



Role of the Ollo de Sapo massive felsic volcanism of NW Iberia in the Early Ordovician dynamics of northern Gondwana

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ARTICLE INFO

Article history:

Received 30 March 2009

Received in revised form 24 August 2009

Accepted 4 September 2009

Available online 12 September 2009

Keywords:

Ordovician magmatism

Metavolcanic rocks

Ollo de Sapo Fm.

Variscan belt

Northern Gondwana

ABSTRACT

The Ollo de Sapo Fm. in the Sanabria region of NW Iberia consists of subvolcanic, volcanic and volcano-sedimentary rocks underlying and partly intercalated with Early Ordovician, platform-facies sediments. Granitic plutons of the same age, presently transformed into orthogneisses, are genetically related. The metavolcanic rocks are dacites and rhyolites with potassic and peraluminous character, and volcanic arc signature, possibly inherited from the melting of calc-alkaline crustal material. In the study area, the Ollo de Sapo Fm. is made up of two large superposed volcanic domes separated by a thin screen of contemporaneous metapelites and sandstones. The domes underwent endogenous growth with subvolcanic, phenocryst-rich magma intruding and cooling under a volcanic and volcanoclastic shield. The western dome tapers to the east and underlies the younger eastern dome, suggesting that the whole formation consists of several volcanic edifices replacing each other along the 570 km outcrop belt of the Ollo de Sapo Fm.

Two new U–Pb protolith ages of 488 ± 6 Ma and 472 ± 12 Ma match, within error, the known age span for the Ollo de Sapo Fm. in Iberia (495–483 Ma). The younger age dates an augen gneiss at the core of the eastern volcanic dome, whereas the older date comes from the overlying volcanic sequence, suggesting intrusion of the augen gneiss protolith into the overlying volcanic rocks.

An incipient rift involving necking of crustal-scale boudinage a few hundred km landward of the edge, but still within the wide passive margin of northern Gondwana may explain the linear distribution of the Ollo de Sapo Fm. and the limited time span of massive volcanism. The heat for crustal melting was probably supplied by mafic magmas intruding or underplating the lower crust. The Early Ordovician felsic magmatism of NW and Central Iberia seems to form part of a large siliceous province linked to break-up and terrane dispersion of the northern Gondwana realm.

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1. Introduction

Many segments of the Variscan belt are characterized by the presence of large bodies of augen gneisses and metavolcanic rocks. These igneous massifs occur in sedimentary deposits of late Proterozoic to Silurian ages. Many of them are granitic massifs of roughly the same age (latest Cambrian to Early Ordovician), presently transformed into orthogneisses and geochemically related. Most intrude the lower parts of the late Proterozoic–Paleozoic sequence, and are coeval with sedimentation in a stable continental platform, supposedly the passive margin of northern Gondwana.

The geodynamic significance of the Cambro–Ordovician magmatism has been related to either extension or convergence (Mattauer, 2004). A rift origin seems clear for alkaline to per-alkaline granites (Lancelot and

Allégret, 1982; Pin et al., 1992), but some workers have interpreted the calc-alkaline signature of most massifs as evidence of their origin in a volcanic arc above an active subduction zone (Soliva et al., 1989; Gebauer et al., 1993; Valverde-Vaquero and Dunning, 2000).

In the Central Iberian Zone of NW Iberia (Julivert et al., 1972), granitic orthogneisses with the characteristics described above are common, but the best example of Early Paleozoic magmatism is the metavolcanic assemblage of the Ollo de Sapo Fm. The name was first used by Hernández Sampelayo (1922) and the formation was first described in detail by Parga Pondal et al. (1964), who indicated its name (meaning toad's eye in the Galician language) to be local and derived from the bluish quartz porphyroclasts common in the low-grade porphyroids that are one of the typical facies of the formation.

These authors recognized sedimentary rocks, such as arkosic conglomerates, schistose arkoses, and subordinate quartz–schists and quartzites, and also acid volcanic rocks, essentially rhyolitic tuffs. They also described the occurrence of the Ollo de Sapo Fm. in a narrow antiformal structure extending from the Cantabrian coast in northern Galicia to the Hiendelaencina region in the eastern part of the Spanish

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Central System (Fig. 1). Although Early Ordovician felsic volcanism occurs elsewhere in the Iberian Massif, the Ollo de Sapo Fm. is strictly speaking limited to this narrow strip, which delineates the southern part of the Ibero–Armorican arc, and to a few, nearby outcrops to the west (Iglesias Ponce de León and Ribeiro, 1981; Farias, 1990).

The Ollo de Sapo Fm. has been studied by many researchers, and several interpretations have been proposed for its origin, from purely sedimentary to volcanoclastic, to volcanic and plutonic (Parga Pondal et al., 1964; Capdevila, 1969; Navidad, 1978; González Lodeiro, 1980; Ortega et al., 1996; Díaz García, 2002a,b). This paper presents a

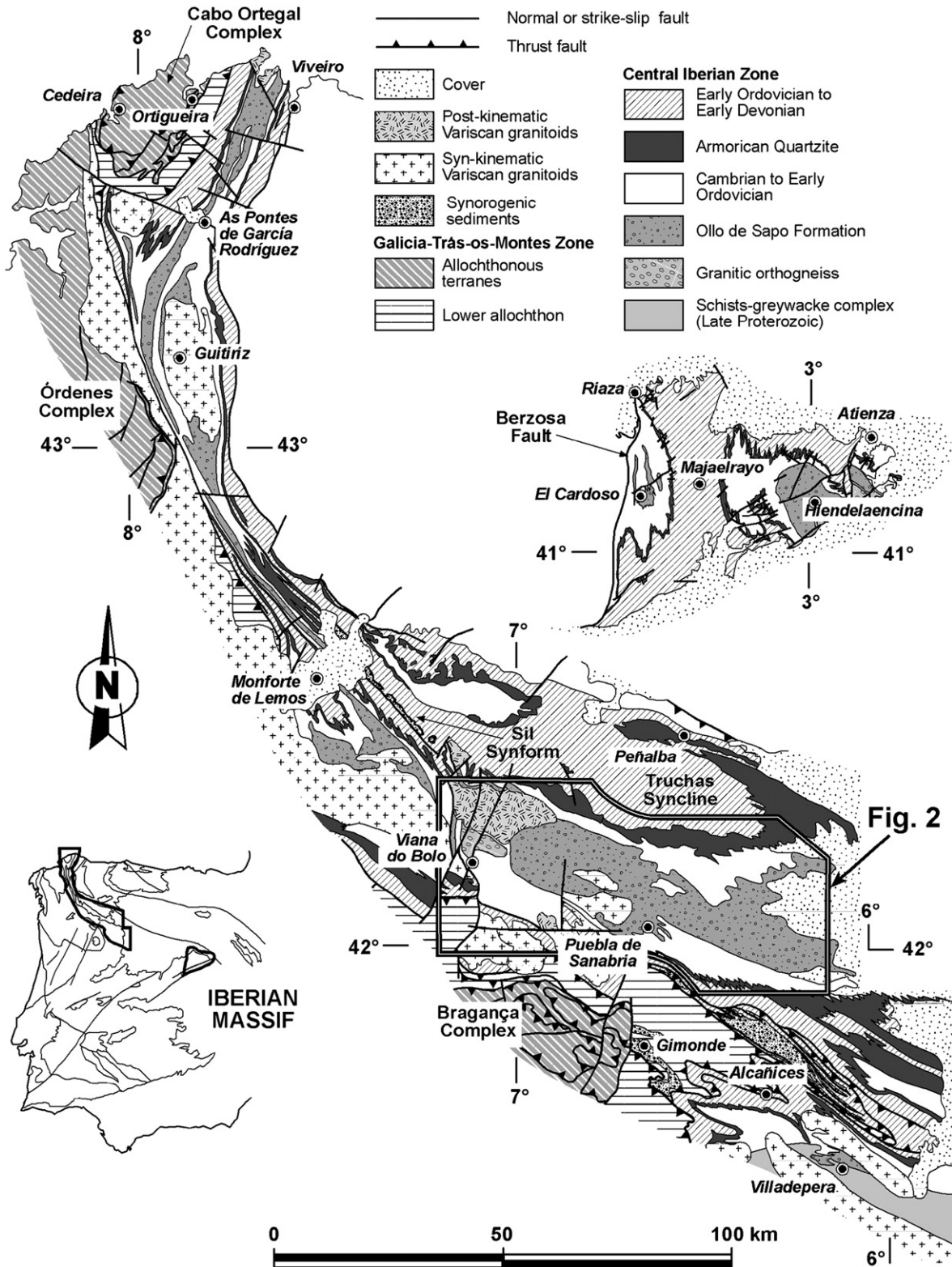


Fig. 1. Sketch of the Ollo de Sapo antiform in the Galicia, Sanabria and Hiendelaencina regions. Inset shows the position in the Iberian Massif. Location of study area is also shown. After Martínez Catalán et al. (2004b).

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