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Evidence for a new alkali- and volatile-rich basaltic magma feeding Mount Etna since the early 1970s

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Over the last three decades Mount Etna has entered a very intense eruptive cycle and has produced trachybasalts and basalts progressively and selectively enriched in alkalis, ^{226}Ra, and Sr and B isotope ratios. The origin of this remarkable trend has been attributed to either i) a selective magma contamination by crustal fluids from the upper sedimentary basement or ii) the deep input of an alkali-richer basic magma possibly contaminated at shallower crustal levels. Geochemical data we recently obtained on primitive basalts from two violent flank eruptions in 2001 [1] and 2002 [2] have allowed us to resolve this issue. The chemistry and volatile (H_2O-CO_2-S-Cl-F) content of the bulk rocks and of melt inclusions trapped in their olivine crystals demonstrate the end-member contribution of a new volatile-rich ($\sim$4 wt%) primitive magma that differs in both its alkali content and volatile composition (higher S/Cl, lower Cl/K and Cl/F ratios) from all historical Etnean magmas. Plots of K/Th and Rb/Th ratios versus Th show that this new magma (K/Th$\sim$2.5, Rb/Th$\sim$7.1) has gradually mixed with and replaced the pre-seventies trachybasalts (K/Th$\sim$1.55, Rb/Th$\sim$4) that filled the plumbing system, determining the recent evolution of Etna lavas [1]. This new magma now predominates in the plumbing system, but few of it had been directly extruded prior to the 2001 and 2002 flank eruptions. Pressure constraints derived from crystal-hosted melt inclusion data show that the chemical and volatile contrasts between the new magma and former ones are already established at great depths ($\geq$12 km). This and other lines of evidence definitely exclude any significant influence of crustal contaminations from the sedimentary basement. Instead, our results and other published data suggest that the geochemical signature of the new magma is acquired during its gen-

esis. It may reflect partial melting of a local mantle level that contains a distinct fluid component, richer in alkalis and radiogenic Sr but relatively poorer in chlorine. Additional investigations of the volatile composition of pre- and post-seventies primitive Etna basalts should provide further constraints upon this interpretation.

[1] Métrich N., Allard P., Spilliaert N., Andronico D. and Burton M., *Earth Planet. Sci. Lett*. 228 (1-2), 1-17 (2004) ; [2] Spilliaert N., Allard P., Métrich N and Sobolev A.: *EGU Assemb.*, Nice, April 2004, EGU04-A-06485, and paper in preparation.