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The western Aeolian Islands volcanoes (Southern Tyrrhenian Sea, Italy) : the temporal and chemical evolution of a complex magmatic system

E. Leocat (1,3), A. Peccerillo (2), and P.-Y. Gillot (3)

(1) Université Nice Sophia Antipolis, Laboratoire Geoazur, Nice, France (lerell@hotmail.fr), (2) Università degli Studi di Perugia, Perugia, Italia, (3) Université Paris Sud 11, Laboratoire IDES, Orsay, France

The Aeolian Archipelago is located on the northern continental margin of the Calabro-Peloritan basement. This volcanic province emplaces in the geodynamic system linked to the convergence of African and European plates. In this study, we focused on Alicudi, Filicudi, Salina, Lipari and Vulcano to understand the temporal and geochemical evolution of western Aeolian Islands magmatism. These volcanoes contain the whole geochemical compositions typical of convergence settings ranging from calc-alkaline (CA) and high-K CA (HKCA) to shoshonitic (SHO) and potassic rocks (KS). Moreover, these magmas were emitted over a short time span, which attests to the complexity of the geodynamical setting. Geochemical data, consisting in major and trace elements whole rock analysis, were carried out on dated samples, whose geochronological data are based on K-Ar technique. The first magmas, emitted at Filicudi, Salina and Lipari after 300 ka, have relatively the same CA composition, whereas some Lipari lavas have early HKCA affinity. Around 120-130 ka, Alicudi and Vulcano emerged simultaneously in the western and central volcanic province that is influenced by two contrasted magmatic systems. In fact, the SHO magmatism in the central sector is coeval with CA activity in the western arc. After 40 ka, the last activity of Filicudi consists of mafic magmas of HKCA affinity while Salina and Alicudi emitted CA products. In contrast, mainly differentiated magmas of HKCA-SHO affinity were emplaced at Lipari and Vulcano. Overall, the K and incompatible elements enrichments increase through time mostly in the central arc. At the scale of the archipelago, the magmatic changes occurring around 120 and 40 ka may be explained by deep and regional processes, as mantle source contamination variations. However, at smaller space and time-scales, the magmatic evolution is more complex reflecting peculiar processes, as crustal assimilation and fractional crystallisation, specific to each volcano plumbing system.