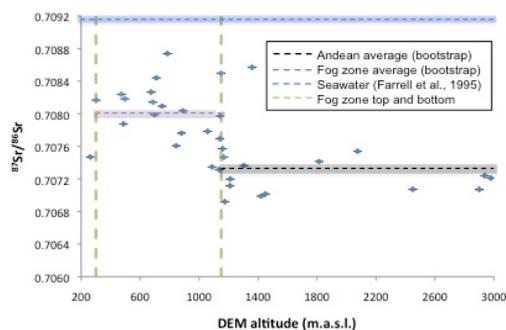


## $^{87}\text{Sr}/^{86}\text{Sr}$ in gypsic soils of hyperarid settings as an altitude proxy: Results for northern Chile (19-24°S) and paleoaltimetry applications

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Quantification of uplift of a continental surface relative to sea level is challenging. We have developed a new altimeter proxy based on the  $^{87}\text{Sr}/^{86}\text{Sr}$  ratio of incipient soils in hyperarid settings like those present in the Atacama Desert. The proposed altimeter is based on the first order topographic control on the extent of coastal fog [1]. Atmospheric advection brings offshore-generated stratocumulus clouds to the continent, generating fog that on geologically recent timescales ( $10^3$ - $10^4$  yrs) has averaged base and top altitudes of 300 and 1150 m.a.s.l., respectively. In the hyperarid desert, calcium sulfate accumulates on the surface, progressively forming saline soil [2]. Samples of Atacama's incipient soils reveal  $^{87}\text{Sr}/^{86}\text{Sr}$  values clustering in two altitudinal domains (Figure 1); seawater  $^{87}\text{Sr}/^{86}\text{Sr}$  (0.70916) is distinctively higher than the ratio for Atacama's incipient soils outside of the fog zone (0.70733).



**Figure 1:** Northern Chile (19-24°S) modern accumulations of salts'  $^{87}\text{Sr}/^{86}\text{Sr}$  and altitude of formation. Translucent color boxes represent the uncertainty in each domain's  $^{87}\text{Sr}/^{86}\text{Sr}$  mean ratio. Samples from [2] and this study (N = 36).

We are investigating the use of this relationship to deduce late Miocene-Pliocene topographic history of the Nazca/South America forearc. Based on results of dated paleosols in the study area we reach a preliminary interpretation:  $\geq 400$  m local uplift has occurred since 5 Ma.

[1] Cereceda *et al.* (2002) *Atm. Research* **64**, 261-271. [2] Rech *et al.* (2003) *G&C Acta* **67**, 576-586.

## The origin of geochemical anomalies in top soils of Eastern-Central Peloritani Mountains (Sicily, Italy)

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The Peloritani Mountains extend across the Southern Sector of the Calabria-Peloritani Arc, in NE Sicily. The arc consists of a stack of nine continental crust tectonic units *Aspromonte, Mela, Piraino, Mandanici, Ali, Fondachelli, San Marco d'Alunzio, Longi-Taormina Capo Sant'Andrea*, including Pan-African and Variscan crystalline basements and remnants of Meso-Cenozoic sedimentary covers.

In this study, we focused on 122 top soils samples collected over an area of 300 km<sup>2</sup>, from the Ali to the Bafia villages (Eastern-Central Peloritani Mts.). The concentrations of 53 elements Mo, Cu, Pb, Zn, Ag, Ni, Co, Mn, Fe, As, U, Au, Th, Sr, Cd, Sb, Bi, V, Ca, P, La, Cr, Mg, Ba, Ti, B, Al, Na, K, W, Sc, Tl, S, Hg, Se, Te, Ga, Cs, Ge, Hf, Nb, Rb, Sn, Ta, Zr, Y, Ce, In, Re, Be, Li, Pd and Pt including potentially harmful metals, have been determined by ICP-MS after Aqua Regia acidification. Geochemical data have been georeferenced and interpolated geochemical maps show distribution patterns of 15 elements for which the Italian environmental law (D. Lgs 152/2006) establishes trigger limits based on geogenic values that differ for land use.

Regarding both residential and industrial/commercial land use, Pb, As and Cd concentrations in these soils often exceed the corresponding trigger limits as established by Italian law. To discriminate between anthropogenic and geogenic origin of Pb, we determined Pb isotopic compositions ( $^{206}\text{Pb}/^{207}\text{Pb}$  and  $^{208}\text{Pb}/^{207}\text{Pb}$ ) of galena hand-picked from bedrock and of soils (leach and residues) collected in the studied area. The Pb isotopic compositions of the samples indicate that the origin of most contamination is likely geogenic. This interpretation is consistent with widespread occurrence of small sulphide deposits in the area.

The presence of different heavy metal anomalies in top soils represents an interesting new finding, which could be useful for mineral exploration follow up survey, at least for commodity like Au and Ag.