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Age constraints for the Golan Heights volcanic soils, determined from integrating geochemical and geochronological tools.

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The Golan Heights plateau, northern Israel, located at the western edge of the Harrat Ash-Shaam volcanic field that extends through Saudi Arabia, northeastern Jordan, southern Syria, and to southern Turkey, is underlain by volcanic rocks that range in age between ~5.5 and 0.1 Ma. Throughout the Golan Heights, these rocks are covered by shallow soils that rarely exceed 0.5 m in thickness. The accepted assumption is that the ages of the Golan Heights soils correspond with the ages of the basalts they cover. Such age correspondence would imply that the soils have been slowly accumulating over hundreds of thousands to a few million years, and thus suggest a generally stable system. The ages of these soils, however, and their temporal correlation to the basalts have never been determined nor tested.

Here we present age constraints for the soils of the Golan Heights. Soils were surveyed and sampled with their respective basalt bedrock, for mineralogical, chemical and Sr isotope analysis. Basalt age of the sampling sites spans between ~4.5 to 0.1 Ma. Accounting for dust contribution, mass balance calculations based on conservative immobile elements, coupled with basalt denudation rates based on ^{36}Cl measurements, suggest that the soil ages are decoupled from the ages of the underlying basalt, and represent up to a few thousand years of soil production. This time frame is orders of magnitude shorter than the basalt age (~4.5-0.1 Ma) and challenges the prevalent assumption that these soils form a chronosequence, where the soils mature in correlation with the basalt age, and represent a slow and steady soil production process. Furthermore, these results suggest that despite the generally flat morphology of the plateau, this region is subject to erosion, loses soil at high rates, and hence is likely sensitive to changes in environmental conditions. This is particularly important in light of the known sensitivity of the Eastern Mediterranean climate to global climate change.