Late Quaternary erosion in lowland and mid-altitude Tasmania in relation to climate change and first human arrival

Peter D McIntosh[1], David M Price[2], Rolan Eberhard[3], Adrian SIee[4]

[1] Forest Practices Authority, Hobart, Tasmania, Australia
[2]University of Wollongong, Wollongong, NSW, Australia
[3] Department of Primary Industries and Water, Hobart, Tasmania, Australia
[4]University of Tasmania, Hobart, Tasmania, Australia

Although erosion at many Tasmanian lowland and mid-altitude sites has been previously documented and dated, establishing a chronology of landscape stability and instability and assigning causes to erosion has been complicated by the small number of ages obtained, errors in dating methods, and the difficulty of distinguishing between climatic and anthropogenic processes. In this paper we critically assess previous Tasmanian studies, calibrate published ^{14}C ages considered to be dependable, present new ^{14}C and thermoluminescence (TL) ages for 18 sites around Tasmania, and consider the evidence for the hypotheses that erosion processes at low and mid altitudes have been: (1) purely climatically controlled; and (2) influenced both by climatic and anthropogenic (increased fire frequency) effects. Of the 58 ages obtained for erosion accumulations (comprising dunes, colluvium, alluvium and loess-like aeolian deposits) only three fall in the period 45-100 ka. Plots of all finite ages (calibrated for ^{14}C and 'as measured' for TL and optically stimulated luminescence (OSL)) indicate a slight increase in erosion between 45 and 35 ka and a sustained increase of erosion after 35 ka, within the OSL-dated 40-31 ka dry period defined at Lake Mungo (Bowler et al. 2003) and the ^{14}C-dated moist Tullabardine Interstadial defined in Tasmania. Evidence for climatically controlled erosion periods similar to those recorded in loess deposits dating to c. 350 ka in New Zealand has not been found. We consider three possible biases that may have affected the age distribution: the limitations of ^{14}C dating, sampling bias, and preservation bias. We suggest there may have been a tendency towards the sampling of more recent dune strata, but that ^{14}C dating and preservation biases are unlikely to have affected the age distribution obtained. The absence of widespread erosion before 35 ka, the abrupt beginning of erosion around this time, the frequent association of erosion products with charcoal, the arrival of people in Tasmania at 40 ka BP, and the known use of fires by Aborigines to maintain patches of non-climax vegetation suggest that ecosystem disturbance by anthropogenic fires, in a drier climate than that presently prevailing, contributed to erosion in lowland and mid-altitude Tasmania. This model of ecosystem disturbance and erosion following human arrival is similar to the 'alternative' model proposed by Roberts et al. (2001) to explain megafauna extinction, i.e. ecosystem disruption preceding extinction, with climatic factors also having an influence.

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