



Sr-Nd isotope, trace and RE element geochemistry of the Ordovician magmatism in the southern Variscides

L. BUZZI (1), A. FUNEDDA (2), L. GAGGERO (1) AND G. OGGIANO (3)

(1) Dipartimento per lo studio del territorio e sue risorse, Università di Genova, (2) Dipartimento di scienze della Terra, Università di Cagliari (3) Istituto di scienze geologico – mineralogiche, Università di Sassari

New geochemical and Sr - Nd isotopic data on whole rocks (16 samples) for basic igneous rocks from Nappe Zone and Internal Zone of Sardinia have been carried out. The results enable us to describe a succession of igneous events occurred in different and subsequent geodynamic environments. In the Sardinia Lower Paleozoic basement, three igneous events can be distinguished on the ground of stratigraphy, isotope geochemistry and U-Pb radiometric dating (Di Pisa et al., 1992; Buzzi et al., 2007): 1) a Cambro-Ordovician intermediate to felsic calc-alkaline volcanism, 2) an Early Ordovician bimodal, alkalic, volcanic and hypabissal magmatism and 3) a Late Ordovician alkalic, basic plutonism and felsic volcanism.

1. In the Nappe Zone, trachyandesites are emplaced during the Cambro-Ordovician. They are associated to rhyolite (U-Pb LA-ICP-MS zircon dating: ~490 Ma, Buzzi et al., 2007) or dacite lavas. The Cambro-Ordovician metavolcanic rocks vary in composition from sub-alkaline basalt and andesite to trachyandesite, dacite and rhyolite and show calc-alkalic affinity. They are strongly enriched in LIL elements and exhibit poorly to slight fractionated REE patterns and negative Eu anomalies. The high Th/Ta and La/Nb are consistent with an orogenic component in the sources of the magmas. The negative initial ϵ_{Nd} values, between -4.07 and -6.54, suggest a relatively enriched source with respect to a depleted mantle source. This magmatic event was probably related to a Cambro-Ordovician arc setting.
2. In the Internal Zone, volcanoclastites, volcanites and sills emplaced into the diamictic metapelite and oolitic ironstones sequence at the Early Ordovician. In

the Meana Sardo Unit (Nappe Zone), large bodies or dykes are intruded into the Cambro-Ordovician metasandstones. In the Gerrei region (Nappe Zone), the metabasites occurred within metamorphosed reworked andesitic and dacitic lavas, topped by Mid Ordovician andesites (~ 465 Ma, U-Pb LA-ICP-MS zircon dating, Buzzi et al., 2007). A geochemical alkaline affinity was recognised for the basic protoliths. On the whole, they show fractionated REE patterns. REE-enriched compositions are characterised by positive Eu anomalies. The lack of Eu anomaly in slightly REE-enriched compositions is coupled with higher Mg# than in REE-rich compositions. An anorogenic geochemical signature can be envisaged by Th/Ta and the La/Nb ratios, typical of intraplate alkali basalts. The initial ϵNd values range between +2.42 and +4.14, supporting a depleted mantle source. A continental rift geodynamic setting is suggested by the geochemical data for the alkaline basic rocks, they probably attained the formation of the Rheic ocean.

3. In the Internal Zone, coarse-grained alkali gabbros emplaced as large bodies within Upper Ordovician metasediments. Their initial ϵNd values range between +1.68 and +3.02 suggesting an origin from a depleted mantle source. The Late Ordovician magmatism likely represents the onset of the palaeo-Tethys expansion.

REFERENCES

Buzzi L., Funedda A., Gaggero L., Oggiano G. and Tiepolo M. — U-Pb zircon dating (LA-ICP-MS) of the Ordovician felsic volcanism through the Variscan Units in Sardinia (Italy). EGU General Assembly 2007, Wien, 15-20 April 2007, abstract.

Di Pisa A., Gattiglio M. and Oggiano G. (1992) — Pre-hercynian magmatic activity in the nappe zone (internal and external) of Sardinia: evidence of two within plate basaltic cycles. IGCP N. 276, Newsletter 5, 107-116.