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THE WHEN, WHAT, AND HOW OF GULLY EROSION AND SEDIMENT DEPOSITION ON THE TABLELANDS OF NEW SOUTH WALES, AUSTRALIA

PORTENGA, Eric W.[1], BISHOP, Paul[2], GORE, Damian B.[3], WESTAWAY, Kira E.[3], ROOD, Dylan H.[4] and BIERMAN, Paul[5], (1)School of Geographical and Earth Sciences, University of Glasgow, Room 414 Gregory Building, Lilybank Gardens, Glasgow, G11 7UA, United Kingdom, (2)Geographical and Earth Sciences, University of Glasgow, University Avenue, Glasgow, G12 8QQ, United Kingdom, (3)Department of Environment & Geography, Macquarie University, North Ryde, 2109, Australia, (4)AMS Laboratory, Scottish Universities Environmental Research Centre (SUERC), East Kilbride, G75 0QF, United Kingdom, (5)Department of Geology and Rubenstein School of Environment and Natural Resources, University of Vermont, Delehanty Hall, 180 Colchester Ave, Burlington, VT 05405, e.portenga.1@research.gla.ac.uk

The timing of initial gully incision into valley bottoms, the processes controlling incision, and the emplacement mechanism for gully-derived sedimentary deposits on the southeastern Tablelands of New South Wales, Australia, have been debated for several decades. We use single-grain optically stimulated luminescence (OSL) to establish the timing of these sedimentary units and conclude that they were deposited after the arrival of Europeans to the region (ca. calendar years 1801-1914). We thus refer to these sediments as post-European materials (PEM) as they are likely the result of European land-use changes.

Gully erosion and its relationship to PEM have been extensively studied on the Tablelands of southeastern Australia. We test the long-held geomorphic interpretation that gully incision was initiated in water-saturated swampy meadow environments along pre-European valley bottoms. We measure concentrations of meteoric ^{10}Be and the OSL of bulk sediment samples from two PEM profiles derived from initial erosion in Birchams Creek.

Bulk sediment OSL data collected from two upstream reference profiles that could each potentially serve as the source material for PEM –swampy meadow sediments and weathered regolith derived from sandstone bedrock – show two possible depth-sources from both the swampy meadow profile (39-87 cm and 102-147 cm) and the regolith profile (9-18 cm and 63-99 cm).

Homogeneous concentrations of meteoric ^{10}Be measured from PEM deposits (8.4-9.4 x 10^8 atoms/g) show that PEM was well mixed during fluvial transport before deposition. Meteoric ^{10}Be results show that PEM could only be derived from shallow erosion (~12-15 cm) of the swampy meadow source profile and not the deep incision indicated by bulk sediment OSL data. PEM could be derived from the regolith source up to depths of 81 cm, which agrees with potential depths suggested by bulk OSL analysis.

We interpret these data to suggest that incision leading to gully erosion throughout the Tablelands region did not begin in swampy meadows. European-induced reductions of vegetation on valley bottoms in the late 1800s to early 1900s was an attempt to improve the land for livestock grazing – a change in land-use that ultimately led to removal of PEM sediment from its source and the incision of erosional gullies, many of which are still active.

Session No. 332

T45. Tracking Sediment Movement across Earth's Surface
Wednesday, 22 October 2014: 1:00 PM-5:00 PM

208/209 (Vancouver Convention Centre-West)

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Back to: T45. Tracking Sediment Movement across Earth's Surface

<< Previous Abstract | Next Abstract >>