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Erosional dynamics of the Rangitikei River (North Island, New Zealand) since the Last Glacial Maximum

S. Bonnet (1), U. Rieser (2), L. Moulin (1), D. Lague (1), P. Davy (1) and A. Lacoste(1,3)

(1) Université de Rennes 1, Géosciences Rennes CNRS UMR 6118, Campus de Beaulieu, Rennes, France, (2) Luminescence Dating Laboratory, School of Earth Sciences, Victoria University of Wellington, P.O. Box 600, Wellington, New Zealand, (3) now at Université de Lille 1, Processus et Bilan des Domaines Sedimentaires, CNRS UMR 8110, Cite scientifique, Villeneuve d'Ascq, 59655, France

Fluvial incision rate is classically estimated from elevation vs age data of fluvial terraces, assuming a constant incision rate between the formation of two successive terraces. This is probably an oversimplification of the river dynamics that is not satisfying if we want to correctly describe and model both fluvial and landscape erosion. Here, we investigate the erosional behavior of a bedrock river following the formation of a major climatic terrace during the last glacial maximum (LGM).

The Rangitikei river flows in the southeastern part of the North Island, New Zealand, within the Wanganui Basin, located in a back-arc position with respect to the Hikurangi subduction between the Australian and Pacific plates. The erosional dynamics of the Rangitikei is set by a flight of climatic agradation terraces that defines a long-term incision rate of $\sim$1.2 mm/yr since $\sim$100 ka. During the LGM this river showed a wide ($>$ 1 km) agradational braided pattern with geometrical properties, such as width-area scaling, similar to present-day kiwi braided rivers. River entrenchment that leads to abandonment of the Ohakea terrace took place since the LGM at a mean rate of $\sim$3.6 mm/yr. Post-LGM entrenchment is recorded through up to 20 post-Ohakea autocyclic terraces whose geometrical distribution and age (OSL) however suggested significant variability in the incision rate since the LGM.