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Occurrences of igneous rocks in the Adriatic Sea: a possible indicator of the Paleozoic supercontinent disintegration

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Islands of the Adriatic Sea are part of the Mesozoic Adriatic Dinaridic Carbonate Platform (ADCP) and so are mostly comprised of limestones. Occurrences of igneous rocks inside ADCP are in general extremely rare, with the exception of two small islands, Jabuka and Brusnik, which are completely igneous in origin. Small outcrops of igneous rocks can also be found on the island of Vis. Samples used in this research where gathered on a diving expedition of the islands Jabuka and Brusnik and a previously unknown and unexplored underwater (14-25 m b.s.l.) locality - Brusnik Shoal.

Samples are mostly hypidiomorphic holocrystalline medium-grained rocks with a massive, locally ophitic texture. Mineral composition is dominated by clinopyroxene and weakly zoned polysynthetic twins of plagioclase. Subordinate are secondary aggregates of amphibole (uralite), chlorite, sericite, biotite, apatite and fine-grained opâque minerals while microfissures are filled with non-oriented needles of prehnite and calcite. Petrographically, all samples are determined as gabbro to gabbro-diorite.

Major and trace element signature, characterized by low content of MgO (2.43-5.01 wt. %), low magnesium number (34-53), low content of Ni and Cr (6-12 and 6-61 ppm, respectively) is typical for calc-alkaline to tholeiitic gabbros and shows that the parental magma was not primitive by nature. Trace element patterns, high LILE/HSFE and chondrite-normalized LREE/HREE ratios (LaN/YbN: 3.27 – 5.26), Eu anomaly (Eu/Eu*: 0.75 – 0.93), low Nb (2.2 – 3.8 ppm) and high Pb (2 – 18 ppm), together with elevated P, Zr, Ti, U, Th, K concentrations studied in this research point to an active marginal setting with significant contribution from the recycled continental crust. Observed geochemical characteristics point to a single igneous event that led to the formation of all studied samples. At the same time, different degrees of crustal contamination, fractionation of pyroxene and plagioclase and/or development of stratification inside the igneous body, together with a varying degree of alteration (chloritization, uralitization, prehnitization, albitization) and weathering, resulted in slight diversification between the studied sites/samples.

The samples gathered during this research are compared to those of wider Mediterranean area (particularly with Moroccan localities) related to the rifting system that lead to the continental breakup and the formation of the oceanic domain. Data obtained here indicate an existing connection between those localities i.e. petrogenetic processes.

When all geochemical characteristics are put into previously published, although wide, age context (K-Ar and Ar-Ar ages; ranging 276-200 Ma), correlation of recorded petrogenetic processes with the Triassic magmatism i.e. active continental margin setting (continental breakup) becomes quite tentative. From that perspective these scarce localities inside the Adriatic Sea may be regarded as the easternmost occurrences of Central Atlantic Magmatic Province (CAMP)-like rocks and possibly an important source of information about the processes that accompanied the disintegration of the Paleozoic supercontinent Pangea.