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Assessing the impact of increased rainfall variability on catchment scale sediment transport and water quality

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The ability to measure and model soil erosion and resultant land surface change provides insight and understanding into landscape evolution as well as a range of environmental impacts, including loss of organic matter and nutrients, reduction of landscape productivity and a reduction in downstream water quality. Recently there has been recognition that changing climate will affect rainfall and storm patterns with research directed to examine how soil erosion, sediment transport and water quality will respond to climate change. This study investigates the effect of different rainfall patterns on erosion, sediment transport and resultant water quality for a well studied tropical monsoonal catchment in the Northern Territory, Australia. There have been several studies of the effect of climate change on rainfall patterns in the study area with projections indicating a significant increase in storm activity. Therefore it is important that the impact of this variability be assessed from a hydrology and geomorphology perspective. Here a numerical model of erosion and hydrology (CAESAR) is used to assess several different rainfall scenarios. Numerical modelling is an important quantitative method with which predictions can be made about landuse and climate change variability on the hydrological cycle and catchment processes. The results show that that increased rainfall amount and intensity increases erosion and sediment transport rates. Predicted erosion rates and water quality was variable and non-linear but within the range of measured field data for the catchment and region. The work demonstrates that landscape evolution models such as CAESAR with its coupled erosion, deposition and hydrology components provide a good match with independently derived sediment concentrations. This provides confidence in the model and modelling approach. The study provides a robust methodology for assessing the impact of enhanced climate variability on sediment transport and water quality.