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The laccolithic intrusion of Orciatico (Tuscany)

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The subvolcanic lamproitic body of Orciatico, emplaced at 4.1 Ma, represents a minor igneous centre of the Tuscan Magmatic Province (central Italy). This region, during the Neogene, was affected by an extensional stress field responsible for the formation of NNW-SSE horst and graben dissecting the eastward propagating compressional belt of the Northern Apennine. The igneous activity, dominated by crustal-hybrid products and minor mantle-derived ones (e.g. Orciatico lamproite), followed the migration of the extension from west (14 Ma) to east (0.2 Ma).

The Orciatico intrusion is a laccolith emplaced at the margin of one of the Tuscan Pliocene grabens. The intrusion has a characteristic ovoid-like, subhorizontal tabular shape connected to an elongated subvertical structure to the SE. According to the study of vesicle shape and distribution, the cooling surfaces, and the overall geometry of the body, three main units can be identified: (1) the subvertical feeding dyke, where flow directions can be well determined; (2) the connection zone, with a complex structure composed of small stoped blocks of country rock surrounded by lamproite with vesicles paralleling them; (3) the main body with a remarkable lack of vesicles and cooling surfaces.

The emplacement took place at a depth of about 0.4 km, estimated on the basis of the local stratigraphy and the present mean erosion rate for Italy. The laccolithic body has a length (average ca. 1 km) to thickness (ca. 125 m) relationship fitting the power-law correlation for the dimensional parameters of laccoliths reported in the literature. The observation of the NNW-SSE subvertical feeding dyke and the mantle origin of the Orciatico lamproite indicate that the NNW-SSE border fault of the graben is connected

to lithospheric-scale structures able to rapidly transfer melts from mantle to shallow crustal levels.