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Geochemistry and mineralogy of the older (> 40 ka) ignimbrites in the Campanian Plain, southern Italy

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The Campanian Plain in southern Italy has been volcanically active during the last 600 ka. The largest and best known eruption at 39 ka formed the Campanian Ignimbrite (CI), which has the largest volume (∼310 km3) and the greatest areal extent. However, significant, but scattered deposits of older ignimbrites underlie the CI and document a long history of trachytic eruptions. We examined the geochemistry and mineralogy of 11 older ignimbrite strata by optical petrography, electron microprobe, scanning electron microscope, X-ray diffraction, and various whole-rock geochemical techniques. Strata at Durazzano (116.1 ka), Moschiano (184.7 ka), Seiano Valley A (245.9 ka), Seiano Valley B (289.6 ka), Taurano 7 (205.6 and 210.4 ka), Taurano 9 (183.8 ka), and Taurano 14 (157.4 ka) have been previously dated by the 40Ar/39Ar technique (Rolandi et al., 2003, Min. & Pet., 79) on hand-picked sanidine. The older ignimbrites are trachytic, but are highly altered with LOI from 8 to 17 wt%. Whole-rock compositions reflect variable element mobility during weathering; TiO2, Al2O3, Fe-oxide, and CaO tend to be enriched relative to average CI composition, whereas Na2O and K2O are depleted. X-ray diffraction identified major chabazite, kaolinite, and illite-smectite alteration products in some samples. The phenocryst mineralogy in all of the strata is typical for trachyte magma and consists of plagioclase (∼An80 to ∼An40), potassium feldspar (∼Or50 to ∼Or80), biotite (TiO2 = ∼4.6 wt%, BaO = ∼0.70 wt%, F = ∼0.65 wt%), diopside (∼Ca47Mg48Fe5 to ∼Ca48Mg34Fe18), titanomagnetite, and uncommon Ca-amphibole. Relatively immobile trace elements Zr, Hf, Nb, and Th display similar abundance, linear trends, and ratios as those measured in the Campanian Ignimbrite: Th/Hf = ∼4, Zr/Hf = ∼50, and Zr/Nb = ∼6. The similarity of trace element systematics and phenocryst mineralogy among the Campanian Ignimbrite and the older ignimbrites suggests that the magmagenesis processes and parental source have been relatively constant during the long period of trachyte volcanism in the Campanian Plain.