LATE PLEISTOCENE BEACHES AND WADI ALLUVIA NEAR MERSA ALAM, RED-SEA COAST, EGYPT

by Karl W. Butzer

Department of Anthropology, University of Chicago, Chicago, U.S.A.

Field study near Mersa Alam (25^0N., 35^0E.) during 1962-63 recognized a variety of tectonically-undisturbed, late Pleistocene littoral deposits and related glacial-eustatic sea-level stages, which were stratigraphically linked to the alluvial terraces of the coastal plain (Butzer and Hansen, 1968: chap. 8):

1 +10 m coral reef (coralline limestone). Minimal wadi activity.

2 +6 m coral reef (calcarenite and coral), with Th^{230}/U^{234} dates of 80,000 $\pm$ 8000 B.P. (on reef shell) and 118,000 $\pm$ 10,000 B.P. (on shell from older beach gravels back of the reef. Eem interglacial transgression. Minimal wadi activity.

3 +8.5 m gravel bars and estuarine gravels, indicating accelerated wadi activity.

4 Regressive oscillation.

5 +3.5 m coral reef (calcarenite, some coral). Minimal wadi activity. Terminal Eem transgression?

6 Regressive oscillation with wadi dissection.

7 Alluviation of coarse gravels of Middle terrace, indicating "pluvial" conditions with increased stream competence. Basal beds appear to be contemporary with estuarine conglomerate at modern high-water, while later fluvial sediments extend to below modern sea-level. Early Würm regression?

8 Dissection of alluvium and calcification (weak paleosol).

9 Alluviation of Low Terrace, again indicating a "pluvial" climate. Gravels indicate oversteepened gradient at coast, and deposits extend to below modern sea-level. Contemporary with early or middle Würm regression.

10 Long-term dissection of coastal deposits to well below modern sea-level during middle to late Würm regression. During Holocene times sea-level returned to its present mark, drowning the lowermost wadis, since post-Pleistocene wadi activity has been minimal.

This stratigraphic sequence shows conclusively that in southeastern Egypt the last "pluvial" episodes of the later Pleistocene are broadly contempo-

rary with the first half of the Würm glacial regression, while the greater part of last, Eem interglacial experienced a climate about as arid as that of today. At the same time the Mersa Alam evidence shows that there was a brief, moister interval during the late Eem while the last half of the Würm regression was comparatively dry. This emphasizes that pluvial-glacial or pluvial-interglacial correlations are gross oversimplifications of a rather more complex pattern of events.

THE PLEISTOCENE RECORD OF THE KURKUR OASIS, LIBYAN DESERT

by Karl W. Butzer

Department of Anthropology, University of Chicago, Chicago, U.S.A.

Intensive study of Pleistocene stratigraphy and geomorphology of the Kurkur Oasis has yielded surprising new insights into the nature and chronology of climatic change in the Libyan Desert. At the same time the results allow limited correlations with, reinterpretations of, and stratigraphic precisions for, the Kharga sequence of Elinor Gardner and Gertrude Caton-Thompson. The major events can be summarized as follows (Butzer and Hansen, 1968: chap. 7):

Table: Geomorphic evolution of the Kurkur area, Libyan Desert, during the late Cenozoic

HOLOCENE

32 Limited fluvial activity and accumulation of eolian quartz sands.

31 (At Dungul and possibly at Kurkur) Wadi Tufa V. Age 8300 B.C. or younger.

UPPER PLEISTOCENE

30 Red Silt accumulation in surface swales and crevices by occasional, but appreciable, rains.

29 Dissection of Tufa IV (vertical differential 3 m).

28 Wadi Tufa IV. Aggradation of +3 m wadi terrace with gravel, sand, and marl. Moderate spring activity. Age 29,800 B.C. or younger. Deposition of White Silts on slopes.

27 Dissection of Tufa IIIc (vertical differential 6 to 9 m).

26 Dissection of Tufa IIIc. Aggradation of semilacustrine marl and sand at +6 to +9.5 m. Accelerated spring activity, with extensive valley-ponding. Age greater than 38,000 B.C. Deposition of White Silts on slopes (?).

25 Limited fluvial activity, with accumulation of eolian quartz sand.

24 Dissection of Tufa IIIa/b (vertical differential 6 to 10 m), interrupted by cutting of erosional bench at +5 metres.

23 Wadi Tufa IIIb. Further wadi aggradation of +8 to +10 m terrace with travertines and tufas. High water-table, accelerated spring activity, and development of "mound spring" vents on floodplain.

22 Wadi Tufa IIIa. Aggradation of wadis to +5 m with gravel, marl, and organic tufas. Age greater than 38,000 B.C. Pluvial erosion of uplands (with possible Red Silt accumulation in pans).

21 Limited fluvial activity, with accumulation of eolian quartz sand.

MIDDLE PLEISTOCENE

20 Dissection of Tufa II (vertical differential 15 to 20 m).

19 Wadi Tufa II. Aggradation of complex +16 to +20 m wadi terrace. Pluvial erosion of uplands followed by accelerated spring activity.

18 Limited fluvial activity with accumulation of eolian quartz sands.

17 Dissection of Tufa I (vertical differential 25 m) and establishment of modern topography.

16 Wadi Tufa I. Aggradation of complex +25 to +35 m wadi terrace: clastic basal facies followed by tufas and travertines. Pluvial erosion of uplands (possibly with related Red Breccias on surface and in karst caverns), followed by accelerated spring activity.

15 Limited fluvial activity with accumulation of eolian quartz sands.

BASAL AND LOWER PLEISTOCENE

14 Bedrock dissection at scarp edge from Pediment III to foothill level (vertical differential 40 to 80 m); active retreat of Chalk Cuesta. Deformation of local strata through sag and slumping, as a result of undermining by stream and groundwater erosion. Local landsliding. Karst development.

13 Lateral planation with development of Pediment III at 320 to 325 m.

12 Bedrock dissection between Pediments II and III (vertical differential 15 to 20 m).

11 Dissection of Plateau Tufa, with exhumation of Pediments I and II (vertical differential 40 m).

10 Chemical weathering, with development of terra rossa paleosol.

PLIOCENE

9 Alluviation of Plateau Tufa, Upper Unit (over 40 m of travertines with organic tufas and clastic beds). Significant spring activity.

8 Erosion.

7 Alluviation of Plateau Tufa, Lower Unit (over 5 m of clastic beds with some travertines). Pluvial erosion on uplands.

6 Limited fluvial activity, with accumulation of eolian quartz sands.

MIOCENE

5 Lateral planation, with development of Pediment II at 340 m.

4 Bedrock dissection between Pediments I and II (vertical differential 25 m).

3 Lateral planation, with development of Pediment I at 360 to 365 m. Development of Nummulitic Cuesta.

2 Bedrock dissection between Libyan Tableland and Pediment I (vertical differential between 60 and 110 m).

OLIGOCENE (?)

1 Cutting of structural/erosional platform of Libyan Tableland at 425 to 475 m.