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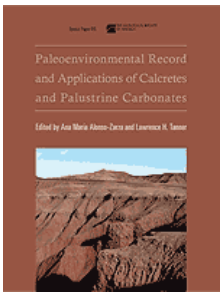
Paleoenvironmental Record and Applications of Calcretes and Palustrine Carbonates, edited by Ana María Alonso-Zarza & Lawrence H. Tanner, 2007. GSA Special Paper Series, SPE 416. Geological Society of America, P.O. Box 9140, Boulder, Colorado 80301-9140, USA. Softcover, 248 pages. Price USD 80.00 postpaid. ISBN-978-0-8137-2416-4.



The editors chaired a technical session on the paleo-environmental record and application of calcretes and palustrine carbonates at the 32th International Geological Congress in Florence (August 2004) and were inspired to put the present book together. Six contributions from that meeting form the backbone; eight more were added to create a basis for understanding calcretes and paludral carbonates in ancient and recent landscapes. The papers are subdivided into three groups.

The first group deals with ancient landscapes, climate and sequence boundaries, and comprises 6 contributions. Hanneman and Wideman recognise calcic pedocomplexes when at least two calcic paleosols are separated by a C-horizon. With such sequence-stratigraphic markers, regional unconformities at approx. 30, 20 and 4 Ma have been recognised throughout the Great Plains and the West of the USA. Tabor et al. conclude that alternating humid/dry climates in the Carnian Ischigualasto Formation in Argentina are reflected by argilli-, gley- and ventisols with variable amounts of calcitic material. Variable soil drainage and depositional rates characterise a paleosol catena, and climatic changes control lithological compositions and hence landscapes. Mariott and Wright review the preservation bias of paleopedologic features in simple paleosols of the Old Red Sandstone in Southwest Wales. They point out that reactivated, truncated cumulate horizons in floodplains are partly masked by low-magnitude erosion and draw attention to mobile upper soil horizons that were common in early Paleozoic sediments before stabilising rooted vascular plants developed. Tanner and Lucas draw attention to maturity differences and intraformational variations in paleosols in the Late Triassic Chinle Group (Four Corners region, USA). These reflect gradual aridification across the Colorado Platform, and overprint variations in basin sedimentation controlled by base level and tectonics. Sandler established, with carbon and oxygen isotopes of pedogenic calcite from mid-Turonian paleosols, that central Israel was a carbonate shelf emerging during the Mid-Turonian. This is supported by karsts, fluviatile sandstones and soils. Pedogenic calcite allowed the calculation of pCO_2 of which the level suggests high Turonian temperatures. Foley et al. recognised pedogenic carbonates in cold Antarctic deserts. Compared to hot areas, the carbonate content is low, as is the accumulation rate. This may be due to a shallow active layer, low weathering rate and the aridity of the landscape.

The second group of contributions deals with sedimentary environments and facies, and also has 6 contributions.

Parcerisa et al. review lacustrine carbonates in Oligocene alluvial fans in the Catalan coastal ranges (Spain). Two lithostratigraphic units with pond oncolites, open lacustrine/fluviatile/palustrine limestones and tufa-oncolites from ephemeral fluvial settings coalesce synchronously and develop calcrete soils. Armenteros and Huerta discuss the formation of clastic sediments, palustrine facies and calcretes in the Duero basin (Spain) which interfinger with narrow peripheral alluvial fans in the margin of the basin, and are replaced by fluvial systems. Calcretes form from mixed pedogenic and phreatic processes in palustrine

environments. The absence of carbonates reflects an increase in clastic supply due to a more humid climate. Szule et al. established that carbonates of Late Triassic age in the north of the Upper Silesian basin, sandwiched between Carnian gypsiferous red beds and Triassic/Jurassic continental clastics, are fresh-water facies with travertines and that they represent subaereally exposed and altered palustrine/pedogenic deposits. The succession reflects fluctuating humid/arid climates, and the carbonates were deposited in marshy pools fed by circulating groundwater and hydrothermal fluids. Alonso-Zarza et al. studied a succession of Quaternary carbonates in a core from the dry, slightly saline wetland Tablas de Damiel (Ciudad Real, Spain), where peat formed under humid conditions and was admixed with diatoms and sponge spicules. These deposits are followed by fluvial reworked palustrine carbonates from a desiccating fresh-water environment. Thus the Las Tablas sediments are a recent analogue for fresh-water palustrine carbonates. Marty and Meyer studied palustrine carbonates with sedimentary and early diagenetic structures from a subarid-intermediate climate in the Northeastern Pyrenean foreland basin (SW France) around the K–T boundary. The "*Faciès Rognacien"* consists predominantly of fresh-water marsh carbonates, formed in a seasonal wetland, and subordinate lacustrine deposits formed in isolated paleo-lows. Molina et al. recognised calcarenitic grainstones with disaggregated *Microcodium* prisms and subordinate quartz, glauconite, mud- and bioclasts that alternate with pelagic sediments with calcareous nannofossils of Danian-Selandian age. This is the Paleocene Majalcorón Formation in the Subbetic of South Spain. The calcarenites are derived from calcareous paleosols formed during eustatic oscillations around the K–T boundary on an eroding shallow-marine ramp with paleokarst features.

The third group of contributions consists of two papers dealing with calcrete datings and applications.

Rasbury et al. describe a non-pedogenic calcrete with characteristic microcrystalline and textural features and biogenic structures, which contains veins with thin sheets of displacive calcite within a red mudstone. Petrographically and with luminescence, six calcite cement generations have been recognised that are related to rhizoliths and formed in shallow groundwater No vadose textures have been recognised. The cement stratigraphy aids in identification of the non-pedogenic versus pedogenic nature of the carbonates and can be dated with the U–Pb method. Azañón et al. discuss the central section of the Betic Cordillera (southeast Spain), where the 1000m high Guadix depression is filled with late Tortonian–Pleistocene continental deposits topped with a laminar calcrete. From this calcrete, four samples were dated with the U–Th method, and the age of 42.6 $\pm$5.6 ka indicates cessation of continental sedimentation and the beginning of incision/erosion from Late Pleistocene-Recent, during which the highly incised canyon was formed, and the Guadix basin captured by the Guadalriver.

The editors rightly point out that the study of ancient soils accelerates and that the variety of paleosols and their potential application is large. In this book, contributions have been brought together that focus on calcretes and palustrine carbonates, because these deposits contain information that helps in interpreting the sedimentary record and the evolution of the landscape today and in ancient settings.

Overall the editors have succeeded in their objective and the book is a useful and up-to-date reference for all those who are engaged in similar studies. The price, although on the high side, is acceptable for the well executed book.

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