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Interpretation of Evidence for the Early Prehistory of New Zealand: Reply to Sutton

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ABSTRACT

The chronology and cause of the seven major periods of erosion and alluviation during the last 1600 years are discussed and viewed against the alluvial history of the last 10,000 years. The more detailed history of the last 1600 years represents the tail-end of a long-term natural pattern which has periodically affected New Zealand's landscape and biota, regardless of the presence or absence of humans and browsing mammals. Therefore, stratigraphic signs of erosion and vegetation destruction are not indisputable evidence for the presence of humans.

Ages of charcoals in soils or alluvium show that vegetation was periodically burned during the last 8000 years, and indeed, much earlier. Burning can occur naturally; consequently charcoals are not reliable evidence for the presence of humans.

A settlement date earlier than A.D. 800 cannot be supported unquestionably using the premise that severe erosion and alluviation, and burning of vegetation, were the result of human impact.
Keywords: EROSION PERIODS, HOLOCENE TEMPERATURES AND ALLUVIATION, STORMINESS, ALLUVIAL CHRONOLOGY, POLYNESIAN SETTLEMENT, CHARCOALS, CLIMATIC FLUCTUATIONS.

CAUSE OF EROSION PERIODS

Sutton (1987) says that the work of McGlone (1983), McFadgen (1985) and Grant (1985) "identifies the beginning of major environmental instability as occurring within the interval 2500–1500 B.P. and largely within the shorter period 1800–1500 B.P. In each case this change, although simultaneous over a vast area, is attributed to a natural cause." Firstly, it is thoroughly normal for a natural change to affect a large area. Secondly, it is unrealistic to think that the beginning of any earth science history has been found. Figure 1A gives the smoothed New Zealand temperature pattern for the last 11,000 years, derived from Salinger (1983). There is adequate documentation that increased storminess and consequent greater erosion and alluviation are associated with higher temperatures (Grant 1981, 1983; Pittock and Salinger 1982). The box in Figure 1B shows the climatically controlled erosion periods of the last 1600 years and their relative magnitudes based on Grant (1985), and the remainder of Figure 1B shows dates from earlier phases of alluviation in various regions back to *c.* 9500 years B.P. (Cowie and Wellman 1962; Grant 1985; Grant-Taylor 1959; Grant-Taylor and Rafter 1963, 1971; Rhea 1968; Suggate 1958; Te Punga 1953). The massive alluviation of the very warm, wet Early to Mid Holocene is widespread and conspicuous (E. Griffiths, Soil Bureau, DSIR, pers. comm. 1988). Hence it is reasonable to sketch the curve of the relative magnitude of alluviation during the entire Holocene. We then see (Fig. 1B) that what I have discussed elsewhere in greater detail since 1600 years B.P. merely represents the tail-end of a very long-term natural pattern which has periodically affected New Zealand's landscape and biota, regardless of the presence or absence of humans and browsing mammals. Over the last 10,000 years alluviation has actually diminished in magnitude, and therefore impact, towards the present. The last 1600 years is

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entirely consistent with the long-term declining magnitude of alluviation, and shows no reversal of the trend, which might be expected if humans were a significant factor in causing erosion and alluviation.

In 1985 I summarised the evidence for similarities of alluvial chronologies in North America, central Europe, and Africa (Grant 1985). In Australia, a significant rainfall increase over large areas accompanied a temperature increase after 1945–1946 which paralleled the start of the Waipawa Period *c.* 1950. There is now evidence of major flooding and alluviation in the Amazon Basin during the period 1300–700 years B.P. (Colinvaux *et al.* 1985), which embraces the Pre-Kaharoa (1300–900 B.P.) and Waihirere (680–600 B.P.) periods. In Spain, catastrophic flooding and alluviation between the mid-eleventh and seventeenth centuries (Moore 1984), spans the time from the Pre-Kaharoa to the Matawhero (450–330 B.P.). The evidence is strong that periodic alluviation has often been synchronous on many parts of the globe; therefore such alluviation has probably resulted from a natural cause which has a universal influence.

Erosion and alluviation have taken place in New Zealand throughout the Holocene, beginning with the great alluviation of 5000 to 10,000 years ago. Direct evidence for human occupation, however, is barely 1000 years old. If the assumptions which Sutton (1987) makes for the period between 2500 and 1500 years B.P. are applied consistently, then the conclusion to be drawn is that New Zealand was already occupied at the beginning of the Holocene. This conclusion is absurd, therefore Sutton's assumptions have misled him.

CHARCOALS

Along with erosion and sedimentation, Sutton (1987) claims that human presence is indicated where microscopic charcoals occur. Figure 1C shows radiocarbon ages of charcoals in soils or alluvium, remote from volcanic effects, as evidence of when vegetation was burned (Cox 1977; Grant 1985; Grant-Taylor and Rafter 1963, 1971; and unpublished ages: from Waitotara River, NZ 5488, 3920 ± 580; from Kauaeranga River, NZ 5514, 2590 ± 140). Again, this is a situation where we may be prejudiced by our particular conceptual model. If we adopt as evidence of human presence, only the criteria of charcoal, increase in bracken fern, influx of silt, or changes in the frequency of other indicator species (Sutton 1987), then it is possible to argue that humans were in the Whangarei area *c.* 7700 B.P. Cox's (1977) statement: "The oldest fire [7700 BP] is unlikely to have been caused by Man but the 1550-year-old one may well have been" is merely a subjective selection. I have discussed burning of vegetation elsewhere (Grant 1985) and I would only add here that kanuka-dominant vegetation does not necessarily imply " the occurrence of earlier and extensive fires."(Sutton 1987). Even in high rainfall areas, I have observed that kanuka is a primary coloniser of fresh, coarse alluvium and that older stands of kanuka on alluvium have established in the absence of fire.

Even when evidence for fire, erosion and sedimentation, and vegetation change is stratigraphically closely associated with definite cultural signs or items, the former three should not be used as evidence for human presence on the premise that they have happened only, or mainly, as a result of human activity. Natural fires are started today by lightning (I have seen a rimu head burning from this cause), and in the warmer climates of each earlier erosion period, particularly during the Early and Mid Holocene, fires from lightning were almost certainly more frequent. Hence, during each warm stormy period there was an increased

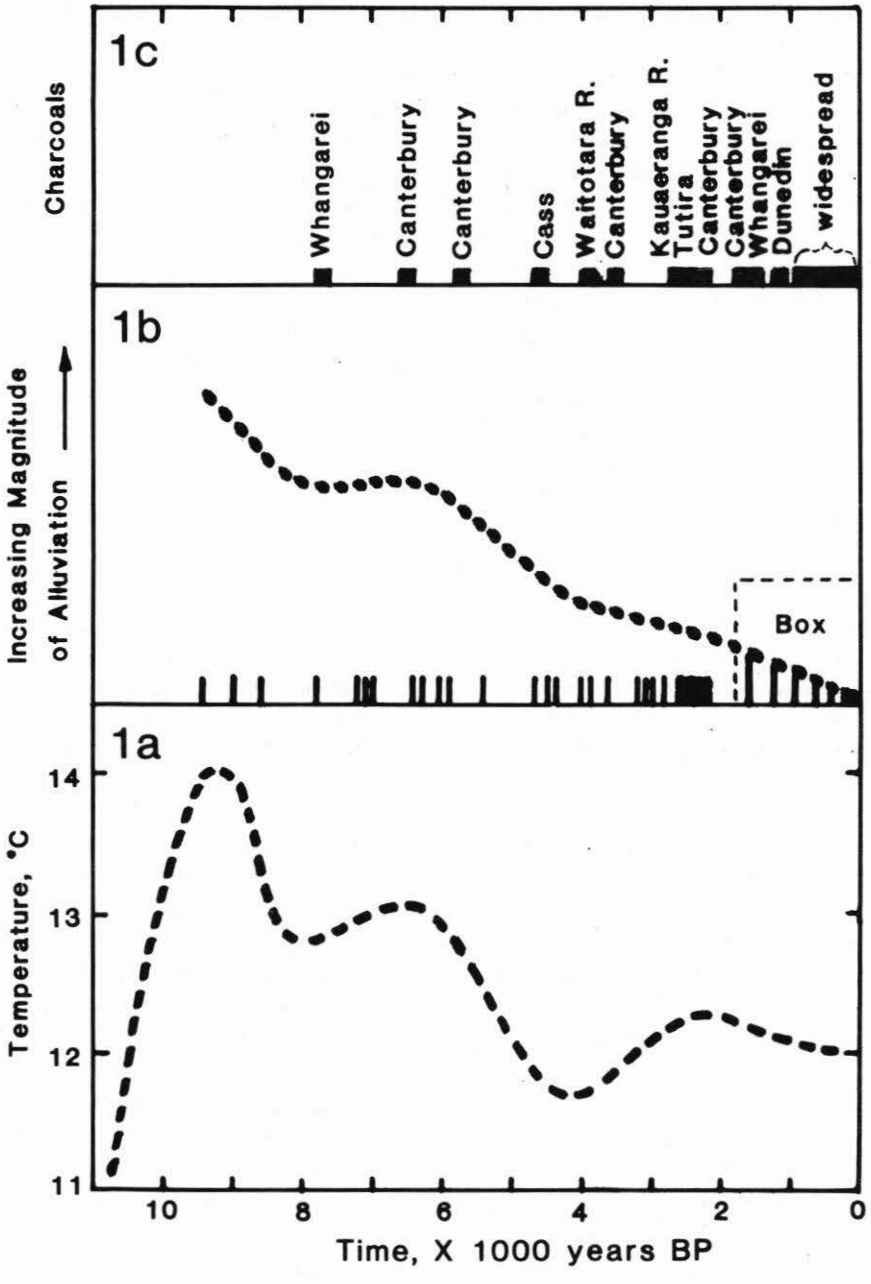

Figure 1: A. Smoothed pattern of New Zealand temperature for the last 11,000 years. B. Major periods of erosion and alluviation since 1800 years B.P. (in box), and radiocarbon ages for earlier phases of major alluviation in the last 9500 years (vertical bars). The general Holocene trend of decreasing alluviation magnitude towards the present is shown by the curve. C. Some radiocarbon ages when vegetation was burned as evidenced by charcoals in soils or alluvium remote from volcanic effects.

chance that vegetation would be destroyed, not only by erosion, sedimentation and gales, but also by natural fires.

I have discussed the intensified destruction of vegetation by erosion, sedimentation and gales associated with periodic increases of storminess; the effects have been so great that it is unnecessary to invoke human presence to explain the chief vegetation changes of the past. For example, on the Ruahine Range (west of Hawke's Bay), and on the Pouakai Range (Taranaki), areas of vegetation probably destroyed are 17–18 percent in the Wakarara Period (180–150 years B.P.), 26 percent for Matawhero (450–330 years B.P.), 52 percent for Waihirere (680–600 years B.P.) and more than 52 percent for the Pre-Kaharoa Period (1300–900 years B.P.). The vegetation of other areas, in both North and South islands, would have been affected to greater or lesser extents. Each period of vegetation destruction, and subsequent re-establishment, allowed many different plant species to invade the sites, resulting in increased diversification and many apparently anomalous mixtures of major species (Grant 1988). Bracken fern and kanuka were probably induced on some sites.

PERIODICITY OF EROSION PHASES

Sutton (1987) considers that the periodisation proposed by Grant (1985) "is too fine-grained and very likely to be affected by local processes ... ". To the contrary, I am certain that the pattern of erosion periods is very coarse-grained in time, especially before A.D. 1770, and the "coarseness" increases progressively going back in time because more evidence has been destroyed. Alluvial stratigraphies indicate a more complex real-world pattern (more fine-grained), but it was impossible to define this satisfactorily from the sampling undertaken and the number of ages used. With one exception, I believe that the major climate-controlled periods of the last 1600 years have been reasonably well documented. The exception is the presently dated Pre-Kaharoa Period (1300–900 B.P.) which is almost certainly too coarse and actually embraces two periods. This is to be discussed in a separate paper. Analyses on long time-series of many earth science records (e.g., rainfall, temperature, pressure, cyclones, floods, etc.) of the nineteenth and twentieth centuries have demonstrated that there have been statistically significant fluctuations over short spans of time (fine-grained), which adds strength to my comments above (see references in Grant 1983 and 1985).

I assume that Sutton's "local processes" are those associated with humans. The erosion periods and their physical processes are too widespread, and their levels of energy involved too high, to be of anything other than natural origin, and they have taken place totally regardless of humans and animals. The alluviation record of the Mid and Early Holocene verifies this conclusion. Furthermore, the current erosion, alluviation and flooding of the Waipawa Period, which is everywhere affecting our mountains and lowlands, is not the result of cultural influences. It is associated with climatic fluctuations, linked to changes of global atmospheric circulation, which are affecting the entire South Pacific (Grant 1981, 1983, 1985; Salinger 1979; Trenberth 1976, 1977).

Further, concerning the interpretation of evidence, the work of Burrows and Greenland (1979) certainly does not argue "for the constancy of climate within the last millennium" (Sutton 1987). On the contrary, the data they review, which includes some of my own work on climatic fluctuations, demonstrates that climate is remarkably inconstant.

CONCLUSION

A rethinking of New Zealand's early prehistory is needed (Sutton 1987), but Sutton's suggestion of a settlement date earlier than A.D. 800 is certainly not made possible by the earth sciences associated with the erosion periods of Grant (1985) using Sutton's premise that the erosion and alluviation was the effect of human impact. Nevertheless, a new model of Late Holocene environmental history, which I discuss in a later paper, will probably require a revision of "the current paradigm of New Zealand prehistory" which, as Sutton (1987) notes, "is very conservative".

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