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Tectonic and petrologic evolution of the Western Mediterranean: the double polarity subduction model

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The geochemical composition of the mantle beneath the Mediterranean area is extremely heterogeneous. This feature results in volcanic products whose geochemical features in some cases do not correspond to the geodynamic environment in which they are sampled and that is observed at present day. The subduction-related models that have been developed during the last decades to explain the evolution of the Western Mediterranean are mainly based on geologic and seismologic evidences, as well as petrography and age of exhumation of the metamorphic units that compose the inner parts of the different arcs. Except few cases, most of these models are poorly constrained from a petrologic point of view. Usually the volcanic activity that affected the Mediterranean area since Oligocene has been only used as a corollary, and not as a key constrain. This choice is strictly related to the great geochemical variability of the volcanic products erupted in the Western Mediterranean, due to events of long-term recycling affecting the mantle beneath the Mediterranean since the Variscan Orogeny, together with depletion episodes due to partial melting. We consider an evolutionary scenario for the Western Mediterranean based on a double polarity subduction model according to which two opposite slabs separated by a transform fault of the original Jurassic rift operated beneath the Western and Central Mediterranean. Our aim has been to reconstruct the evolution of the Western Mediterranean since the Oligocene considering the volcanic activity that affected this area since ∼30 Ma and supporting the double polarity subduction model with the petrology of the erupted rocks.