

Figure F1. Acetic acid leaching protocol for efficient decarbonation of marine sediments.

Figure F2. Comparison of Na (normalized to Al) concentration of shipboard samples to washed samples, Sites U1450 and U1451. Error bars = analytical uncertainties associated with Al-normalized ratios. Dashed line = 1:1 line.

Figure F3. A–H. Comparison of washed and decarbonated major element concentrations normalized to aluminum, Sites U1450 and U1451. Error bars = analytical uncertainties associated with the Al-normalized ratios. Regression analysis of (A) Na ($n = 33$; $r^2 = 0.94$; $p < 0.05$; $y = \{0.99 \pm 0.04\}x + \{-0.01 \pm 0.01\}$) and (H) Si ($n = 33$; $r^2 = 0.95$; $p < 0.05$; $y = \{0.96 \pm 0.04\}x + \{0.02 \pm 0.15\}$) indicate negligible loss of sodium and silicon due to acetic acid leaching.

Figure F4. Leached Mn (ΔMn) compared to leached Fe (ΔFe) for selected samples, Sites U1450 and U1451. Regression line (purple color) shows a moderate correlation ($n = 33$; $r^2 = 0.61$; $p < 0.01$) between ΔMn and ΔFe .

Figure F5. Sr, Sites U1450 and U1451. A. Comparison of Sr (normalized to aluminum) of washed samples to decarbonated samples (dashed line = 1:1 line). B. Moderate correlation ($n = 33$; $r^2 = 0.47$; $p < 0.01$) of leached Sr (ΔSr) to sum of leached calcium and magnesium ($\Delta\text{Ca} + \Delta\text{Mg}$). Purple line = regression line.

Figure F6. Comparison of Nd/Al ratios in washed samples and decarbonated samples, Sites U1450 and U1451. Error bars = associated analytical uncertainties. Dashed lines = 1:1 line.

Figure F7. A, B. Comparison of Pb/Al and Cu/Al ratios between washed and decarbonated samples, Sites U1450 and U1451. Dashed line = 1:1 line. C. Moderate correlation ($n = 33$; $r^2 = 0.59$; $p < 0.01$) between leached lead (ΔPb) and leached manganese (ΔMn) concentrations. D. Moderate correlation ($n = 33$; $r^2 = 0.61$; $p < 0.01$) between leached copper (ΔCu) and leached manganese (ΔMn) concentrations. Purple line = regression line.

Figure F8. Comparison of washed and decarbonated samples showing impact of acetic acid leaching on sum of all rare earth elements (ΣREE) normalized to aluminum, Sites U1450 and U1451. Dashed line = 1:1 line.

Figure F9. Comparison between CO_2 measured in washed sediments and sum of leached Ca and Mg ($\Delta\text{Ca} + \Delta\text{Mg}$), Sites U1450 and U1451. Error bars = analytical uncertainties. Purple line = error weighted regression line ($y = \{0.021 \pm 0.001\}x + \{0 \pm 0.002\}$).