**Lithological and geomorphic controls on 26Al/10Be ratios in fluvial bedrock channels in tropical Australia**

Toshiyuki Fujioka1, **Jan-Hendrik May2**, David Fink3, Gerald Nanson4

1Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), 2University of Melbourne, School of Geography, Earth and Atmospheric Sciences, 3Australia's Nuclear Science and Technology Organisation (ANSTO), 4 University of Wollongong, School of Earth, Atmospheric and Life Sciences

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* **Please bold the presenting author in the author list above**

# ABSTRACT

Measuring cosmogenic nuclides in fluvial bedload has established as the primary method for determining catchment erosion rates around the world. Approaches using multiple nuclides have also enabled deriving information on more complex pathways of sediment transport through the catchment. In this context, particularly 26Al/10Be concentration ratios below the nominal production rate ratio of 6.8 have been interpreted as signal of prior prolonged and continuous sediment burial in temporary sediment sinks such as floodplains or river terraces. In many fluvial landscapes, however, sediment production is dominated by fluvial erosion – often associated with waterfalls and major knickpoints – and rapid sediment conveyance through bedrock channels via high-magnitude flood events. While 26Al/10Be ratios are expected to indicate steady-state erosion in such a setting, we here present and interpret new 26Al and 10Be data from four bedrock channels northern Australia with contrasting lithological and physical characteristics. The results indicate that 26Al/10Be ratios from quartzite-dominated bedrock channel sites (5.9-6.9) are indistinguishable from steady-state interpretation. In contrast, two sandstone-dominated sites show persistently depleted values (4.3-6.1), consistent with non­steady state erosion and requiring alternative explanations. This trend is also reflected in detrital samples collected downstream at each site pointing to stochastic bedrock plucking and/or waterfall headward wall retreat as processes capable of contributing significant sediment to the channel. This conclusion has important implications with regard to sources and mechanisms of sediment production in bedrock dominated fluvial systems, and therefore needs to be considered in approaches interpreting basin-wide erosion rates that assumes a steady­state erosion at sediment source.