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New geochemical and isotopic data of 1944AD Vesuvius last eruption products: how does Vesuvius magmatic sytem actually work?

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The 1944 AD eruption is the last eruptive event occurred at Vesuvius, which brought to an end the period of effusive-explosive eruption cycles that started after the 1631 eruption. The eruption begun with a period of lava flows followed by extended fire- fountaining episodes. These in turn gave way to a convecting eruption column and then a final phase of vulcanian explosions releasing grey-white lithic ash. The studied samples were collected in layers of the lava fountains phase and typically consist of a cumulus crystal framework and an interstitial glassy matrix. Phenocrysts are dominated by leucite, plagioclase and clinopyroxene.The analysed material from the 1944 eruption has different composition: K-trachybasalt, tephrite-basanite and phonotephrite. Previous geochemical and mineralogical studies have evidenced that the 1944 eruption was fed by two different magmas: a degassed phonotephritic magma erupted during the effusive phase and the first lava fountain and a tephritic magma erupted during the more intense lava fountaining phase, also characterized by the emission of clinopyroxene-rich lapilli and the ejection of xenoliths of skarn, cumulates, and subvolcanics, indicating that the shallow reservoir feeding the 1944 eruption was completely emptied and collapsed during the final phases of the eruption.

The new geochemical and isotopic (Sr, Nd, Pb, B) data on 1944 whole rocks and separated minerals, evidence the operating of the mixing process in agreement with the results of previous studies. One component is probably represented by the more radiogenic phonotephritic first erupted magma which is characyerized by isotopic equilibrium among all the separated minerals and whole rocks. This magma represents the

resident magma that during the course of eruption progressively mixed with a second magmatic component, less differentiated and less radiogenic, probably never erupted without being mixed with the resident magma. The mixing process generated a progressive variation of the Sr isotopic composition and the mineral disequilibria among minerals and whole rocks observed with the proceeding of the eruption. and also evidence the occurrence of a third magmatic component in the mixing/mingling process represented by the more radiogenic leucite and diopside. The 1944 isotopic results are also discussed in the framework of the isotopic data relative to the whole Vesuvius activity products, and of the Vesuvius magmatic structure as defined by geophysical and petrological data.