U-Pb zircon and Sm-Nd data for rocks of the Murmansk domain (Kola Peninsula, NE Baltic Shield)

N. KUDRYASHOV, E. APANASEVICH AND A. DELENITZIN

Geological Institute Kola Science Centre RAS, Apatity, Fersman str., 14.

The Murmansk domain is located in the eastern part of the Kola Peninsula (NE Baltic Shield) and consists mainly of plagiogranitoids and plagiomicrocline granites. Plagiogranites contain a plenty of xenoliths of amphibolites, amphibole-biotite gneisses, diorites, and two-pyroxene schist which are considered to be xenoliths of the basic rocks in primary - crust granitites or relicts of more ancient magic basement, altered by granitization or a product of structural - metamorphic reorganization of the uniform stratified complex of primary - crust granitoids. To understand a geological history of this structure we need careful geological study with the modern geochronological data for the subsequent opportunity of correlation of the Murmansk domain with similar Archaean structures of the Kola Peninsula, the Canadian Shield and Greenland. New geochronological results (U-Pb zircon and T(DM) Sm-Nd) are obtained for some rock complexes spatially placed in the eastern part of the Murmansk domain. U-Pb zircon age for biotite gneisses is 2724 +/-7 Ma; T (DM) Sm-Nd is 3068 Ma. The age of zircon from xenolith of amphibolites is determined as 2739 +/-7 Ma, T (DM) Sm-Nd is 2638 Ma. Plagiogranites from different parts of the investigated territory gave U-Pb ages 2771 +/-10 Ma and 2748 +/-7 Ma, T (DM) Sm-Nd - 2936 Ma and T (DM) Sm-Nd - 2868 Ma, respectively. For diorites U-Pb zircon age is obtained - 2717 +/-7 Ma, T (DM) Sm-Nd - 2862 Ma. The given data testify to the Late Archaean time of formation of the investigated rocks of the Murmansk domain with ages, limited by an interval of 2.7-2.8 Ga. The work is supported by scientific school N 2305.2003.5.

Combined (U-Th)/He and U-Pb thermochronometry of rift-flank exhumation in east-central Africa

D. MACPHEE[1], S.A. BOWRING[1], AND P.W. REINERS[2]

[1]MIT, Cambridge, MA 02139 USA (macphee@mit.edu), (sbowring@mit.edu)

[2]Yale University, New Haven, CT 06511 USA (peter.reiners@yale.edu)

A thermochronologic study combining U-Pb and (U-Th)/He analysis of apatite and zircon was conducted up the eastern slope of the Rwenzori Massif in Uganda to characterize the timing and rate of rift-flank exhumation related to continental rifting in east-central Africa. Rising more than 4 km above the adjacent Albertine Rift Basin floor, the Rwenzori represent an extreme example of basement rift-flank uplift, a phenomenon common throughout the East African Rift System and characteristic of continental rift systems in general. New thermochronologic work coupled with field and remote sensing observations makes the case for recent and non-steady state uplift of the massif. U-Pb apatite results indicate that, prior to Neogene rifting, the rocks of the Rwenzori experienced a protracted history of slow cooling without major tectono-thermal perturbation since at least the Paleoproterozoic (>1550Ma). Comparably old (U-Th)/He zircon and apatite (>400Ma, >70Ma respectively) ages reflect a transient lag period before sufficient exhumation has occured to remove the inherited pre-rift thermal structure. This non-steady state condition of rapid uplift outpacing erosion has resulted in preservation of relict landsurfaces, truncated spurs, hanging valleys, vast stranded bogs and uplifted river terraces at high elevation. Given the typical continental geothermal gradient prior to rifting implied by U-Pb thermochronology, no more than 2km of erosion could have accompanied uplift on the order of 5km in the Rwenzori region. This requires a minimum average uplift rate of 1.6km/Myr based on biostratigraphic evidence suggesting the range rose from beneath local baselevel within the last 2.5Ma. Regardless of the active rock uplift rate of the Rwenzori, net exhumation can not yet have exceeded the depth of the (U-Th)/He closure isotherm in apatite (~2km). These results highlight the danger of modeling young orogenic systems using the simplifying assumption of topographic steady state.