



Combining multiple measurement and isotope techniques to help target erosion hot-spots in the Great Barrier Reef catchments

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There is considerable evidence that the amount of sediment reaching the Great Barrier Reef (GBR), Australia, has increased since agricultural development commenced in the 1870's. This is having deleterious effects on freshwater and marine ecosystems. However, understanding the primary source and processes driving the increased sediment delivery has been challenging due to the large size and hydrogeomorphic diversity of adjacent catchments. This paper presents the results from several projects that employed a diverse range of measurement techniques all aimed at understanding the spatial and temporal changes in sediment yield from the 130,000 km² Burdekin catchment, Australia. Cosmogenic nuclides (¹⁰Be) were combined with contemporary sediment flux monitoring to help identify high risk sub-catchments that have anthropogenically accelerated erosion. Within the sub-catchments, fallout radionuclides (¹³⁷Cs, ⁷Pb and ⁷Be) were used to determine the dominant erosion process (surface vs sub-surface erosion). Long term monitoring of improved grazing land management (using nested flumes and gauges), were used to evaluate the effectiveness of land management changes on sediment yields at paddock and catchment scales over 10 years.

The results suggest that the Bowen and Upper Burdekin sub-catchments are the dominant anthropogenic source of sediment to the GBR having an accelerated erosion factor of 7.47 (\pm 3.71) and 3.64 (\pm 0.5), respectively. Within these sub-catchments, most of the fine sediment is coming from vertical channel walls (50%) or horizontal sub-surface soils (~42%). Remediating these catchments and reducing sediment delivery is likely to take greater than 10 years, and will require a range of approaches including pasture and rangeland management, as well as targeted erosion control in highly gullied landscapes.

Together, these data sets help elucidate the often complex sediment delivery processes to the GBR. This helps policy and management determine where to invest in catchment remediation. This study highlights the benefits of using a range of techniques and data sets to identify the major sediment sources in these highly variable systems.