U-Pb zircon geochronology of the Plovdiv pluton (Sahat tepe locality)

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The Plovdiv pluton is intruded along the Maritsa strike-slip fault in the southern part of the Central Srednogorie Zone. The erosion is exposing several hills in the town of Plovdiv providing excellent outcrops for studying the pluton. The last comprehensive petrological study is made by Bojadziev (1973). The pluton is believed to be intruded in Upper Cretaceous lava rocks and metamorphic basement (Dabovski et al., 2009 and ref. therein). The K-Ar ages of feldspars and amphiboles are giving comparatively wide interval of the formation of the rocks in the range of 81–78 Ma (Boyadjiev, Lilov, 1981). The aim of the present study is to constrain better the igneous age of crystallization of the main phase of the pluton using high temperature zircon geochronology. It is part of ongoing petrological study of the Plovdiv pluton.

Macroscopic petrological features of the Plovdiv pluton: a) Sahat tepe locality; b) block-prismatic jointing in the monzonites from Alyosha tepe locality; c) macroscopic mineral composition of the monzonites of the Plovdiv pluton; d) an aplitic vein crosscutting the monzonites and a mafic enclave; e) a xenolith entrained from a mafic enclave; f) a mafic enclave with a quenching zone

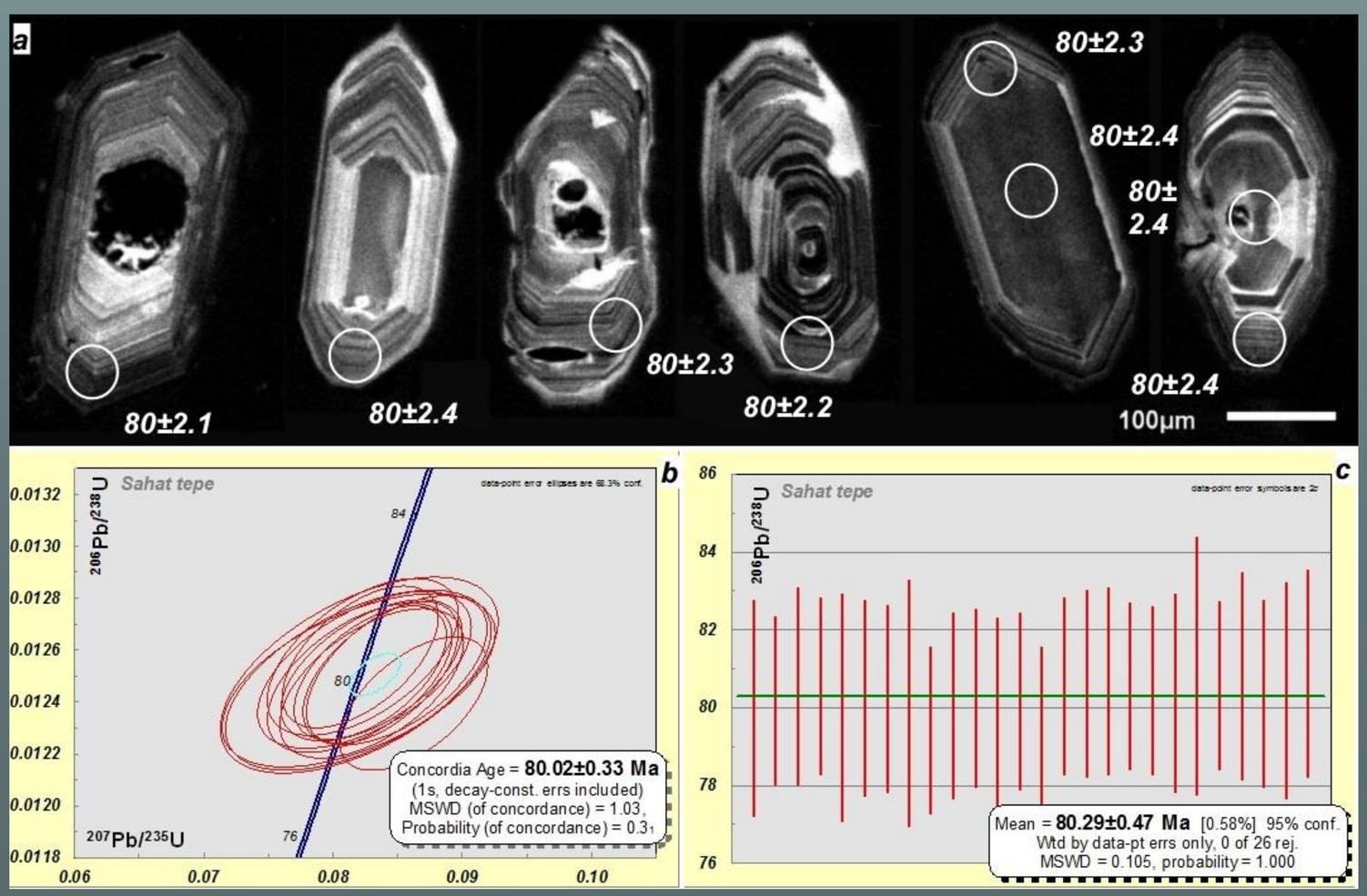
Petrology of the Plovdiv pluton: a) mafic “dyke” crosscutting the monzonite; b) mafic enclaves; c) an aplitic vein crosscutting the monzonite and a mafic enclave

Upper Cretaceous basaltic andesite lava flow with pahoehoe upper surface texture from the frame of the Plovdiv pluton, Lalut tepe locality

The main igneous phase is presented by monzonites to monzo-diorites that constitute most of the pluton. Many mafic inclusions and sill-like or irregular small bodies suggest mingling of at least two different by composition magmas. The latest phase is presented by aplitic veins and thin porphyritic dikes.

For the present geochronological study the monzonites from Sahat tepe locality were sampled. Cathodo-luminiscence (CL) images of the separated zircons were made prior to zircon analyses to identify inherited cores, cracks and inclusions. U–Pb isotope analyses of particular zircon zones were carried out using a New Wave Research (NWR) Excimer 193 nm laser-ablation system attached to a Perkin-Elmer ELAN DRC-e inductively coupled plasma mass spectrometer (LA–ICP–MS) at the Geological institute, Bulgarian Academy of Sciences.

27 spot analyses of different zones of the zircons were made. The zircons exhibit similar features with well-expressed oscillatory zonation, typical for crystallization in magmatic conditions. The crystals are predominantly short to medium prismatic and some of them reveal complex internal structure. Nevertheless analyzing some of the cores they show similar ages suggesting dynamics in the magma chamber. Apatite inclusions are also observed. The calculated Concordia magmatic ages determined by most of the analyses are 80.02 ± 0.33 Ma corresponding to the igneous formation of the rock.



Geochronology of the Plovdiv monzonite – Sahat tepe locality: a) cathodoluminiscence (CL) images of the studied zircons; b) Concordia age diagram; c) weighted average diagram

References

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