

Eolian dust contribution to soils on Mount Cameroon

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Mount Cameroon is an active volcano located in central Africa next to the Gulf of Guinea. Because of the tropical climate, basalts are quickly altered and soils develop rapidly on the flanks of the volcano. We studied three sections through basaltic tuffaceous units on the eastern flank of the volcano. Each section comprises 2-3 units, the upper portions of which were altered to soil (Andepts). The original rock was pyroclastic alkali basalt characterized by marked enrichment in trace elements, as inferred from the composition of fresh basaltic lava flows. Isotopic compositions measured on samples from each significant horizon of the three soil profiles display systematic variations related to the nature of the horizons. The lower part of each unit has Sr, Nd and Pb isotopic compositions similar to those of fresh basalts ($^{87}\text{Sr}/^{86}\text{Sr} < 0.7034$, $^{143}\text{Nd}/^{144}\text{Nd} > 0.51275$, $^{206}\text{Pb}/^{204}\text{Pb} > 20.2$). In contrast, the upper, organic-rich horizons have lower Nd and Pb isotopic compositions and higher $^{87}\text{Sr}/^{86}\text{Sr}$ ratios. This variation is systematic and applies to the present soil located at the top of the profiles as well as the paleosoils on underlying units. We believe that the isotopic variation is not anthropogenic because (1) all three isotopic systems are affected and (2) the ages of the paleosoils predate the possible influence of mankind. We favour a different interpretation.

Mount Cameroon is exposed to winds from the Sahara during the winter. These winds bring large amounts of dust whose origin can be traced to large areas of old continental crust that outcrops in the middle of the Sahara. Unradiogenic Nd and Pb isotopes and radiogenic Sr isotopes characterize this crust. If such material had been deposited on Mount Cameroon, it would have affected the composition of the upper part of each soil. Assuming reasonable compositions for both the basaltic precursor and the Saharan dusts, we calculate that the dust contribution to the upper parts of soils and paleosoils is up to 10%. This result potentially constrains the flux of Sahara dust in this part of central Africa during the past few thousand years.

The record of the hydrothermal activity at Rainbow (MAR, 36°14'N) by sediment cores

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The Rainbow vent field on the Mid-Atlantic Ridge (36°14'N, MAR) lies at a depth of 2300m, and its plume reaches neutral buoyancy at ~2100m water depth. The neutrally-buoyant hydrothermal plume initially spreads to an across-plume width of ca. 2 km, and then disperses down-plume, closely following the path of the underlying 2300 isobath. Geochemical and isotopic investigations are in progress on two sediment cores (site 343 and 316) collected from directly beneath the hydrothermal plume at distances of 2 km and 15 km from the active vent-field. Previous geochemical investigation showed a net enrichment of Fe, Cu, Mn, V, P and As - typical tracers of hydrothermal input - as well as a minor detrital material (Cave et al., 2002).

In the present study, a sequential leaching has been applied throughout both sediment cores ($\text{CaCO}_3 > 80\%$) to allow the direct distinction between hydrothermal input ("leachate"), and the detrital fingerprint ("silicate"). Leachate fractions, which are enriched in all hydrothermal elements (e.g. Cu, Co, Zn, V and Sr show a systematic variation) consistent with the chemical evolution of the dispersing plume. REE patterns show strong negative Ce anomalies associated with small positive Eu anomalies and HREE depletion. In contrast, all silicate fractions from both cores are strongly enriched in all High Field Strength Elements (HFSEs) as well as Rb and Ba, when compared to the leachates. Preliminary REE patterns for the silicate fractions show light negative Ce anomalies and strong positive Eu anomalies combined with little HREE enrichment. This suggests that the ultramafic substratum of the Rainbow vent may influence the chemistry of the vent fluid and therefore, that leachate/silicate fractions may potentially record variations in the local seawater. The Sr isotopic compositions of the leachates are similar to modern seawater (0.7092), varying between 0.709152 and 0.709180, whereas the silicate fractions yield highly variable Sr isotopic compositions, ranging from 0.708748 to 0.709053, all of which are significantly less radiogenic than seawater. $^{177}\text{Hf}/^{176}\text{Hf}$ ratios for the bulk sediments range between +2.26 and +3.57 ϵ_{Hf} and in line with the value for the North Atlantic Fe-Mn crusts (+2 ϵ_{Hf}) over the last few million years. Thus, Sr isotope ratios of leachates can be used to reconstruct local seawater chemistry.

Reference

Cave R.R., German C.R., Thomson J. and Nesbitt R.W. (2002). *Geochim. Cosmochim. Acta*, in press