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VS24 Volcano Geology

IAVCEI (Volcanology, Geochemistry)

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Abstract content:

A multi-discliplinary approach to understanding volcanism and geodynamic evolution of the Miocene Cabo de Gata volcanic field, southeast Spain

The Miocene Cabo de Gata (CdG) volcanic zone covers ~40 km^2 in southeastern Spain. A wide variety of volcanic features together indicate eruption in shallow-subaqueous to emergent conditions. Our studies have encompassed physical volcanology, geochronology, geochemistry, and geophysics in order to provide a four-dimensional view of a minimum of 5 Myr of volcanic activity and the geodynamic controls on magmatism.

Well-preserved facies indicate a subaqueous depositional environment. Dome volcanism predominates; in general, domes spilled passively onto the sea floor, with related feeder dikes and sills common. Facies comprise massive, columnar-jointed and locally flow-banded lava that commonly grades into hyaloclastite that in turn progresses outward to resedimented breccia. Debris-avalanche deposits represent collapse of these domes; in general avalanches did not travel long distances and locally contain megaclasts. Pumice deposits represent both vesiculated carapace and reworked explosive deposits, although the latter are more rare.

The oldest rocks in the CdG zone are to the SW and are likely somewhat older than Serravillian (~13.5 Ma), based on our oldest $^{40}Ar/^{39}Ar$ dates; the youngest, to the NE, are Tortonian (~8.5 Ma) although the majority of volcanism had ended by 10.5 Ma. Shoshonitic to high-K calc-alkaline rocks dominate the early stages of volcanic activity, whilst calc-alkaline basaltic andesite to rhyolite prevail in the late stages. Whole rock and trace element geochemistry along with Sr and Nd isotopes indicate that each pulse of magma differentiation started from a different parent. These parental magmas were produced by partial melting of a heterogeneous mantle wedge metasomatized by recycled subducted sediments.

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Cabo de Gata subaqueous volcanism geodynamics geochemistry

<< Back to session