Geochemical and Isotopic Evolution of Panarea Island: The Oldest Volcano in the Aeolian Arc.

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Panarea is the oldest (200ka±15ka) and smallest island (3.3 km^2) of the Aeolian archipelago and is located in the southern margin of the Tyrrhenian Sea. The island consists of a central volcanic edifice cut by contemporaneous NE dikes. New major- and trace-element, and Sr, Nd, Pb isotopic data from lavas and tephra representing the entire eruptive history of Panarea document a comagmatic series varying from andesite to rhyolite. Variation diagrams show a systematic depletion of CaO, FeO^T, MnO, MgO, TiO_2 wt.% and an enrichment in alkalis consistent with crystal fractionation. Sr, Nd and Pb data ($^{86}Sr/^{87}Sr$:0.70433-0.70604;$^{143}Nd/^{144}Nd$:0.512235-0.512578;$^{206}Pb/^{204}Pb$:19.162-9.241;$^{207}Pb/^{204}Pb$:15.628-15.709; $^{208}Pb/^{204}Pb$: 39.270-39.010) overlap the range of isotopic compositions of islands in the Aeolian archipelago ($^{86}Sr/^{87}Sr$:0.70352-0.70751;$^{143}Nd/^{144}Nd$:0.512426-0.51287; $^{06}Pb/^{204}Pb$:18.934-19.770; $^{207}Pb/^{204}Pb$: 15.558-15.758; $^{208}Pb/^{204}Pb$:38.798-39.360). A general similarity exists for Sr isotopic compositions of Panarea volcanic products and the nearby Stromboli volcano. The wide variation in Nd isotopic compositions at Panarea suggests the effects of different components in the source. The $^{206}Pb/^{204}Pb$ isotopic compositions and trends for individual volcanic islands in the Aeolian archipelago, in general, are unique. Isotopic differences suggest the presence of a heterogeneous mantle. The eastern portion of Stromboli island and Panarea have the lowest $^{206}Pb/^{204}Pb$ values, and regionally from west to east, there is an increasing Pb isotopic trend in the islands of Lipari, Vulcanello, Vulcano, Salina, Filicudi, and Alicudi. The presence of metasomatized MORB-like mantle is consistent with mass transfer of subducted contaminants into the source region of the Aeolian volcanics.