

Appendix B from N. D. Sheldon, “Quaternary Glacial-Interglacial Climate Cycles in Hawaii”

(J. Geol., vol. 114, no. 3, p. 000)

Calculating Mass Balance

Mass balance can be reduced to two concepts, strain (ϵ) of an “immobile” element and transport (τ) of a second element with respect to the immobile element (Chadwick et al. 1990). The open system mass-transport function (τ) for element j in the weathered sample (w) is defined as follows: $\tau_{j,w} = (\rho_w C_{j,w} / \rho_p C_{j,p})(\epsilon_{i,w} + 1) - 1$, where ρ_w is the density of the weathered material, $C_{j,w}$ is the chemical concentration (weight percentage) of element j in the weathered material, ρ_p is the density of the parent material, and $C_{j,p}$ is the chemical concentration (weight percentage) of element j in the parent material. If $\tau_{j,w} = 0$ (i.e., element w was immobile), then $\epsilon_{i,w}$ can be solved for separately, thus bypassing volume (as in the classical definition of strain) as follows: $\epsilon_{i,w} = (\rho_p C_{j,p} / \rho_w C_{j,w}) - 1$, where $\epsilon_{i,w}$ is the strain on immobile element i in the weathered sample.

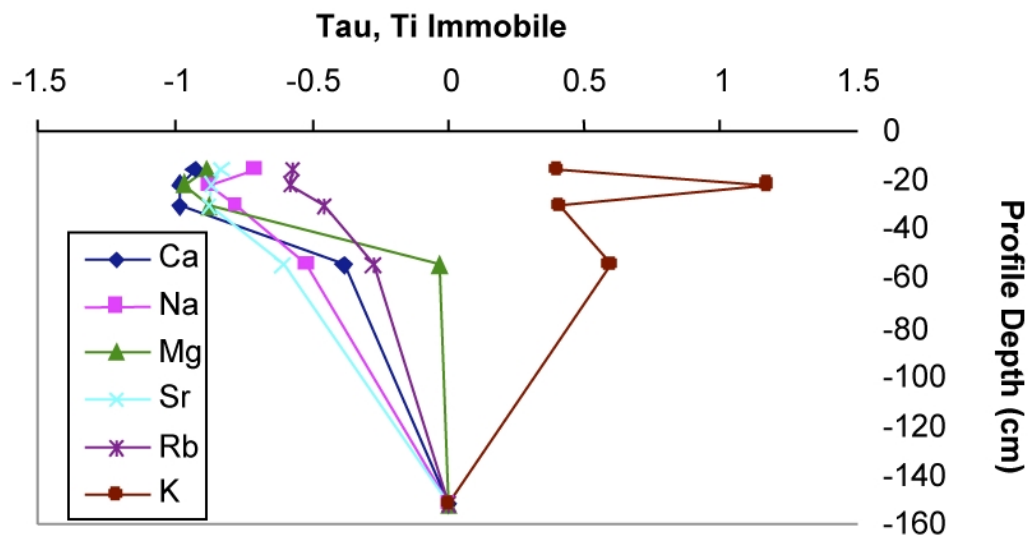


Figure B1. Expanded mass balance plot of figure 2C. Note that K was apparently added to the profile. However, in addition to the reasons listed in the text why this is probably not due to pedogenesis, it should also be noted that the analysis of the basalt parent of this paleosol was anomalously poor in K_2O (0.12%), further questioning the results—especially given that the other alkaline cations (Na, Rb) both show significant losses in accordance with modern soil-forming processes. Samples H14–H19.

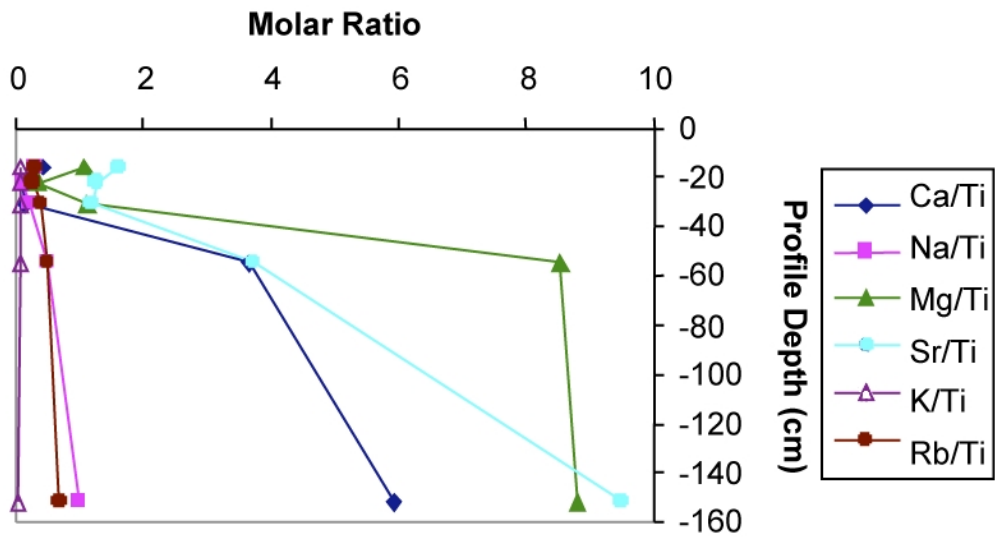


Figure B2. Expanded molar ratio plot of figure 2D. Rb and Sr have been multiplied by 10^5 so that they may be plotted on the same scale as everything else. Samples as in figure C1.

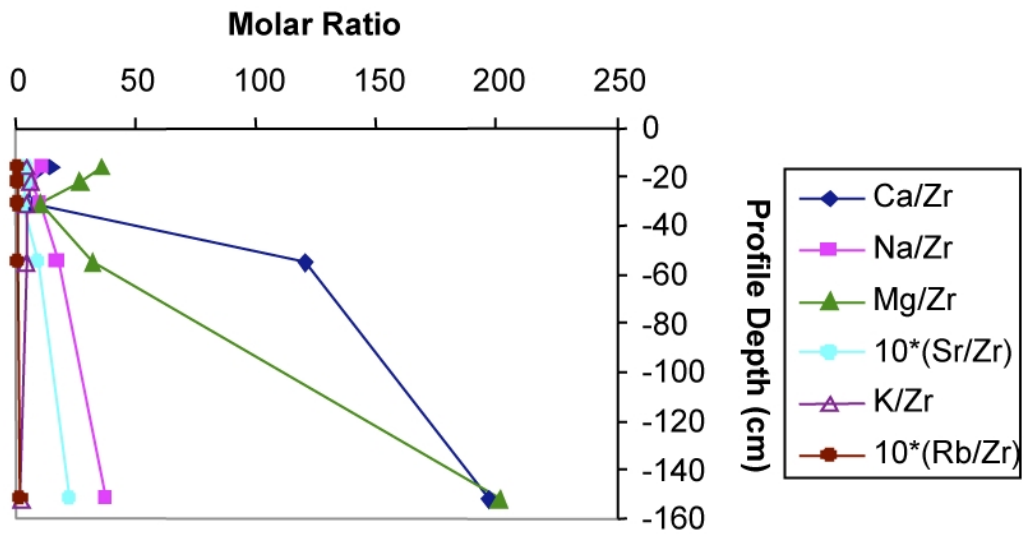


Figure B3. Expanded molar ratio plot of figure 2E. Rb and Sr have been multiplied by 10 so that they may be plotted on the same scale as everything else. Samples as in figure C1.