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INTRODUCING CALCRETES – FROM MICROMORPHOLOGY TO BASIN ANALYSIS

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ВЪВЕЖДАНЕ НА КАЛКРЕТИТЕ – ОТ МИКРОМОРФОЛОГИЯ ДО БАСЕЙНОВ АНАЛИЗ

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At the mid of November 2006 in the frame of the Socrates (Erasmus) Program the University of Mining and Geology "St. Ivan Rilski", Sofia, Bulgaria, was visited by Prof. Dr. Ana Mª Alonso Zarza from the Facultad de Ciencias Geológicas, Universidad Complutense de Madrid. During her visit Prof. Alonso-Zarza gave a presentation entitled "Calcretes in the geological record: applications for environmental analyses". The completely full auditorium in the Department of Geology and Paleontology was demonstrative for the interest of the event. Professors and students from the geological faculties of universities of Sofia with specialists from the Geological Institute of the Bulgarian Academy of Sciences and many professionals attended the presentation.

The talk was directed to the Bulgarian geological community in order to discuss the modern definition and classification of the calcretes and their application for stratigraphy and paleoenvironmental studies. Calcretes are terrestrial carbonates that result mainly from the displacive and/or replacive introduction of carbonate into soil, rock or sediments. Their formation is controlled by so many factors that their correct study, plus that of the features they contain, offers invaluable data on ancient terrestrial palaeoenvironments. In recent years, interest in them has increased notably, not only because their importance in paleoenvironmental and paleoclimatological studies, but also because of the special interest to reach a general model for sequence stratigraphy in terrestrial basins, where the calcretes must be necessarily included.

The presentation was based on many case-studies from Spain, such as the Triassic of the Iberian Ranges, the Tertiary of the Madrid Basin and Quaternary deposits from SE Spain and the Canary Islands. Along the presentation the following aspects were discussed:

- Definition of calcretes and discussion on the differences between pedogenic and groundwater calcretes. In pedogenic calcretes, precipitation of carbonate takes places mostly in the vadose zone above the water table, and within a previous host rock or sediment. In groundwater calcretes, the precipitation of carbonate also occurs within a previous host rock and around the groundwater table.
- Mineralogy: calcretes versus dolocretes.
- Source of carbonate and calcium considering the "per-ascensum" versus "per-descensum" model.
- Calcretes as paleosol profiles, focusing on the macromorphological stages and its applications to understand rates of formation and their relationship with the rates of sedimentation and erosion. Examples from alluvial fans were discussed.
- Micromorphology: different biogenic and not-biogenic features were shown. The importance of SEM to detect the origin of the carbonate was discussed. Moreover a special interest was put to consider the role of roots in the precipitation of carbonate.
- The controls on calcrete-soil formation: climate, parent material, vegetation and time-relief were exhaustively analyzed through the study of several examples of ancient and recent calcretes deposits.
- At basin scale, the arrangement of these carbonates in the overall infill of the basin has been used for stratigraphic analysis, either because they (especially calcretes) may be indicators of sequence boundaries or because their characteristics reflect different accommodation rates during basin infill.

The main conclusions were:

- Three main factors control the formation of these carbonates: the position of the water table, the host rock, and the period of subaerial exposure.
- These terrestrial carbonates are widely distributed on floodplains and the distal areas of alluvial basins and should be used for reconstruction of the fluvial architecture.
- Their presence and characteristics can be used as indicators of aggradation, subsidence or accommodation rates, and therefore as indicators of different tectonic regimes.

Ana Maria Alonso-Zarza graduated in 1985 in Universidad Complutense of Madrid. Since then she started her PhD on the sedimentology and petrology of terrestrial deposits of the Tertiary of the Madrid Basin. She finished the PhD in 1989. She worked as a postdoctoral student till 1991, when she started teaching Sedimentary Petrology for geologist and engineering geologists. She also teaches a postgraduate courses on paleosols and also "Petrophysics and weathering of building stones" to graduate students. Her actual permanent position as Professor Titular was obtained in 1993. Her research and publications, till 2005, focused on the analysis of the physical, chemical and biological processes that operate in terrestrial environments, focusing on palaeosols and palustrine deposits, in order to reconstruct ancient terrestrial landscapes. Her studies have centered mostly on the Triassic, Tertiary and Quaternary deposits of Spain. She has also worked in paleosols from Antarctica, Cayman Islands and China. In 2005 she started to work on caves as Natural Monuments and how the study of diagenetic processes in caves can help to preserve them or to minimize the impact of visits.