European Mineralogical Conference
Vol. 1, EMC2012-513, 2012
European Mineralogical Conference 2012

Geotectonic setting and structural distribution of basic-ultrabasic and metagranitoid rocks in the Bayuda Desert (Sudan): implication on the preliminary interpretation of the Neoproterozoic crustal evolution in N-E Africa

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The transitional zone between the Saharan Metacraton and the Arabian-Nubian Shield in the central eastern Bayuda Desert is characterized by a large-scale fold interference pattern (Azuma area) and shear zone (Dam ElTor area). Oblique NW-SE directed collision between the Saharan Metacraton and the Arabian-Nubian Shield in the Neoproterozoic is believed to have resulted in E-W shortening forming a N-S trending collisional zone (the Keraf Shear Zone). The central eastern Bayuda Desert is adjacent this N-S trending collisional zone. Geotectonic discrimination diagrams of basic-ultrabasic rocks (Zr-Nb-Y) indicate normal mid-oceanic ridge basalts and within-plate trondhjemite as protoliths. The same rocks show negative Nb and P values for crustal rocks signatures, no mobilization of incompatible elements in the primitive mantle normalized spider diagram and a chondritic normalized REE pattern of primitive melt. The metagranitoids are subalkaline and calc-alkaline. They plot dominantly as volcanic arc and syn-collisional granites according to the Rb, Y and Nb contents. First LA-ICP-MS zircon age data of metagranitoids north of Dam ElTor indicate an age of 914.1+/-5.5 Ma, which can be assigned to the “Bayudian Event”; within Dam ElTor the age is 700+/-7 Ma, while south of the shear zone typical Panafrican ages of 630+/-4 Ma and 645.3+/-5.4 Ma were obtained. Pb-isotopes of K-felspar of these metagranitoids divided them into two groups: samples with higher 207Pb/204Pb ratios (>15.67) and lower 206Pb/204Pb ratios (<18.3) cluster around ratios 15.73 and 18.0 espectively. Samples with lower 207Pb/204Pb ratios (<15.63) and higher 206Pb/204Pb ratios (>18.3) are located south of the shear zone and are associated with the younger ages (Pan-african event). Moreover, rocks north of Dam EtTor are at high-grade metamorphic in contrast to the medium and low grade rocks in the southern part. Preliminary interpretation of rock distribution and structural elements shows a type-II fold interference pattern in the Azuma area formed by probably superposition of strain pattern resulting from approximately NE-SW directed shortening by a later NW-SE shortening, while the NE-SW trending Dam ElTor Zone was formed dominantly by NW-SE directed shortening. Deformation formed by NE-SW shortening is termed here as pre-Dam Eltor deformation. This resulted into earlier F1sub-horizontal folds. They were refolded by a coaxial asymmetric F2 folding event. Both folds trend NW with NE vergence. Deformation resulting from the NW-SE shortening is termed Dam ElTor deformation. Structures related to this deformation trend NE and are manifested as interference pattern at Azuma and fold and thrust belt at Dam ElTor Shear Zone. Further shortening along this trend formed a dextral fault along Wadi Singer. It is likely that pulses responsible for the Bayuda event (920-900 Ma) persisted up to the onset of the Pan-African (?). The beginning of the Pan-African convergence (∼850 Ma), likely superposed the NE trending folds onto the earlier NW trending folds. More LA-ICP-MS-isotope data on metagranitoids to further support such a scenario are in progress.