Arsenic-chloride exchange in the Pecora River Valley (Southern Tuscany, Italy)

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High concentrations of As have been documented in large aquifers (e.g. Bangladesh, China, India -West Bengal [1]) and coastal Holocene/Quaternary alluvial plains where fresh groundwater mixes with intruding seawater [2]. Very high As concentrations have been measured in the alluvial sediments (As>500mg/kg) of the Pecora River (Southern Tuscany, Italy; [3]). As concentrations exceeding 10 μgL^{-1} [4] have been recorded in some of the groundwaters potentially exposed to seawater intrusion caused by aquifer overexploitation. To quantify how the ionic exchange between As oxianions (adsorbed on minerals' surfaces) and seawater Cl^- may contribute to the release of As in groundwater, desorption kinetic experiments were carried out on three samples from this alluvial deposit. After 24 hours, desorption experiments using four aqueous solution with different salinity extracted between 20 and 80 μgL^{-1} of As, with the highest levels extracted by seawater. For longer desorption periods (~20 days), the samples were saturated with the same solutions to constrain the timing of the As-Cl reaction. The solutions with $Cl^-<2000\ mgL^{-1}$ extracted $<20\ \mu gL^{-1}$ of As after at least 8 days, while the extracted As using seawater varied between 20 and 60 μgL^{-1} Compared to other experimental studies [5], the percentage of extracted As is much lower (< 0.04% of the total) because the mobile (and thus potentially bioavailable) As is only 9-11% of the total As, which is mainly associated with relatively stable Fe-oxides and sulphides. This study deomostrates the importance of a rigorous mineralogical characterization for a prediction of potential As release from coastal aquifers following seawater intrusion.

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Cyclic subduction of the Aeolian Arc: Evidence from Salina.

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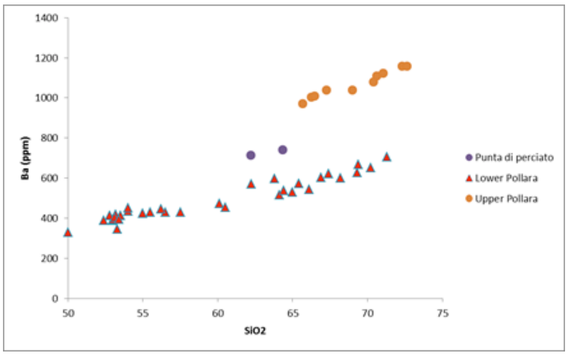
The island of Salina is part of the Aeolian Arc of Italy, located in the southern Tyrrhenian Sea. It occupies a central position at the junction of a sub-arcuate chain of seamounts and volcanic islands with a linear belt of volcanic islands defined by the Tindari-Letojanni fault and is related to a steeply dipping Beniof zone. Volcanic activity on Salina has stretched from 430ka to 13ka, initially consisting of mafic lavas and concluding with more evolved, mingled, basaltic andesite and rhyolite explosive eruptions.

Geochemical evidence from basalts across the Aeolian Arc suggests that whilst Panarea, Salina and Lipari have a strong signature of fluid metasomatism from a subducting slab, the outlying islands of Alicudi and Stromboli have a more complex genesis with evidence of slab sediment melting, inflowing mantle and crustal assimilation [1].

A temporal trace element analysis for Salina shows the amount of Barium, for example, varies across eruptions; some more evolved eruptions have significantly higher barium for similar levels of silca and suggest a marked cyclicity that may not be driven by fractionation alone. The variations are examined to determine the degree to which they are driven by changes in subduction fluid metasomatism as opposed to increased assimilation of crustal materials or changes in the style of fractionation.



[1] Francalanci *et al*., in Beccaluva, Bianchini and Wilson, *Cenozoic volcanism in the Mediterranean Area*, p235-264, (2007).

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