RECYCLED CARBONATE SEDIMENTS IN THE METASOMATISM OF CENTRAL MEDITERRANEAN SUB-CONTINENTAL MANTLE AS REVEALED BY MINERALOGICAL, CHEMICAL AND ISOTOPIC CHARACTERISTICS OF POTASSIC MAGMATISM

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Subduction drags a large amount of CO_2 into the Earth's interior, which is partly returned to the atmosphere by arc volcanism. Processes involved in the recycling of subducted carbon within the upper mantle are mainly related to mineralogical transformation during metasomatism. This process can be tracked by the subduction-induced modification of the mantle in term of incompatible trace and major elements (e.g., K, Ca, HFSE), radiogenic and stable isotopes. Potassic and ultrapotassic igneous rocks at destructive plate margin are the result of magmas produced by partial melting of upper mantle that experienced extreme sediment-derived enrichment. The Central Mediterranean, Italian peninsula and surroundings, is the most important region on Earth for studying subduction-related potassic and ultrapotassic magmatism, derived from partial melting of metasomatised lithospheric mantle wedge The erupted magmas display different potassic and ultrapotassic affinity, from leucite-free to leucite-bearing, with associated shoshonites and high-K calc-alkaline. Central Mediterranean potassic and ultrapotassic rocks are extremely enriched in incompatible trace elements with variable fractionation of Ta, Nb, and Ti in comparison to Th and large ion lithophile elements (LILE). They are also variably enriched in radiogenic Sr and Pb and unradiogenic Nd. The main geochemical and isotopic signatures are consistent with sediment recycling within the mantle wedge via subduction. A two-step metasomatism, produced by the recycling of pelitic sediments and dehydration of lawsonite-bearing schists, enriched the mantle wedge from which leucite-free ultrapotassic rocks were generated. The involvement of recycled carbonate-rich pelites played an important role in the shift to leucite-bearing ultrapotassic rocks (kalsilite- and leucite-bearing) of the classic 'Roman province'. Such a process is independently demonstrated by minor element contents of high-Fo olivine from Italian potassic and ultrapotassic rocks, and by whole rock isotope data (U-Th disequilibria, Sr-Nd-Pb isotope, and high-precision $\delta^{238}U$) on historical K-igneous rocks from Mount Vesuvius. The latter requires the addition to the mantle wedge of U-rich carbonated melts, generated by partial melting of subducted calcareous sediments in the presence of residual epidote.These data provide constraints on the deep carbon cycling within Earth.