promising as key records than are terrestrial records, because of the better prospects for dating marine cores.

AUS-INTIMATE II WORKSHOP

Discussion was led by Peter Almond outlining the details of the AUS-INTIMATE-II proposal and what events from the NZ CES should be focused on for synoptic climate reconstruction. These included

- Early onset to the LGM (~30 to 28 ka)
- LGM variability (~28 to 19 ka)
- Termination 1 (~19 to 16 ka)
- Late glacial reversal (~13.5 to 11 ka)
- Holocene thermal optimum (~11 to 8 ka)

The discussion and proposal to move the definition of the Holocene thermal optimum age range to include ~11 to 6 ka was agreed on in an effort to fit with global initiatives to model Holocene thermal optimum conditions. There was further discussion about the

inclusion of an Antarctic CES for comparison with the AUS-INTIMATE CES and it was agreed to adopt the recently derived CES from the EPICA EDML as a starting point.

There was brief discussion of the future of the research initiative beyond AUS-INTIMATE II with the possibility to focus on the environmental significance of past climate changes and the impact of climate change on the environment.

Options for future meeting dates and venues were also discussed. The possibility of a meeting aligned with, or as a session of, Geological Society of New Zealand (GSNZ) 2008 meeting was raised. This year's GSNZ meeting is at Te Papa, Wellington, from November 23rd–26th inclusive, and is a joint Annual Conference for the Geological, the Geophysical and the Geochemical and Mineralogical Societies of New Zealand.

Other upcoming meetings that could provide possible opportunities for INTIMATE discussions include:

- the AQUA Biennial Conference 8-12 December 2008 (http://www.aqua.org.au/AQUA/frames_conf.html);
- 9th International Conference on Southern Hemisphere Meteorology and Oceanography (9ICSHMO) 9–13 February 2009, Melbourne, Australia. (<http://www.bom.gov.au/events/9icshmo/>). Abstract submission due 1 August 2008;
- 7th IAG Conference on Geomorphology (ANZIAG) 6-11 July 2009, Melbourne (<http://www.geomorphology2009.com>);
- International Geological Congress, Australia 2012 (<http://www.ga.gov.au/igc2012>)

Marcus Vandergoes outlined a recently-established research programme (NIWA and GNS Science) that will evaluate Marine Oxygen Isotope (MIS) Stage 1 Holocene thermal optimum (and possibly Stage 5) paleodata as a basis for modelling future climate, and highlighted that inclusion of all available data would make for a better result. There was general discussion, with some thoughts that it may be difficult to use an INTIMATE umbrella for the MIS 5 work, because the time frames differed. However, with the re definition of the Holocene thermal optimum age range to include ~11 to 6 (see above) it should facilitate data contributions under the INTIMATE banner for those who are interested in participating. There was also discussion about data ownership, and suggestions were made about the possibilities of licensing use of data for the project. And it was stated that this modelling program was to draw on published data. Nevertheless, the submission of data into international data repositories may be a way forward. Particularly if going to GIS map format, it was agreed as very important to come up with a specification and clarification of which data repositories to use, and that any initiatives should be done in discussion and agreement with Australian colleagues. The conclusion was that if contributions could be made to this programme under a NZ-INTIMATE umbrella it would only enhance the group's profile and applicability of the group's efforts and research to data modelling and public output.

There was discussion of whether or not the INTIMATE time window remained appropriate for future work. It was pointed out that from the onset of the Australasian work, there had been no enthusiasm in the NZ part of the group from limiting the timeframe from 8 ka to 30 ka, as has been the practice in say North Atlantic INTIMATE. The NZ community felt that the present day provides a more sensible upper limit, and makes the INTIMATE work of more general relevance to New Zealand, which differs importantly from Australia, North America and Europe in that human disturbance of

ecosystems did not begin in NZ until about 800 years ago. There was general agreement on retaining the 0 to 30 ka timeframe.

ONEKAKA MEETING OUTCOMES

Peter Almond summarised the conclusions of the meeting, to general agreement of participants:

- There is a need to update the proxy record set with any recent publications of data presented at the December 2006 Kaikoura meeting. Those who presented new data at Kaikoura will be asked to provide published or in press data sets.
- There is a need to document how events are defined, as per the Kaikoura scheme (Peter Almond to co-ordinate and circulate a discussion document).
- Produce an updated poster with new data and CES (David Barrell to coordinate – if possible have it available in time for AQUA meeting in December 2008).
- Produce an article for Quaternary Australasia on the Onekaka meeting (Peter Almond, David Barrell and Marcus Vandergoes to coordinate).
- Produce an article for EOS on the Onekaka meeting (Peter Almond, David Barrell and Marcus Vandergoes to coordinate).
- Paper updating and formalising the NZ CES in the same vein as the Alloway et al 2007 paper. Marcus Vandergoes to coordinate, and confirm a timeframe for production.
- Andrew Mackintosh has opted to stand down from the NZ-INTIMATE co-ordination role (the other two being Peter Almond and Marcus Vandergoes). Andrew (Drew) Lorrey (NIWA) was nominated as a replacement, and elected by acclamation.

PLANS FOR INQUA 2011

- A likely focus will be a synthesis of Holocene climate changes.
- Aim for outputs relating to past synoptic climate condition scenarios for NZ, derived from 6 region climate analysis of paleodata. Time frames suggested to focus on are:
 - 1) 6 ka and 21 ka, being times of international relevance and are associated with projects already underway;
 - 2) the time of Kawakawa Tephra deposition;
 - 3) the late-glacial reversal, with options for looking at time slices during this period.

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