Paleo-denudation rates at the Plio-pleistocene transition from *in situ*-produced cosmogenic ^{10}Be: Method and new results from the Tianshan and the Himalayas

J. CHARREAU[1], N. PUCHOL[1], P.-H. BLARD[1], R. PIK[1], R. BRAUCHER[2], L. LEANNI[2], D. BOURLES[2], J. LAVE[1] AND O. BEYSSAC[3]

[1]CRPG-CNRS, BP 20, 54501, Vandoeuvre les Nancy, FRANCE (charreau@crpg.cnrs-nancy.fr)
[2] Aix-Marseille Université, CNRS-IRD UM 34 CEREGE, Aix-en-Provence, France, (bourles@cerege.fr)
[3]IMPMC, cc115, 75005 Paris, FRANCE (olivier.beyssac@impmc.upmc.fr)

Denudation that controls the mass transfer from the uplifting highlands to the lowlands basin and links climate and tectonics is a key factor governing the evolution of the Earth's surface. Quantitative records of past denudation rates are therefore critical, especially at the Plio-pleistocene transition, when the onset of Quaternary glaciations may have enhanced worldwide denudation rates.

To independently reconstruct denudation rates from sedimentary archives, we applied an innovative approach based on the analyses of in situ-produced cosmogenic ^{10}Be in ancient sediments. A pioneer study carried out in the Northern Tianshan (Central Asia) has shown a possible transient, from 4 to 2 Ma, increase in denudation rate in the drainage basin [1]. Continuing this work, we present here new cosmogenic paleo-denudation records from four different locations: three from both sides of the Tianshan range and one from the Surai section, in the Siwaliks (the southern piedmont of the Himalayas). While all these records have displayed local, and sometimes significant, variations of denudation rates since ~10 Ma, they do not show synchronous increase in denudation at the Plio-Pleistocene transition. These results challenge the paradigm of a worldwide increase in denudation rates that would be induced by the Quaternary climate variability.

Thanks to independent constraints: paleoelevation from oxygen and carbon isotopic records of paleosol carbonates, source tracking using new Raman spectra of graphite particles in the Surai section,,the inherent uncertainties of the method were reduced. However, a critical step is now to understand how the material is transferred to the basin and what are the main factors that control the distribution of current denudation.

[1] Charreau *et al*., EPSL, 2011

Deglacial trends in the oxygen content of intermediate waters in the southwest Pacific

ZANNA CHASE*[1], ASHLEY TOWNSEND[2], HELEN BOSTOCK[3] AND HELEN NEIL[3]

[1]Institute for Marine and Antarctic Studies, University of Tasmania, 7000, Australia (*correspondence: Zanna.Chase@utas.edu.au)
[2]Central Science Laboratory, University of Tasmania, 7000, Australia (Ashley.Townsend@utas.edu.au)
[3]National Institute of Water and Atmospheric Research, Wellington 6421, New Zealand (Helen.Bostock@niwa.co.nz; Helen.Neil@niwa.co.nz)

Intermediate waters of the Southern Ocean – Antarctic Intermediate Water (AAIW) and Subantarctic Mode Water (SAMW) – ventilate a large portion of the intermediate depths of the ocean. They are important in the uptake of carbon dioxide from the atmosphere and they transport nutrients and oxygen to the low latitude thermocline. These processes are sensitive to climate change. Indeed, observations between 1970 and 1990 show that Southern Ocean intermediate waters have experienced the largest decrease in oxygen of any ocean region, driven by a decrease in the exchange of water between the surface and the interior [1].

Here we use redox sensitive trace metals to examine the response of intermediate water oxygenation to the most recent deglacial warming. Excess Re, U and Mn records from cores bathed by Antarctic Intermediate Water on the Campbell Pleateau (700 – 1200 m), southeast of New Zealand, suggest an increase in bottom water oxygen during the deglaciation. This trend is consistent with a rapid increase in benthic foraminiferal $\delta^{13}C$ at the start of the deglaciation at intermediate depth in the northern Tasman Sea, suggesting a ventilation event [2]. In contrast, redox-sensitive metals from the Chile margin, near the present-day locus of maximum AAIW production, indicate a decrease in intermediate water oxygenation upon deglaciation, a trend that has been interpreted to reflect a deglacial decrease in AAIW ventilation [3]. This presentation will examine intermediate water records from both sides of the Pacific in an effort to untangle the influences of biological productivity, ventilation and circulation.

[1] Helm *et al*. (2011), *Geophys. Res. Lett*. **38,** doi:10.1029–2011GL049513. [2] Bostock *et al*. (2004), *Paleoceanography* **19** doi:10.1029/2004PA001047. [3] Muratli *et al*. (2010). *Nature Geoscience* **3**, 23–26.

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