Central European carbonatites under cover: insights for mineral exploration from the Tajno alkaline intrusions, NE Poland

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The Carboniferous sub-platform Tajno alkaline-carbonatite intrusion is located within a narrow alkaline magmatic belt, which trends E–W from SW Lithuania to NE Poland, along the southern rim of the Mesoproterozoic A–type Mazury Complex. The Tajno pluto–volcanic massif comprises clinopyroxenite cumulates and syenites that are crosscut by carbonatite veins of variable thickness. An emplacement age for the carbonatite has been obtained based on zircon U–Pb and pyrrhotite Re–Os from albitites crosscut by the intrusion. Both ages cluster at 354–345Ma, which corresponds to the Tournaisian Epoch of the Early Carboniferous Period.

The carbonatite is 5 to 20Ma younger than the Kola Province, Russian Federation [1]. The current Tajno pluto-volcanic massif lies under ~600m of a Meso–Cenozoic cover. Carbonatite igneous systems are formed by processes of partial melting in metasomatised lithospheric mantle, and are associated with mantle plumes. This implies that a specific geochemical footprint may be spread throughout the host rocks and overlying sedimentary cover by post–emplacement processes. This is of key importance for carbonatite mineral exploration under cover.

The Tajno carbonatitic veins do not contain typical accessory minerals (e.g. pyrochlore, perovskite, zirconolite, baddeleyite) that are classically found in other carbonatites. Instead, REE-bearing minerals such as burbankite, parisite, synchysite and bastnaesite are common. This explains its low Nb content. By contrast, fluorite is abundant as cement in the carbonatite breccia.This new study of alkaline-carbonatite rock assemblages is focused on: (1) characterise Tajno's isotopic, REE and HFSE footprint based on petrographic and geochemical observations of apatite and titanite; and (2) increase the understanding of Tajno–type carbonatitic intrusions in the region, and determine if such intrusions can be detected under the sedimentary cover by geochemical techniques.

[1] Demaiffe et al.,(2013) *The Journal of Geology* **12**, (1), 91–104