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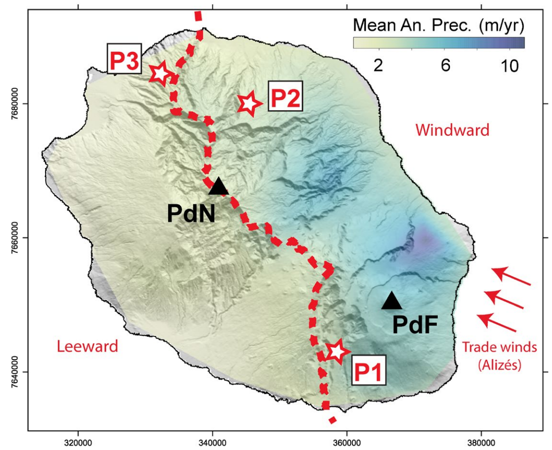

All Quiet on the Weathering Front: Geochemical evolution of soils on Réunion Island

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Chemical weathering of basaltic rocks plays a major role in the regulation of the global carbon cycle at geological timescales, in particular tropical, basaltic islands although representing a small area of exposed land. Although soils from Hawai'i have been extensively studied, other tropical islands have received much less attention. In this study, we investigate the mineralogical and geochemical composition of three weathering profiles developed on stable landforms (*planèzes*) of Reunion Island, Indian Ocean. Pyroxenes and feldspars are progressively replaced by gibbsite and halloysite, and differences in weathering extent could be accounted for by the variable composition of the parent material. Only where soil has been developing for up to two million years we observe a complete loss of primary minerals and soluble elements throughout the entire profile. Elsewhere, complete loss is only achieved in the top meter. Chemical weathering and CO_2 consumption fluxes estimated at the study sites correspond to a small fraction of the overall fluxes for Reunion Island. These observations suggest that stable landforms play a limited role on chemical weathering on tropical, basaltic island, where hydrothermal alteration and weathering of rapidly eroding regions dominate. These results also show that, despite extreme weather events, stable landforms of Reunion Island, preserve a large fraction of their soluble element budget (including nutrients) for 100,000's of years.

Moreover, modelling of uranium-series isotope compositions shows that, in the topsoil, weathering ages (time elapsed since onset of chemical weathering) are similar to the age of the parent material for each profile, providing an independent validation of the use of uranium-series isotopes in weathering profiles to derive weathering ages and soil production rates. All profiles show a decrease in production rates with decreasing depth and a negative relationship between production rates and weathering ages, illustrating the depletion of soluble material with time. While production rates exceed 100 mm/kyr in the early stages of basalt weathering, they slow down to only a few mm/kyr after a million years.