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Two episodes of magmatic activity in Sudetes: towards improving age constraints

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Magmatic activity during the Variscan orogeny in the Sudetes region (NE Bohemian Massif, Poland) took place in two main episodes at ca. 340 Ma and ca. 300 Ma (Jastrzębski et al. 2018, Jokubauskas et al. 2018), which are roughly related to the late-collisional and post-collisional stages of the orogen. The older episode is dominated by plutonic rocks, mainly diorites and granodiorites, emplaced along shear zones located parallel to the NE border of the Bohemian Massif (Oberc-Dziedzic et al. 2015, Jastrzębki et al. 2018). In contrast, rocks of the younger episode include both volcanic (mainly rhyolitic) and plutonic rocks (diorites, granodiorites, granites) randomly erupted/emplaced within the NE part of the Bohemian Massif (e.g. Turniak et al. 2014, Szczepara et al. 2014). The different tectonic setting of magma emplacement between the two episodes is consistent not only with the structural position of the magmatic bodies but also their geochemistry. For example, dioritic rocks of comparable silica content are characterized by pronounced negative Nb, Ta, Ti anomalies in the older generation of intrusions, whereas these chemical features are absent in the younger rocks. each of the episodes of magmatic activity seems to be prolonged over several million years, e.g. two different diorite dykes from the older igneous episode were emplaced 6 My apart at 342 Ma and 336 Ma (Pietranik et al. 2013) and a time range of 10 My (from 305 to 295 Ma) was observed for the younger magmatic episode in both rhyolitic (Szczepara et al. 2014) and granitoid rocks (Turniak et al. 2014). However, all the geochronological data collected so far are U-Pb ages obtained on zircon grains using either LA-ICP-MS or ion probe. In spite of their high spatial resolution, these techniques result in ages having a precision of ca. 1%, therefore hindering our ability to determine the time range of emplacement/eruption of the magmas during the two episodes. In this contribution, we have re-evaluated the age from two dioritic dykes previously studied by Pietranik et al. (2013) using the more precise and accurate CA-ID-TIMS U-Pb zircon dating. These dykes have identical CA-ID-TIMS ages of 340.37 $\pm$ 0.19 Ma for an apparently younger dyke (previously dated at 336 Ma) and 340.02 $\pm$ 0.07 Ma for an apparently older dyke (previously dated at 340 Ma). The new age constraints have several implications: (1) each of the episodes could be shorter than expected and (2) chemically, isotopically and physically different dioritic magmas can be emplaced close in space and time suggesting contemporaneous melting of heterogeneous crust or crust-mantle system in diverse conditions.

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