D. JÄKEL

e Météorolo-
ier 1972

e Météorolo-
'au 31 Décembre

e-Volta, Ser-
triques, jusqu'

Climatology.

aise. Service
r jusqu'au

vigation
(Agency for
Madagascar).
que et Tech-
c and Techni-

TROPICAL PEATS: HYDROGEOLOGIC AND CLIMATIC CONTROL

Faure, H., Gac, J.Y., Hillaire-Marcel, C., Lezine, A.M., Monteillet, J., Ngom, P.M., Pezeril, G. & Saos, J.L.

CNRS; France and ORSTOM, Université de Dakar, Direction des Mines et de la Géologie; Senegal

Along the flat sandy coasts, estuaries and deltas of West Africa, from South Mauritania to Nigeria, Holocene sediments fill wide areas of low-lying countries. The thickest deposits (over 30 m) are found in ancient river valleys or in deep depressions between Upper Pleistocene eolian sand dunes (Niayes).

The infilling of these ancient depressions is made of very fine grain material (silt, clays) and reworked sand that are very rich in organic vegetal components and peat layers.

Most of these sediments, sand and fine organic silt hold at various dept ground water. Its salinity is ranging from sea water along the coast and estuaries, to fresh water inland, along rivers and in lenses floating above the coastal salted bevelled water.

The present disposition of the depressions shows various environments ranging from mangrove estuaries and lagoons to evaporated dry salt pans (sebbhas) or permanent fresh water intradune lakes. The extreme variety of hydrological situations is recorded in the chemistry of soil and water and in the vegetation.

The different types of depression are essentially controlled by the water table relation to the topographic surface. In each particular place the local annual hydrologic budget determines the geochemical and botanical environment. When the water table changes in response to climatic crisis, the environment of each depression tends to change and goes through different types in a logical sequence.

During the Holocene and Upper Pleistocene a drastical change of the water table position and environment was a consequence of postglacial changes. The water table position underwent a general rise favourable to rapid accumulation for three major causes: Sea level, climate and local paleogeography.

1. The Sea level rose (at a mean rate of 1 cm per year) from

N.-A. Mörner and W. Karlén (eds.), Climatic Changes on a Yearly to Millennial Basis, 201–203.

17,000 to 7,000 B.P. and forced a rise of the water table along the coast and estuaries. From 7,000 to present 2 or 3 minor sea level fluctuations produced environmental changes competing with climatic water table changes (e.g. Faure, 1980; Faure et al., 1980).

2. The climatic rainfall increase at early Holocene induced a water table rise, that is to say fresh water lens more or less thick floating above the sea level controlled water table. A more important feeding of the underground waters by rains and rivers occurred during periods of increased run-off at Holocene (e.g. Faure & Gac, 1981; Gac et al., 1983).

3. The most effective paleogeographic change of water table is the construction of successive littoral sand barriers that favoured accumulations of fine material and mangrove peats in shaded areas. In deltas, progradation and meandering cause rapid changes in local rates of sediment accumulation as well as in the situation of favourable depressions.

The thick peat accumulations are thus the result both of post-glacial sea level rise that controlled deep water anoxic depressions and Holocene wet climate that favoured vegetation. The oldest radio-carbon dates from Benin and Ivory Coast show propitious conditions for peat formation around 23,000 and 19,000 years B.P. In the Guinea Golf, shelf peats of 12,000 to 11,000 years B.P. are found at 60 m water depth. In Senegal, dates between 9,000 and 8,000 B.P. are obtained at a depth between 28 m and 23 m from the thickest in-filling of valley and from continental shelf mangrove. The deepest paleo-valley and Niaye show a nearly continuous peat accumulation locally of several meters covering the end of the Holocene up to the present.

The "Direction des Mines et de la Géologie" of Senegal has estimated a volume of above 50 10^6 m^3 of peat in the Niayes zone. Its exploitation would save a precious amount of fuel and preserve the Sahelian zone from deforestation for fire wood production.

A better understanding of the detailed processes of the tropical peat genesis could help to reconstruct the proper environmental conditions so as to renew the peat formation after its exploitation. In this perspective man could make the peat a semi-renewable energy ressource growing again for the future.

REFERENCES

Faure, H., 1980. Late Cenozoic vertical movements in Africa. In: Earth Rheology, Isostasy and Eustasy (N.-A. Mörner, Ed.), Wiley, 465-469.

Faure, H., Fontes, J.C., Hébrard, L., Monteillet, J. & Pirazzoli, P.A., 1980. Geoidal changes and shore level tilt along the Holocene estuaries: Sénégal River area, West Africa. Science 210, 421 - 423.

Faure, H. & Gac, J.-Y., 1981. Will the Sahelian drought end in 1985? Nature 291, 475-478.

Gac, J.-Y., Monteillet, J. & Faure, H., 1983. Marine shorelines in estuaries as paleoprecipitation indicators. In: Variations in the global water budget (A. Street-Perrott, M. Beran & R. Ratcliffe, Eds.) Reidel, 361-370.