Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.11364

Estimating the contribution and sources of aeolian sediments (dust) to the volcanic soils of the Golan Heights, Eastern Mediterranean, and their effect on soil composition.

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Aeolian sediments are considered a major material source for upland soils in the Eastern Mediterranean. The volcanic fields of the Golan Heights, northern Israel, located at the western edge of the Harrat Ash-Shaam volcanic field, are a lithological anomaly in this otherwise general carbonate mountains terrain, and a unique opportunity to study the significance of aeolian contribution to the soil as the allochthonous dust input is mostly felsic whereas the autochthonous input from basalt weathering is mafic in composition. While topographic position and field evidence indicate that nearly all soils formed in situ from bedrock weathering, the contribution of allochthonous aeolian sediments to the soils have long been recognized, mainly through the presence of quartz grains, typical to the regional dust. However, there is still need for a comprehensive understanding of the contribution of aeolian sediments and their sources to these soils. In this study, we address these knowledge gaps.

Soil samples were collected, along a south-north transect following the precipitation gradient (450-900 mm/yr), for grain size distribution, mineralogical, chemical and Sr isotope analysis. Together these provided a comprehensive estimation of dust contribution to the soils. The dominance of dust in the soils is strongly indicated by the grain size fraction distribution modes at the silt fraction (~10μ and ~100μ), typical of the regional dust. Comparisons between the chemical composition of the soils, underlying bedrock, and dust, exhibit a more complex picture; different elements or elemental ratios exhibit stronger/weaker autochthonous basaltic or allochthonous felsic signatures in the soils. For example, despite the significant presence of quartz, that indicates dust input, some samples exhibit little to no dust signal in their REEs patterns or insoluble elements concentrations, thus suggesting variations in residence times for different dust components in the soils.

Combining the results from all these different analyses exhibits the complexity in measuring, describing and quantifying the contribution of dust to the soil, and the importance of a multi parameter approach when addressing these types of questions.