

How many subduction in the Variscan orogeny? Insights from numerical models

Alessandro Regorda ^{*1}, Jean-Marc Lardeaux ², Manuel Roda ¹, Anna Maria Marotta ¹,
Maria Iole Spalla ¹

¹ Department of Earth Sciences, Università degli Studi di Milano - Italy

² UMR Géoazur, Université Nice Sophia-Antipolis - France

The Variscan belt is the result of the Pangea accretion, a prominent feature of the European continental lithosphere (von Raumer et al., 2003). The debate on the number of oceans and subduction systems that have been active during mountain building is still open (Faure et al., 2009; Franke et al., 2017). Two scenarios concerning the geodynamic evolution of the Variscan belt have been proposed:

- 2) Monocyclic scenario: this geodynamic reconstruction assumes a single long-lasting south-dipping subduction of a large oceanic domain. For some authors Armorica remained more or less closed to Gondwana during its northward drift, in agreement with the lack of biostratigraphic and paleomagnetic data that suggest a short-lived narrow oceanic domain (lesser than 500-1000 km; Matte, 2001; Faure et al., 2009; Lardeaux, 2014);
- 3) Polycyclic scenario: this geodynamic reconstruction envisages two main oceanic basins opened by the successive northward drifting of two Armorican microcontinent and closed by opposite subductions (Lardeaux, 2014; Franke et al., 2017). The northern oceanic basin is identified as the Saxothuringian ocean, while the southern basin can be identified as the Medio-European ocean (Lardeaux, 2014). The width and the duration of the Medio-European oceanic domain are debated due to discrepancies between metamorphic and paleo-geographic data.

Models of single and double subduction have been developed to verify which scenario better fit with Variscan P-T evolutions from the Alps and the French Central Massif (FCM). From the comparison between model predictions and natural Variscan P-T-t estimates results that data from the Alps with high P/T ratios and accurate radiometric ages better fit with the double subduction model, supporting that a polycyclic scenario is more suitable for the Variscan belt evolution. On the other hand, data of the FCM with high P/T ratios that fit with both single and double subduction models have poorly constrained geological ages and, therefore, are not suitable to discriminate between mono- and polycyclic scenarios. Moreover, considering the FCM, the predictions of the models open to the possibility that rocks of the Upper Gneiss Unit could derive from tectonic erosion of the upper plate and not only from the ocean-continent transition of the lower plate (Regorda et al., 2020).

Mots-Clés : Numerical modeling, Variscan orogeny, double subduction

References

- Faure M., Lardeaux J.-M. and Ledru P.; 2009: *A review of the pre-Permian geology of the Variscan French Massif Central*. Comptes Rendus Geoscience, **341**, 202-213.
- Franke W., Cocks L.R.M. and Torsvik T.H.; 2017: *The Palaeozoic Variscan oceans revisited*. Gondwana Research, **48**, 257-284.
- Lardeaux J.-M.; 2014: *Deciphering orogeny: a metamorphic perspective. Examples from European Alpine and Variscan belts. Part II: Variscan metamorphism in the French Massif Central – A review*. Bull. Soc. géol. France, **185(5)**, 281-310.
- Matte P.; 2001: *The Variscan collage and orogeny (480-290 Ma) and the tectonic definition of the Armorica microplate: A review*. Terra Nova, **13(2)**, 122-128.
- Regorda A., Lardeaux J.-M., Roda M., Marotta A.M. and Spalla M.I.; 2020: *How many subduction in the Variscan orogeny? Insights from numerical model*. Geoscience Frontiers, **(11)**, 1025-1052.
- von Raumer J. F., Stampfli G.M. and Bussy, F.; 2003: *Gondwana-derived microcontinents –*

Ne rien inscrire dans cette zone et ne pas modifier les marges des pieds de page et entêtes sans quoi votre résumé sera systématiquement refusé

the constituents of the Variscan and Alpine collisional orogens. Tectonophysics, **365**, 7-22.

Ne rien inscrire dans cette zone et ne pas modifier les marges des pieds de page et entêtes sans quoi votre résumé sera systématiquement refusé