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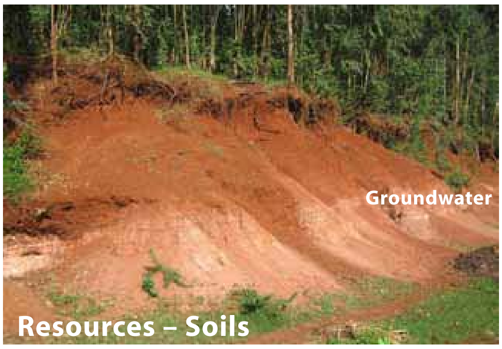
"Challenges for the Planet: Earth Sciences' Perspective"



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the Lower Mesopotamian Plain (Heyvaert and Baeteman, 2007). The geomorphological map of the Lower Khuzestan plain reveals the existence of two Karkheh palaeochannel belts (Kh1, Kh2) in the northern part of the plain. To the south, the Karkheh floodplain is bordered by a Karun mega-fan, consisting of at least three channel belts (K1, K2, K3). South of the city of Ahwaz, a Karun lobe (K4) characterised by a canal network with a radial pattern was detected.

A first case study encompasses the reconstruction of the Karkheh river system during the Late Islamic Period (4th-early 20th century AD). It is documented that the last avulsion of the river Karkheh, from Kh2 to its present-day position Kh3, was induced by the construction of an irrigation canal. The avulsion took place during a single night event in 115 cal BP. A second case study clearly shows that human interventions did not only trigger, but sometimes also obstructed the avulsion of channels. It is proved that the Karun lobe K4 results from the construction of irrigation canals starting from a crevasse-channel cut point through the concave levee of Karun channel K1/K3. Human control blocked the natural development of a crevasse splay into a new palaeochannel. Based on archaeological data, the onset of the K4 lobe is estimated at ca. 2281 cal BP.

This study provides not only an important asset to Near Eastern landscape research and insight into short-term river variability within semi-arid regions, but also creates a valuable example illustrating the use of historical sources within the field of geoarchaeology.

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Paleostress analysis and active tectonics in the Pan-African Lufilian Arc and its Foreland around Mweru Lake (Democratic Republic Congo).

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The study of the active tectonics often arouses the complex question of the reactivation of the tectonic grain. We are investigating the fracturing events that affected the Neoproterozoic Katangan sedimentary sequences in the Lufilian Arc and its foreland of the Kundelungu Plateau. These series host high-grade copper and cobalt ores (Muchez et al., 2007) and were deformed by the Pan-African orogeny (560-520 Ma) (Porada and Berhorst, 2000). The main objective is to determine brittle deformation events and highlight their possible relations with the incipient rifting along the Southwestern branch of the East African Rift System in Southern Africa (e.g. Mweru and Mweru-Wantipa Lakes in the unfolded Katangan foreland and Tshiangalele Lake in the Lufilian Arc).

A SW-NE profile across both the Lufilian Arc and its foreland around the Mweru Lake has been studied to identify fault zones and their possible control on mineralisations. Ore mines and some other fault outcrops have been studied at different locations in Lufilian Arc and in the unfolded Katangan sediments using brittle structures such as faults and joints. These fractures data are used in a palaeostress analysis using the Tensor software (Delvaux and Sperner, 2003). Focusing on the cross-cutting relationships, we suggest a relative succession of brittle tectonic stages and their related tectonic stress state, spanning the large time period between the Lufilian orogeny, up to the neotectonic period.

Although our data should still be considered as preliminary, we believe that we have sampled brittle tectonic events of regional importance, belonging successively to the Pan-African event, a later compressional event of possible Late Palaeozoic – Early Mesozoic age, as well as neotectonic extension related to the Late Cenozoic rifting. The latter is compatible with the tectonic stress inverted from local earthquake focal mechanisms.

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USE OF GEOPHYSICAL TECHNIQUES TO STUDY WATER LOGGING IN EL OBOUR CITY, EGYPT

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El Obour is a newly constructed city in the desert located 25 km from Cairo. The city covers almost 200 km^2 and is characterized by significant variations in topography and geology. These variations play an important role in drainage of sewage and irrigation water from the elevated part of the city at 173 m to the mainly sandy dune bed rock in the lower region at 30 m elevation. In these lower parts, problems arise because of water logging and groundwater mounding. Geophysical techniques, in particular resistivity soundings, have been applied to analyze the subsurface conditions in the study area. One hundred and six vertical electrical soundings have been conducted with a Schlumberger configuration to analyze the type and extend of the ground layers. GIS packages were used as an interface to derive a set of vector and raster maps that show the subsurface characteristics. Low electrical resistivity values of 5 to 15 Ωm are identified as corresponding to clay, clayey silt or clayey sand layers that impede infiltration and restrict ground water drainage. Some of these fan shaped clay layers might reflect old delta branches of earlier geologic times.
The distribution of the clayey layers clearly coincides with the areas facing water logging problems. The closer these clay layers are situated near the surface and the larger their thickness the more water logging is observed. Hence, the distribution of these clay layers can be a key factor to design dewatering strategies. Additionally, groundwater flow can be modeled using the obtained resistivity and lithologic maps to estimate hydraulic conductivities and derive aquifer and aquitard properties. In combination with hydrologic data, this will enable to quantify soil water infiltration and groundwater seepage and to design drainage systems. More studies concerning geology, geography, hydrogeology and other related fields are recommended before constructing such new cities.

LITHOFACIES MAPPING OF THE CRETACEOUS IN FLANDRES AND REFINEMENT OF THE LITHOSTRATIGRAPHIC SUBDIVISION

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The marine sedimentary rock sequence of the Cretaceous covers about 95% of the subsurface of Flanders, only missing on top of the WNW-ESE-running axis and culminating points of the Brabant Massif. The outcrop zone is limited to a narrow band in Limburg to the south of Tongeren and over most of Voeren. The Cretaceous is covered by northwards versus southward thickening Cenozoic sequences, depending on the position north or south of the Brabant Massif. Subsurface mapping is mainly based on correlation of lithological borehole descriptions and geophysical well logs, applying eco- and biostra-