# Supplementary Information

## Chemical controls on abiotic and biotic release of geogenic arsenic from Pleistocene aquifer sediments to groundwater

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**Table S1. Field and lab characterization of sediments used in incubation experiments.** Sediment subsamples from each core were photographed in the field and left out to dry prior to documentation for Munsell color and grain size. Total carbon was measured from preserved core samples.

| **Location** | **MT20** | **MT30** | **MT30** |
|---|---|---|---|
| **Depth (m)** | **18** | **6** | **21** |
| **Grain Size** | 2 mm +/- 0.5 mm | 2 mm +/- 1 mm | 1 mm +/- 0.5 mm |
| | VC | C-VC | C |
| **Total Carbon (mg/kg)** | 303 | 824 | 3544 |
| **Description** | Orange matrix with black mottles; well sorted | Orange matrix with black, clear, and tan mottles; moderately sorted | Orange matrix; well sorted |
| **Sample Image** |  |  |  |

**Table S2. Maximum observed elemental release from incubations of three sediments with lactate, no labile C, or lactate + azide**. Data are shown as the percentage of initial CBD-extractable element released from sediments. Biotic release represents the difference in elemental release between lactate and lactate + azide treatments.

| **Location and Depth (m)** | **MT20.1 18m** | | | | **MT30.1 6m** | | | | **MT30.1 21m** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment**[#] | **Lac** | **No C** | **Az** | **Bio** | **Lac** | **No C** | **Az** | **Bio** | **Lac** | **No C** | **Az** | **Bio** |
| | - % - | | | | - % - | | | | - % - | | | |
| **As** | 61 | 50 | 34 | 36 | 51 | 17 | 4 | 48 | 14 | 13 | 5 | 9 |
| **Mn** | 92 | 46 | 53 | 41 | 176 | 136 | 56 | 124 | 194 | 100 | 80 | 114 |
| **Fe** | 58 | 23 | 14 | 44 | 38 | 5 | 5 | 36 | 10 | 6 | 2 | 8 |

[#]Lac: lactate addition; Az: lactate + azide; Bio: biotic release

**Table 3**. **Maximum observed elemental release from incubations of one sediment with varied DOC sources (lactate, acetate, humic acid, fulvic acid, and no labile C), with and without sodium azide**. Data are shown as the percentage of initial CBD-extractable element released from sediments. Biotic release represents the difference in elemental release between DOC and DOC + azide treatments.

| Treatment[#] | Lactate | | | Acetate | | | Humic Acid | | | Fulvic Acid | | | No C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | Az | Bio | C | Az | Bio | C | Az | Bio | C | Az | Bio | C | Az | Bio |
| | - % - | | | - % - | | | - % - | | | - % - | | | - % - | | |
| **As** | 11 | 2 | 9 | 7 | 1 | 6 | 18 | 10 | 11 | 16 | 14 | 7 | 8 | 1 | 8 |
| **Mn** | 126 | 45 | 81 | 93 | 42 | 51 | 215 | 75 | 140 | 106 | 88 | 18 | 63 | 43 | 20 |
| **Fe** | 8 | 0.3 | 8 | 2 | 0.03 | 2 | 16 | 4 | 12 | 14 | 6 | 9 | 1 | 0.1 | 1 |

[#]C: DOC addition; Az: DOC + azide; Bio: biotic release

**Figure S1. Aqueous As, Mn, and Fe concentration profiles for 9-month incubations of three Pleistocene sediment samples (MT20.1 18m; MT30.1 6m; MT30.1 21m) with lactate (green lines), no labile dissolved organic carbon addition (blue lines), and lactate + sodium azide (red lines) solutions.** Average aqueous concentrations of As, Mn, and Fe from triplicate incubations are plotted for each sampling date, and error bars (some of which are smaller than the symbols) represent the standard error of the triplicate measurements.

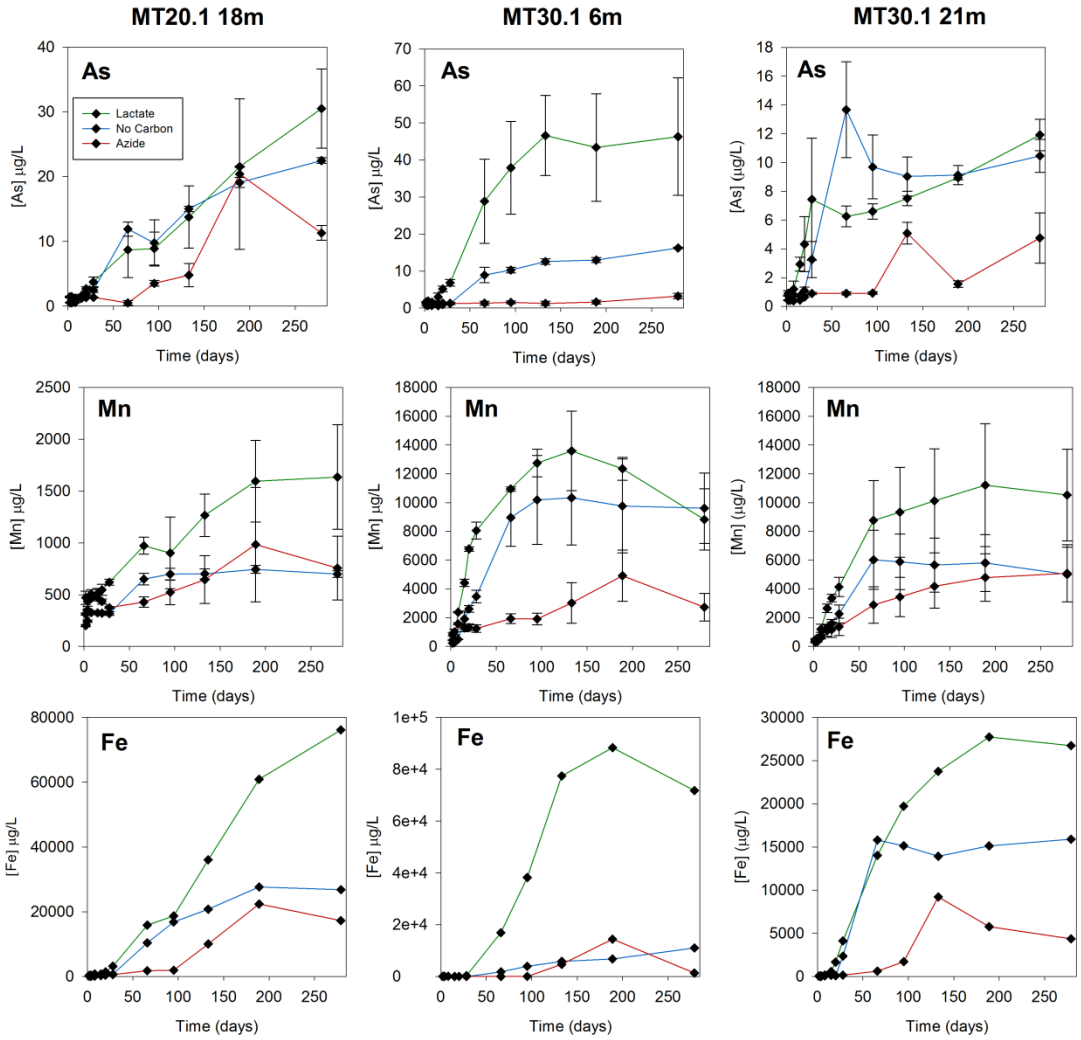

**Figure S2. Dissolved organic carbon concentration profiles for 9-month incubations of three Pleistocene sediment samples (MT20.1 18m; MT30.1 6m; MT30.1 21m) with lactate (green lines), no labile DOC addition (blue lines), and lactate + sodium azide (red lines) solutions.** Average dissolved (total) organic carbon (TOC) concentrations from triplicate incubations are plotted for each sampling date, with diamond symbols representing sediment incubations and square symbols representing no-sediment blanks. Error bars (some of which are smaller than the symbols) represent the standard error of the triplicate measurements.

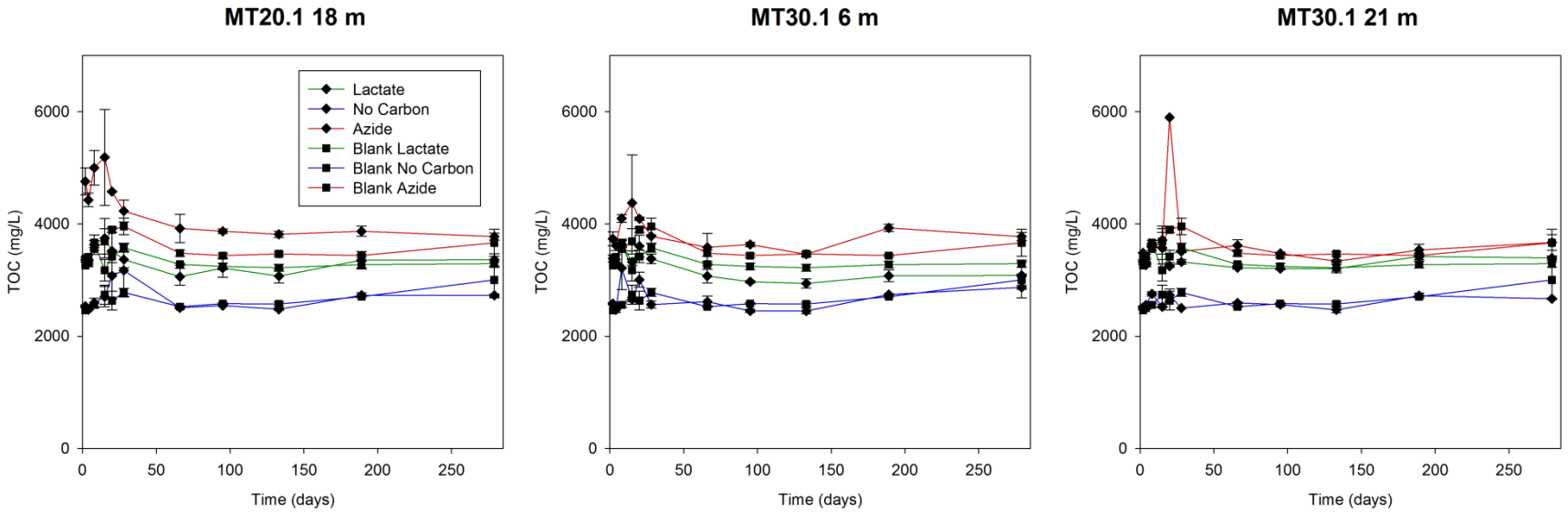

**Figure S3. Aqueous As, Mn, and Fe concentration profiles for incubations of one Pleistocene sediment sample (MT30.1 21m) with varying DOC (lactate, acetate, humic acid, and fulvic acid; green lines), no labile DOC (blue lines), and DOC + sodium azide (red lines) solutions.** Average aqueous concentrations of As, Mn, and Fe from triplicate incubations are plotted for each sampling date, and error bars (some of which are smaller than the symbols) represent the standard error of the triplicate measurements.

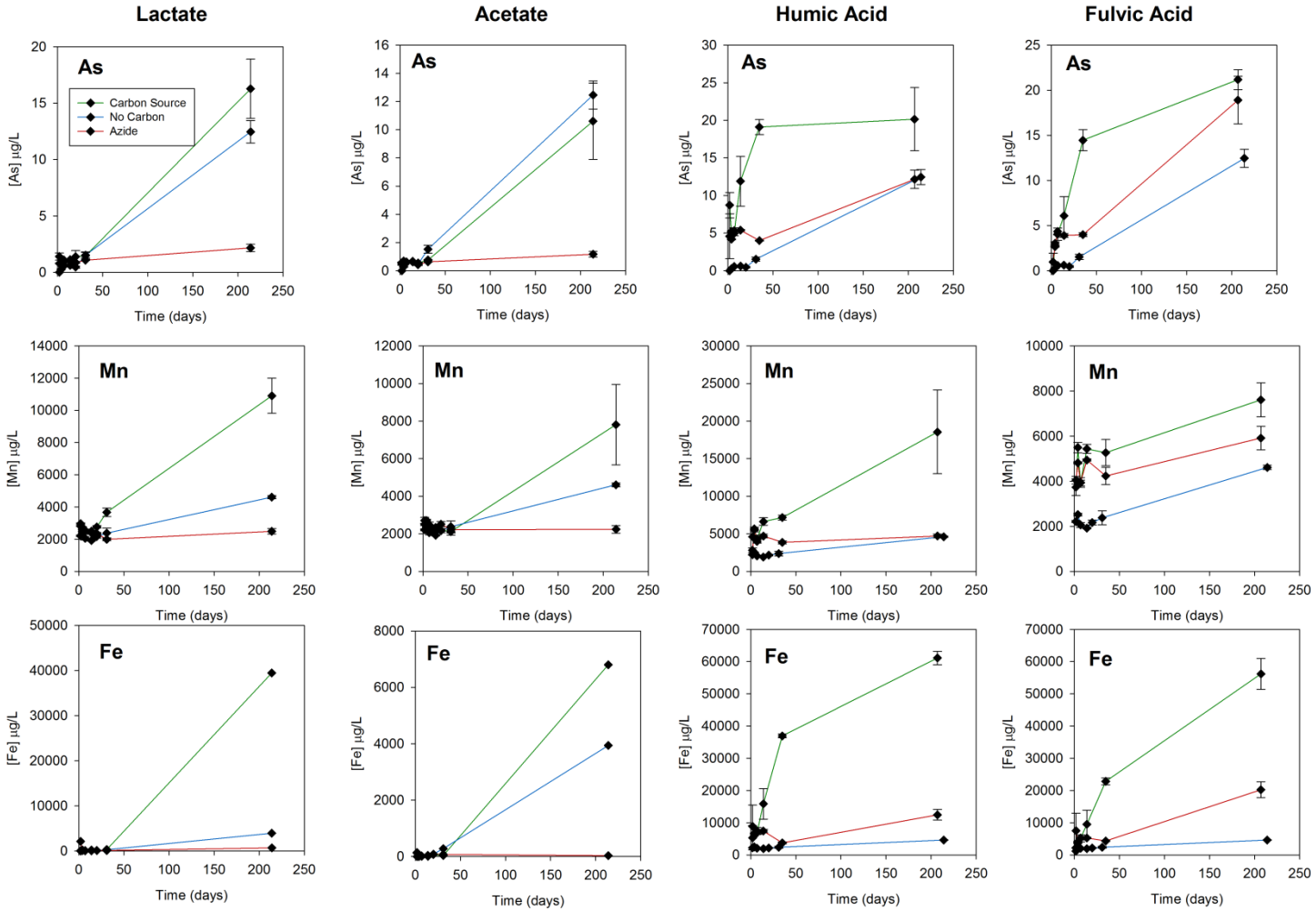

**Figure S4. Cumulative As release vs. % release of CBD-extractable Mn for all sediments, time points, and treatments across both incubation studies.** Data from the first incubation study (where sediment was varied) are shown with filled symbols, and data from the second incubation study (where DOC source was varied) are shown with open symbols. The fit line, equation and R2 value encompass all data from both experiments.