

Distinguished Lecture Tour
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Stages of Transformation of Carbonate Sands into Limestone and Dolostone:
Fuerteventura, Canary Islands
by

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ABSTRACT

The island of Fuerteventura offers a unique possibility for studying mineralogical, chemical and textural changes in Holocene and Pleistocene skeletal carbonate sands which, due to eustatic sea level changes, have been exposed to one or more diagenetic environments. An example is the diagenetic development of a 30,000 year old dolomitized calcarenite from the Jandia Peninsula.

Stage 1 (intertidal or "beachrock" stage) -- Precipitation of magnesian calcite leads to the formation of beachrock in the inter-tidal zone.

Stage 2 (supratidal marine evaporitic stage) -- Lowering of the sea level (about 2-3 m compared with stage 1) has exposed the beachrock to the supratidal zone which, however, still remains under the influence of the sea and of the evaporating seawater. After the retreat of heavy seas, seawater accumulated on the surface or within the pores of the beachrock, evaporates and percolates through the calcarenite. The high Mg/Ca ratio (>15) of the percolating brines causes dolomitization of the magnesian calcite cement as well as of allochems consisting of the same mineral (red algae, echinoderms).

Stage 3 (supratidal meteoric stage) -- When, by further lowering of the sea level, the partly dolomitized beachrock is exposed to meteoric (freshwater) conditions, the supratidal meteoric stage is achieved. Aragonite of the allochems is converted to calcite by wet transformation and calcite is precipitated in the interstitial spaces of the calcarenite as second-generation cement (cement B).

Other interesting examples are calcarenites (eolianites) which originally were exposed to the meteoric diagenetic environment and are now in the intertidal zone; a first generation cement consisting of calcite is followed by a second-generation cement consisting of magnesian calcite!

Calcarenites overlain by basaltic lavas permit the study of hydrothermal alteration of carbonate rocks.

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Biographical Review



German K. Müller was born Sept. 2, 1930 at Schramberg, Schwarzwald, Germany. He received the B. A. degree in Mineralogy, Geology and Chemistry in 1950 from the University of Cologne. In 1952, he was awarded the degree of Dr. rer. nat. in the same subjects from the University of Bonn, where his doctoral thesis was concerned with carbonates in coal seams of the Ruhr.

Dr. Müller has had an unusually wide and varied professional experience. His first position, upon graduation, was a year with the Mining Research and Exploration Institute of Turkey at Ankara as Geologist-Petrologist. From 1954 to 1957 he was head of the Sedimentology Laboratory of Mobil Oil Corp. (Germany). During 1957-59 he performed field work in Ethiopia as Geologist with Texas Gulf Sulphur Co., Addis Ababa.

Returning in 1959 to the academic environment, Dr. Müller was Assistant, then Associate Professor at the Mineralogical Institute, Tübingen University. Currently he is Professor of Mineralogy and Petrology, Heidelberg University, where he has been since 1964. He is Director of the Mineralogisch-petrographisches Institut and Head of the "Laboratorium für Sedimentforschung."

Dr. Müller has published widely, mainly on sedimentological subjects; these publications include text books as well as articles. He holds membership in numerous German and American geoscientific societies. In 1971, he was President of the VIII International Sedimentological Congress in Heidelberg.