

REFLECTIONS ON THE STABILITY OF HOLOCENE ENVIRONMENTAL ZONATION IN SOUTH AFRICA

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Preamble

Recent earth science and palynological researches in southern Africa have shown that there is an increasing body of incontrovertible evidence that Pleistocene paleoclimates were on many occasions substantially different from those of today. The traditional 'pluvial' and 'interpluvial' interpretation of the East and South African Pleistocene record has, of course, been correctly laid to rest. Instead, pragmatic research into Pleistocene sediments and other geomorphologic phenomena both in East Africa (Butzer, Isaac *et al.* 1971) and in South Africa (Van Zinderen Bakker & Butzer 1973) shows a far more complex and problematical set of environmental 'events' that are indisputably real but, at the same time, 'problematical' in the sense that patterns are still difficult to correlate in space and time. Suffice it to mention here: (a) the stable (oxygen) isotopic data of T. C. Partridge (pers. com.) from speleothems, to the effect of a *substantial* late Pleistocene temperature depression in the Transvaal; (b) the evidence of 'periglacial' processes in the Drakensberg and of accelerated frost-weathering in various other parts of the country (see Butzer 1973); (c) the reconstructed hydrological budget of the Alexandersfontein Pan c. 16 000+ B.P., explicable only with a substantially reduced evaporation (assuming a 6°C temperature depression) *plus* a rainfall at least twice that of today (800 instead of 400 mm at Kimberley) (Butzer, Fock, *et al.* 1973); (d) the record of alternating grassveld and Karoo vegetation at Florisbad and Aliwal North (Van Zinderen Bakker 1957; Coetzee 1967); and (e) the record of alternating pedogenesis and dunal activity in the Knysna Forest (Butzer & Helgren 1972).

How is it with the post-Pleistocene? Was it an uneventful 10 000 years of conditions identical to those of the Contact Period of a few centuries ago? Or was it varied and complicated by noticeable environmental shifts on a scale recently shown for East Africa?

The Holocene Record

It would be ridiculous to assert that the Holocene records of South Africa were properly understood. For such a claim there are far too few radiometric dates on Holocene sediments (of which there are surprisingly many) and a disconcerting lack of informative archeological associations with the external (i.e. non-cave) geomorphological record. None the less, some striking facts can be briefly enumerated to caution against the assumption that 'all was the same'.

(1) Two major cut-and-fill, i.e. alluviation and down-cutting, cycles can be widely traced from the lower Vaal across the length of the Orange Free State (Butzer, Helgren *et al.* 1973; Van Zinderen Bakker & Butzer 1973). Both are not directly dated but are unquestionably of Holocene age, with two

secondary carbonate cycles in the lower Vaal valley, as well as discrete episodes of accelerated spring discharge and tufa accumulation on the Gaap Escarpment, now dated c. 9 700–7 650 B.P. and in the mid-3rd millennium B.P. (Butzer & R. Stuckenrath, in preparation; Butzer 1974). The subsequent down-cutting has generally been attributed to the impacts of European settlement, but some farmer traditions in the upper Vaal suggest that many dongas were already 'active' prior to Boer settlement.

(2) Compared with the alternating eolian activity and stream alluviation or paleosol development recorded at Riverton-on-Vaal, sections of the southern coast show some tantalizing similarities (Butzer & Helgren 1972). In the area between Knysna and the Gamtoos drainage, there is ample evidence of (i) coastal dune accumulation, paralleled by soil stripping on slopes further inland, alternating with (ii) episodes of dune stabilization, pedogenesis, and local peat accumulation. Although even more C¹⁴ dates would be desirable from more sites, it appears that a first period of dune stabilization, with attendant pedogenesis, occurred during the 8th millennium B.P. Then followed renewed coastal eolian activity and soil erosion inland, until 4 200 B.P., whereafter humic soils and valley-floor peats developed until c. A.D. 900. Subsequently there was a phase of gullying, another brief aggradation, and renewed gullying with dune reactivation during the last one or two centuries. This geomorphologic succession is basically borne out by Martin's (1968) palynological results from the adjacent Wilderness Lakes.

Implications

Quite aside from the more obvious transition of environmental change from terminal Pleistocene to early Holocene, as documented by Klein's faunal and Shackleton's 0¹⁶/0¹⁸ work at Nelson Bay Cave (Klein 1972, 1974; Shackleton 1973), we still face a substantial array of environmental indicators well into mid- and late Holocene time that can only be understood as substantial evidence for environmental changes. Whether these relate primarily to temperature fluctuations or shifts in precipitation régimes is uncertain. Whether they are temporally equivalent on the south coast and in the Vaal basin is not established beyond doubt. And, whether they are ubiquitous events or phenomena in all of southern Africa remains unpredictable. We need not even speculate whether these events are sufficiently general to warrant comparison with Holocene lake-level fluctuations in East Africa, let alone forest successions in Europe or North America!

The point is that we simply cannot *assume* that Holocene environments in South Africa were unchanging or identical. Instead we must allow that the environment was a *variable* parameter in any model of Later Stone Age economy or ecology.

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