Tectonic evolution and global crustal architecture of the Variscan crust of the European Variscan belt constrained by geophysical data

Karel Schulmann*[1,2], Jean Bernard Edel[3], José Ramón Martínez Catalán[4], Stanislaw Mazur[5], Alexandra Guy[6], Jean-Marc Lardeaux[2,7], Puy Ayarza[4], and Imma Palomeras[4]

[1]Institut Terre et Environment de Strasbourg, Université de Strasbourg, UMR 7063, 1 Rue Blessig, 67084 Strasbourg – université de Strasbourg – France

[2]Center for Lithospheric Research, Czech Geological Survey, Klárov 3, 11821, Prague 1 – République tchèque

[3]Institut Terre et Environment de Strasbourg, Université de Strasbourg, UMR 7063, 1 Rue Blessig, 67084 Strasbourg – Université de Strasbourg, CNRS – France

[4]Departamento de Geología, Universidad de Salamanca, 37008 Salamanca – Espagne

[5]Institute of Geological Sciences, Research Centre in Krakow, Senacka 1, 31-002 Krak´ow – Pologne

[6]Center for Lithospheric Research, Czech Geological Survey, Klárov 3, 11821, Prague 1 – République tchèque

[7]Géoazur - UMR 7329, Université Côte d'Azur, 250 Rue A. Einstein, Sophia-Antipolis, 06560 Valbonne – Université Côte d'Azur (UCA) – France

Résumé

European Variscan system is defined by Devonian collision of the Gondwana derived microcontinent with the main Gondwana landmass. This microcontinent is preserved as a an allochthonous and non-cylindrical body called the Mid-Variscan Allochthon (MVA) surrounded by Devonian Mid-Variscan suture (MVS) complexes (Martínez Catalán et al., 2021). The main collisional process is related to deep lithospheric relamination of subducted continental Gondwana crust (or arc) beneath the upper plate lithosphere followed by translithospheric diapirism of granulitized UHP crust (Maierová et al., 2021). Later the whole system suffers sever deformation during supercollision with the Laurussia after closure of the remnant Rhenohercynian Ocean (RO). A comprehensive set of seismic and potential field data from the European continental crust (from Portugal to Poland) is used to interpret its general architecture resulting from above processes (Schulmann et al., 2022). The high amplitude, short-wavelength gravity anomalies correlate with the outcrops of eclogites, ultramafic rocks and ophiolites delineating the main body of the MVA and the MVS. On the other hand, the short wavelength negative gravity anomalies developed in the central part of the belt coincide with occurrences of lower plate granuliteized diapirs and Carboniferous (330–310 Ma) per- to meta-aluminous magmatic bodies. The magnetic data show two belts correlated with Carboniferous Rhenohercynian and Devonian Mid-Variscan magmatic arc granitoids. The two subduction systems are also well-imaged by moderately dipping primary reflectors in reflection seismic lines. Younger moderately dipping reflectors in the upper-middle crust coincide with outcrops of Carboniferous detachments, limiting granite plutons and core complexes

*Intervenant

along-strike the core of the Variscan orogeny. Deep crustal reflectors are considered as an expression of lower crustal flow resulting from extensional re-equilibration of the previously thickened Variscan crust. A P-wave velocity logs synthesis shows a high-velocity cratonic crust surrounding a thin Variscan orogenic crust defined by low-velocity lower and middle crusts. The latter crustal type coincides with regional outcrops of 330–310 Ma per- to meta-aluminous granitoids and associated gravity lows along-strike the belt. All these data are used to discuss building processes and architecture of possibly best preserved Tibetan type fossil orogen on Earth including mechanisms of crustal re-equilibration afterwards.

Mots-Clés: Geophysics, Variscan belt architecture