

**THE ECCENTRIC CONE MOUNTS DE FIORE, MONTE ROSSI,
MONTE SPAGNOLO, AND THE 2002/03 LAVA FLOW, MT. ETNA:
EVIDENCE FOR MAGMA MIXING**

Bauer, M.¹, Ntaflos, Th.¹, Abart, R.¹, Giacomoni, P.P.², Ferlito, C.³, Coltorti, M.²

¹Department of Lithospheric Research, University of Vienna, Althanstraße 14, 1090 Wien, Austria

²Department of Physics and Earth Sciences, University of Ferrara, Via Savonarola, 9, 44121 Ferrara, Italy

³Department of Biol., Env. and Geol. Sciences, University of Catania, Piazza Università, 2, 95124 Catania, Italy
e-mail: moritz.bauer96@gmail.com

Mt. Etna, located in Sicily, Italy, is Europe's most active volcano and its geodynamic setting and plumbing system have been in the centre of many extensive studies. The 6 stages of eruptive activity from the past to the present are: (1) 'Tholeiitic Stage' between 600-320 ka ago, (2) 'Timpe Stage' 220-110 ka ago, (3) 'Ancient Alkaline Volcanism' 110-65 ka ago, (4) 'Ellittico Stage' 57-15 ka ago, (5) 'Mongibello Stage' from 15 ka ago until 1971, and (6) the 'post -1971 Stage' comprising the volcanic activity since 1971 (CASSETTA et al., 2019).

The lava propagating through the Etna plumbing system generated a complex network of sills and dykes and is responsible for the formation of the summit craters and a plethora of eccentric cones that cover the flanks of the volcano.

We studied whole rock and mineral chemistry of the lavas from three eccentric cones (Monte Spagnolo, Mounts de Fiore and Monte Rossi) and the 2002/03 southern flank lava flow. All lavas are trachybasalts with trachytic texture and variable modal composition of olivine, clinopyroxene and plagioclase phenocrysts. The Monte Spagnolo whole rock composition has the most primitive lavas of all the sampled outcrops with Mg# between 55-57.5 and 10.7 wt% CaO, whereas the Monte Rossi lavas are the most evolved ones with a Mg# between 48.3 and 49.3 and a CaO content between 10.44 and 10.48 wt%. Mounts de Fiore and the 2002/03 lava flow are more evolved than the Monte Spagnolo lavas, as they have a Mg# of around 51 to 52. The corresponding CaO concentration is around 11.2 wt% and 10.62 wt% respectively.

Deviating from the trend of the corresponding whole rock composition, the most MgO-rich olivine (Fo = 88.9 %) was found in the Monte Spagnolo lavas. Due to its low NiO content (0.17–0.2 wt%) and high CaO content (0.25–0.26 wt%) this olivine is apparently of magmatic origin. Considering that the olivine, which could be in equilibrium with these lavas, has Fo = 82.2, it is evident that the olivine with Fo=88.9 points to magma mixing with high MgO-rich lavas. The most evolved lavas from Monte Rossi have the lowest Fo-content (Fo = 67-75 %). In conclusion, olivine and pyroxene with inverse zoning and a higher Mg# in the rims than in the cores indicate extensive magma mixing in all locations except for Monte Rossi. These Fo-content differences from core to rim are in the range of 4%.

Monte Spagnolo lavas, compared to the other studied eccentric cones, represent the most primitive magma formed at high temperatures (avg. 1166 °C) and the Monte Rossi lavas the most evolved magma formed at lower temperatures (avg. 1138 °C). In comparison, the lavas of Mounts de Fiore and of the 2002/2003 eruption show a mediate grade of evolution and average formation temperatures (avg. 1156 °C).

CASSETTA, F., GIACOMONI, P.P., FERLITO, C., BONADIMAN, C., COLTORTI, M. (2019): *Internat. Geol. Rev.*, 62, 338-359.