18TH MEETING OF THE CENTRAL EUROPEAN TECTONIC STUDIES GROUPS
25TH MEETING OF THE CZECH TECTONIC STUDIES GROUP

Book of Abstracts

EDITORS: MARGARÉTA GREGÁŇOVÁ, MARÍNA MOLČAN MATEJOVÁ
& VIERA ŠIMONOVÁ

September 22 - 25, 2021
Terchová, Slovakia
CETEG

The Ediacaran active margin along the north-eastern Baidrag block (Bayankhongor Ophiolite Zone, western-central Mongolia)

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The Bayankhongor Ophiolite Zone (BOZ) located at the northeastern margin of the Baidrag microcontinent in the western-central Mongolia represents a key lithotectonic unit of the Mongolian orogenic collage. The BOZ has been traditionally considered as one of a largest and major ophiolitic system representing a vestige of a Neoproterozoic ocean-floor basin that developed between two ancient microcontinents named the Khangai in the northeast and Baidrag in the southwest. However, the age, petrology and tectonic setting of many magmatic complexes of the BOZ are still poorly constrained. In order to fill the gap, we carried out geochemical and isotopic characteristics as well as zircon U-Pb ages and Hf isotopic data of magmatic rocks from the Khan-Uul area in the southeastern part of the BOZ. The rock assemblage of the Khan-Uul area is composed of volcanic rocks intercalated with the carbonates and ultrabasic to felsic magmatic rocks commonly having both cumulate and mingling textures. The studied rocks were affected by the greenschist to lower amphibolite facies metamorphism. Nearly all samples including the serpentinite (Mg# = 81 – 90 mol.%), the gabbro (Mg# = 71 – 81 mol.%) and the TTG-type intermediate to felsic rocks (Mg# = 15 – 47 mol.%) reveal primitive geochemical characteristics and notable depletion in K_2O (K_2O/Na_2O = 0.01 – 1 wt.%). Based on the geochemical characteristics, they indicate a transitional composition from mainly tholeiitic to calc-alkaline. The REE and trace-element patterns show obvious enrichment in large-ion lithophile elements (including Cs, Ba, K, Sr and Pb) relative to highly depleted high-field strength elements such as Nb, Ta, Zr and Ti. In general, such a geochemical characteristic indicates a magmatic arc source and oceanic subduction environment. A whole-rock Sr-Nd isotopic data of magmatic rocks from the Khan-Uul area reveal a broad range from negative to positive initial epsilon Nd values (ε_{Nd}^{590} = -3.9 to +2.2) with relatively young Nd model ages ($T_{DM}^{Nd}{}_{.2stg}$= 1559 - 1079 Ma) pointing to a limited crustal contamination. U-Pb ages of 10 dated samples revealed that the magmatic rocks were mainly emplaced during the Ediacaran (ca. 600 – 570 Ma). In-zircon Hf isotopic analyses exhibit significantly positive epsilon Hf values for zircons of Ediacaran age ($\varepsilon_{Hf}^{(t)}$ = +3.9 to +13.8) with variable two-stage Hf model ages ranging from 1499 to 658 Ma. In contrast, samples of trondhjemite

show mostly negative ($\varepsilon_{Hf}{}^{(t)}$ = -5.5 to -1.5) and a few positive ($\varepsilon_{Hf}{}^{(t)}$ = +1.3 to +6.1) epsilon Hf values with relatively older Hf model ages ranging from 2389 to 1081 Ma. Our geochemistry data indicate that the studied magmatic rocks from the Khan-Uul area originated in the relatively primitive Ediacaran magmatic arc. The whole-rock Sr-Nd and zircon Hf isotopic data further suggest the dominant contribution of the juvenile material via partial melting of the depleted mantle with only minor crustal components. This study shows that a large part of the southeastern BOZ does not belong to the ophiolite suite as it was widely accepted. Contrary to broadly assumed knowledge, the current data point to an active margin evolution of the northeastern edge of the Baidrag Block during Ediacaran.

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