# Thermo-barometric constraints on Mt. Etna feeding system during the 2015 summit eruptive activity

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The Mt. Etna December 3-8 2015 eruptive event represented an almost unique opportunity to investigate the dynamics of the feeding system of the summit craters, since all of them, Central Craters (CC), North-East Craters (NEC) and New South East Crater (NSEC), were contemporaneously active.

This study focuses on the estimation of the physical-chemical parameters (P-T-X$H_2O$) of this feeding system by means of mineral-melt equilibrium equations applied to olivine (Putirka, 2008) and clinopyroxene (Neave and Putirka, 2017).

Results highlight some important differences in the crystallization conditions of the magma which ultimately fed the activity at the summit craters. Olivine crystallizes from 1121 to 1145 °C at NSEC, from 1155 to 1198 °C at CC and from 1166°C to 1185 °C at NEC. Temperature and pressure estimates based on clinopyroxene suggest that at NSEC this phase nucleates between 1112 °C at 6.8 kbar and 1065°C at 3.7 kbar along a T/P ascent path of -9.69°C/kbar, while clinopyroxene from NEC and CC crystallizes from 1105 °C at 6.8 kbar to 1018 °C at 1.5 kbar along a common T/P rate of -12.9°C/kbar.

According to the clinopyroxene hygrometer of Perinelli et al. (2016), the amount of dissolved $H_2O$ in equilibrium with clinopyroxene does not differ significantly between the magmas erupted from the three craters, varying from 2.8 to 4.7 wt%, increasing constantly at varying P from 8 kbar to 2 kbar.

The above reported preliminary estimations would suggest that i) the final portion the NSEC feeding system could be physically separated from that of CC and NEC and ii) at NSEC magma rises faster than at CC or NEC.

Putirka, K. (2008). Rev. Mineral. Geochem. 69, 61-20.
Perinelli, C. et al. (2016). Am. Mineral. 101, 2774-2777.
Neave, D.A. and Putirka, K. (2017). Am. Mineral. 102, 777-794.

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