**Perspectives in Ecology and Conservation**

**Supplemental material for the manuscript “Long-term contamination of the Rio Doce estuary as a result of Brazil’s largest environmental disaster”**

**Table S1**. Detection limits and quality assurance and quality control of total content determined by USEPA 3052 method of metals analyzed.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Quality assurance | As | Cd | Co | Cr | Cu | Fe | Mn | Ni | Pb | Zn |
| Detection limit | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1 | 0.01 | 0.01 | 0.01 | 0.01 |
| Measured value | 1.07 | 0.96 | 0.99 | 0.96 | 1.01 | 9.03 | 9.77 | 10.07 | 0.99 | 1.00 |
| Certified value | 1 | 1 | 1 | 1 | 1 | 10 | 10 | 1 | 1 | 1 |
| Recovery (%) | 106.8 | 96.2 | 99.4 | 96.1 | 101.2 | 90.3 | 97.7 | 99.1 | 99.2 | 99.9 |

**Table S2**. Chemical and physical properties of surface water and sediment from Rio Doce estuary up to 4.2 years of the tailing arrival of Fundão dam disaster. TSD: total dissolved solids, T (ºC): Temperature, and OM: organic matter.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Timeline |  | Surface water | | | |  | Sediment | | | |
|  | Sal. | T (ºC) | pH | TSD (ppm) |  | OM (%) | Granulometry | | |
|  |  | Clay (%) | Silte (%) | Sand (%) |
| August 2017 | Mean | 0.65 | 23.08 | 7.35 | 561.00 |  | 5.32 | 13.21 | 7.09 | 79.70 |
| (21 months after) | ± SD | 0.92 | 0.71 | 0.36 | 826.60 |  | 4.75 | 12.15 | 9.67 | 20.91 |
|  |  |  |  |  |  |  |  |  |  |  |
| January 2018 | Mean | 0.09 | 30.27 | 7.08 | 95.29 |  | 4.01 | 10.64 | 3.04 | 86.32 |
| (26 months after) | ± SD | 0.07 | 1.34 | 0.44 | 74.70 |  | 3.24 | 9,97 | 2.18 | 11.52 |
|  |  |  |  |  |  |  |  |  |  |  |
| August 2018 | Mean | 0.14 | 25.34 | 7.75 | 109.35 |  | 4.69 | 13.21 | 3.46 | 83.34 |
| (33 months after) | ± SD | 0.16 | 0.87 | 0.39 | 80.76 |  | 3.18 | 12.32 | 0.96 | 12.29 |
|  |  |  |  |  |  |  |  |  |  |  |
| February 2019 | Mean | 0.13 | 30.45 | 8.67 | 139.82 |  | 4.66 | 0.56 | 5.29 | 89.07 |
| (39 months after) | ± SD | 0.07 | 0.89 | 0.77 | 73.89 |  | 3.17 | 11.41 | 12.83 | 22.59 |
|  |  |  |  |  |  |  |  |  |  |  |
| January 2020 | Mean | 0.05 | 29.11 | 9.13 | 53.12 |  | 4.35 | 1.88 | 2.51 | 95.61 |
| (50 months after) | ± SD | 0.04 | 0.24 | 0.19 | 44.19 |  | 2.94 | 0.75 | 2.47 | 3.13 |

**Table S3.** Correlation matrix for r values of metal(loid)s in sediment from the Rio Doce estuary. Note: Values in bold are moderately/highly correlated with a significance level alpha=0.05.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | As | Cd | Co | Cr | Cu | Mn | Ni | Pb | Zn | Pi | Ri | Sal. | Temp. | pH | TSD | OM | Clay | Silte | Sand |
| As | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cd | 0.17 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Co | **0.44** | **0.64** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cr | **0.37** | **0.67** | **0.88** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cu | 0.16 | **0.53** | **0.75** | **0.74** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mn | **0.39** | **0.73** | **0.90** | **0.85** | **0.68** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ni | **0.40** | **0.57** | **0.88** | **0.88** | **0.79** | **0.80** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |
| Pb | 0.08 | -0.11 | 0.14 | **0.23** | **0.28** | 0.17 | **0.35** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |
| Zn | **0.36** | **0.69** | **0.92** | **0.88** | **0.80** | **0.88** | **0.92** | 0.19 | 1.00 |  |  |  |  |  |  |  |  |  |  |
| Pi | 0.21 | **0.95** | **0.71** | **0.75** | **0.62** | **0.81** | **0.66** | 0.02 | **0.77** | 1.00 |  |  |  |  |  |  |  |  |  |
| Ri | 0.21 | **0.98** | **0.71** | **0.75** | **0.62** | **0.80** | **0.65** | -0.03 | **0.77** | **0.98** | 1.00 |  |  |  |  |  |  |  |  |
| Sal. | 0.09 | **0.45** | **0.52** | **0.49** | **0.44** | **0.45** | **0.51** | 0.06 | **0.48** | **0.45** | **0.45** | 1.00 |  |  |  |  |  |  |  |
| Temp. | **-0.24** | **-0.67** | **-0.54** | **-0.64** | **-0.39** | **-0.59** | **-0.65** | **-0.24** | **-0.59** | **-0.65** | **-0.66** | **-0.39** | 1.00 |  |  |  |  |  |  |
| pH | 0.05 | **-0.68** | **-0.27** | **-0.26** | -0.14 | **-0.39** | -0.09 | **0.48** | **-0.27** | **-0.63** | **-0.65** | **-0.28** | **0.29** | 1.00 |  |  |  |  |  |
| TSD | 0.05 | **0.43** | **0.51** | **0.48** | **0.47** | **0.42** | **0.50** | 0.05 | **0.48** | **0.44** | **0.44** | **0.96** | **-0.35** | **-0.27** | 1.00 |  |  |  |  |
| OM | -0.04 | 0.01 | -0.01 | 0.03 | 0.10 | -0.09 | 0.13 | -0.06 | 0.12 | -0.01 | -0.02 | 0.10 | -0.07 | 0.05 | 0.09 | 1.00 |  |  |  |
| Clay | -0.06 | **0.65** | **0.24** | **0.27** | 0.15 | **0.29** | **0.22** | **-0.33** | **0.31** | **0.58** | **0.58** | 0.19 | **-0.44** | **-0.60** | 0.16 | **0.27** | 1.00 |  |  |
| Silte | 0.04 | **0.32** | 0.15 | **0.23** | -0.01 | 0.12 | 0.12 | **-0.24** | 0.19 | **0.27** | **0.28** | 0.03 | **-0.33** | **-0.30** | 0.01 | 0.18 | **0.51** | 1.00 |  |
| Sand | 0.05 | **-0.62** | **-0.28** | **-0.32** | -0.15 | **-0.28** | **-0.23** | **0.39** | **-0.33** | **-0.55** | **-0.55** | **-0.23** | **0.42** | **0.58** | -0.21 | **-0.30** | **-0.93** | **-0.71** | 1.00 |

**Table S4**. Pearson correlation between total Fe and metal(loid) concentrations in bottom estuarine sediment from Rio Doce.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Correlation | Aug 2017 | | Jan 2018 | | Aug 2018 | | Feb 2019 | | Jan 2020 | |
| r | p | r | p | r | p | r | p | r | p |
| Fe vs. As | -0.25 | 0.41 | -0.32 | 0.24 | 0.61 | 0.009 | 0.57 | 0.07 | -0.37 | 0.27 |
| Fe vs. Cd | 0.90 | 0.0009 | 0.96 | <0.0001 | 0.64 | 0.006 | - | - | -0.05 | 0.85 |
| Fe vs. Co | 0.88 | 0.003 | 0.92 | 0.0003 | 0.68 | 0.003 | 0.84 | 0.07 | 0.98 | < 0.0001 |
| Fe vs. Cr | 0.91 | 0.0005 | 0.41 | 0.10 | 0.51 | 0.035 | 0.91 | 0.0009 | 0.95 | < 0.0001 |
| Fe vs. Cu | 0.86 | 0.009 | 0.91 | 0.0003 | 0.29 | 0.26 | 0.84 | 0.04 | 0.95 | 0.0001 |
| Fe vs. Mn | 0.38 | 0.13 | 0.76 | 0.38 | 0.53 | 0.03 | 0.93 | 0.0002 | 0.96 | < 0.0001 |
| Fe vs. Ni | 0.94 | <0.0001 | 0.79 | 0.17 | 0.67 | 0.003 | 0.91 | 0.0014 | 0.97 | < 0.0001 |
| Fe vs. Pb | 0.03 | 0.90 | 0.95 | < 0.0001 | 0.42 | 0.09 | 0.16 | 0.61 | 0.27 | 0.30 |
| Fe vs. Zn | 0.92 | 0.0003 | 0.95 | < 0.0001 | 0.77 | 0.02 | 0.95 | < 0.0001 | 0.98 | < 0.0001 |

Table S5. ANOVA summary for metal(loid)s concentrations, salinity, granulometry, and organic matter.

|  |  |  |  |
| --- | --- | --- | --- |
|  | F | P value | R square |
| Metal(loid)s concentrations | 63,1 | <0,0001 | 0,8111 |
| Salinity | 1,326 | 0,2674 | 0,06218 |
| Silt+Clay | 2,407 | 0,0563 | 0,1087 |
| Sand | 2,378 | 0,0588 | 0,1075 |
| Organic Matter | 0,3242 | 0,861 | 0,01595 |

Table S6. Results of Tukey's post hoc test in the assess the differences among the different sampling periods.

|  |  |  |  |
| --- | --- | --- | --- |
| Tukey's multiple comparisons test | Mean Diff, | 95,00% CI of diff, | Adjusted P Value |
| As\_VR vs. As\_ago17 | -3,93 | -84,96 to 77,10 | >0,9999 |
| As\_VR vs. As\_jan18 | 1,75 | -76,90 to 80,40 | >0,9999 |
| As\_VR vs. As\_ago18 | -1,783 | -78,56 to 74,99 | >0,9999 |
| As\_VR vs. As\_fev19 | -1,318 | -83,80 to 81,17 | >0,9999 |
| As\_VR vs. As\_jan20 | -0,7391 | -84,91 to 83,43 | >0,9999 |
| Cd\_VR vs. Cd\_ago17 | -3,593 | -80,37 to 73,18 | >0,9999 |
| Cd\_VR vs. Cd\_jan18 | -1,111 | -77,88 to 75,66 | >0,9999 |
| Cd\_VR vs. Cd\_ago18 | -1,629 | -78,40 to 75,14 | >0,9999 |
| Cd\_VR vs. Cd\_fev19 | 0,01248 | -76,76 to 76,78 | >0,9999 |
| Cd\_VR vs. Cd\_jan20 | -0,04634 | -76,82 to 76,73 | >0,9999 |
| Co\_VR vs. Co\_ago17 | -9,753 | -86,53 to 67,02 | >0,9999 |
| Co\_VR vs. Co\_jan18 | -3,018 | -79,79 to 73,75 | >0,9999 |
| Co\_VR vs. Co\_ago18 | -6,741 | -83,51 to 70,03 | >0,9999 |
| Co\_VR vs. Co\_fev19 | -5,145 | -81,92 to 71,63 | >0,9999 |
| Co\_VR vs. Co\_jan20 | -3,688 | -80,46 to 73,08 | >0,9999 |
| Cr\_VR vs. Cr\_ago17 | -43,86 | -120,6 to 32,92 | 0,9883 |
| Cr\_VR vs. Cr\_ago18 | -22,36 | -99,14 to 54,41 | >0,9999 |
| Cr\_VR vs. Cr\_fev19 | -6,825 | -83,60 to 69,95 | >0,9999 |
| Cr\_VR vs. Cr\_jan20 | -10,43 | -87,20 to 66,34 | >0,9999 |
| Cu\_VR vs. Cu\_ago17 | -8,117 | -84,89 to 68,66 | >0,9999 |
| Cu\_VR vs. Cu\_jan18 | -1,376 | -78,15 to 75,40 | >0,9999 |
| Cu\_VR vs. Cu\_ago18 | -2,217 | -78,99 to 74,56 | >0,9999 |
| Cu\_VR vs. Cu\_fev19 | -3,407 | -80,18 to 73,37 | >0,9999 |
| Cu\_VR vs. Cu\_jan20 | -3,563 | -82,21 to 75,08 | >0,9999 |
| Mn\_VR vs. Mn\_ago17 | -308,8 | -385,6 to -232,1 | <0,0001 |
| Mn\_VR vs. Mn\_jan18 | 49,97 | -26,80 to 126,7 | 0,9116 |
| Mn\_VR vs. Mn\_ago18 | -77,4 | -154,2 to -0,6240 | 0,0445 |
| Mn\_VR vs. Mn\_fev19 | 72,91 | -3,862 to 149,7 | 0,0989 |
| Mn\_VR vs. Mn\_jan20 | 88,04 | 11,27 to 164,8 | 0,0047 |
| Ni\_VR vs. Ni\_ago17 | -13,27 | -90,04 to 63,50 | >0,9999 |
| Ni\_VR vs. Ni\_jan18 | -0,00353 | -76,78 to 76,77 | >0,9999 |
| Ni\_VR vs. Ni\_ago18 | -7,68 | -84,45 to 69,09 | >0,9999 |
| Ni\_VR vs. Ni\_fev19 | -3,117 | -79,89 to 73,66 | >0,9999 |
| Ni\_VR vs. Ni\_jan20 | -3,804 | -80,58 to 72,97 | >0,9999 |
| Pb\_VR vs. Pb\_ago17 | -95,45 | -172,2 to -18,68 | 0,0008 |
| Pb\_VR vs. Pb\_jan18 | 1,838 | -74,93 to 78,61 | >0,9999 |
| Pb\_VR vs. Pb\_ago18 | -1,78 | -78,55 to 74,99 | >0,9999 |
| Pb\_VR vs. Pb\_fev19 | -83,92 | -163,7 to -4,159 | 0,0229 |
| Pb\_VR vs. Pb\_jan20 | -130,7 | -207,5 to -53,93 | <0,0001 |
| Zn\_VR vs. Zn\_ago17 | -37,11 | -113,9 to 39,67 | 0,9997 |
| Zn\_VR vs. Zn\_jan18 | -9,376 | -86,15 to 67,40 | >0,9999 |
| Zn\_VR vs. Zn\_ago18 | -23,92 | -100,7 to 52,86 | >0,9999 |
| Zn\_VR vs. Zn\_fev19 | -11,26 | -88,04 to 65,51 | >0,9999 |
| Zn\_VR vs. Zn\_jan20 | -10,85 | -87,62 to 65,93 | >0,9999 |
| As\_ago17 vs. As\_jan18 | 5,68 | -67,32 to 78,68 | >0,9999 |
| As\_ago17 vs. As\_ago18 | 2,147 | -68,83 to 73,12 | >0,9999 |
| As\_ago17 vs. As\_fev19 | 2,613 | -74,51 to 79,73 | >0,9999 |
| As\_ago17 vs. As\_jan20 | 3,191 | -75,73 to 82,11 | >0,9999 |
| Cd\_ago17 vs. Cd\_jan18 | 2,482 | -63,59 to 68,56 | >0,9999 |
| Cd\_ago17 vs. Cd\_ago18 | 1,965 | -64,11 to 68,04 | >0,9999 |
| Cd\_ago17 vs. Cd\_fev19 | 3,606 | -62,47 to 69,68 | >0,9999 |
| Cd\_ago17 vs. Cd\_jan20 | 3,547 | -62,53 to 69,62 | >0,9999 |
| Co\_ago17 vs. Co\_jan18 | 6,735 | -59,34 to 72,81 | >0,9999 |
| Co\_ago17 vs. Co\_ago18 | 3,012 | -63,06 to 69,09 | >0,9999 |
| Co\_ago17 vs. Co\_fev19 | 4,608 | -61,47 to 70,68 | >0,9999 |
| Co\_ago17 vs. Co\_jan20 | 6,065 | -60,01 to 72,14 | >0,9999 |
| Cr\_ago17 vs. Cr\_jan18 | 37,66 | -28,42 to 103,7 | 0,9888 |
| Cr\_ago17 vs. Cr\_fev19 | 37,03 | -29,04 to 103,1 | 0,9918 |
| Cr\_ago17 vs. Cr\_jan20 | 33,43 | -32,65 to 99,50 | 0,9991 |
| Cu\_ago17 vs. Cu\_jan18 | 6,741 | -59,33 to 72,82 | >0,9999 |
| Cu\_ago17 vs. Mn\_jan18 | -171,6 | -237,6 to -105,5 | <0,0001 |
| Cu\_ago17 vs. Ni\_jan18 | 7,324 | -58,75 to 73,40 | >0,9999 |
| Cu\_ago17 vs. Pb\_jan18 | 6,565 | -59,51 to 72,64 | >0,9999 |
| Cu\_ago17 vs. Zn\_jan18 | -1,559 | -67,63 to 64,52 | >0,9999 |
| Cu\_ago17 vs. As\_ago18 | 4,394 | -61,68 to 70,47 | >0,9999 |
| Cu\_ago17 vs. Cd\_ago18 | 7,806 | -58,27 to 73,88 | >0,9999 |
| Cu\_ago17 vs. Co\_ago18 | 2,406 | -63,67 to 68,48 | >0,9999 |
| Cu\_ago17 vs. Cr\_ago18 | -16,51 | -82,58 to 49,57 | >0,9999 |
| Cu\_ago17 vs. Cu\_ago18 | 5,9 | -60,18 to 71,98 | >0,9999 |
| Cu\_ago17 vs. Cu\_fev19 | 4,71 | -61,37 to 70,79 | >0,9999 |
| Cu\_ago17 vs. Cu\_jan20 | 4,554 | -63,69 to 72,80 | >0,9999 |
| Mn\_ago17 vs. Mn\_jan18 | 358,8 | 292,7 to 424,9 | <0,0001 |
| Mn\_ago17 vs. Mn\_fev19 | 381,8 | 315,7 to 447,8 | <0,0001 |
| Mn\_ago17 vs. Mn\_jan20 | 396,9 | 330,8 to 463,0 | <0,0001 |
| Ni\_ago17 vs. Ni\_jan18 | 13,26 | -52,81 to 79,34 | >0,9999 |
| Ni\_ago17 vs. Ni\_ago18 | 5,588 | -60,49 to 71,66 | >0,9999 |
| Ni\_ago17 vs. Ni\_fev19 | 10,15 | -55,92 to 76,23 | >0,9999 |
| Ni\_ago17 vs. Ni\_jan20 | 9,465 | -56,61 to 75,54 | >0,9999 |
| Pb\_ago17 vs. Pb\_jan18 | 97,29 | 31,21 to 163,4 | <0,0001 |
| Pb\_ago17 vs. Pb\_ago18 | 93,67 | 27,60 to 159,7 | <0,0001 |
| Pb\_ago17 vs. Pb\_fev19 | 11,53 | -57,99 to 81,06 | >0,9999 |
| Pb\_ago17 vs. Pb\_jan20 | -35,25 | -101,3 to 30,82 | 0,997 |
| Zn\_ago17 vs. Zn\_jan18 | 27,73 | -38,35 to 93,80 | >0,9999 |
| Zn\_ago17 vs. Zn\_ago18 | 13,19 | -52,89 to 79,26 | >0,9999 |
| Zn\_ago17 vs. Zn\_fev19 | 25,84 | -40,23 to 91,92 | >0,9999 |
| Zn\_ago17 vs. Zn\_jan20 | 26,26 | -39,82 to 92,33 | >0,9999 |
| As\_jan18 vs. As\_ago18 | -3,533 | -71,78 to 64,71 | >0,9999 |
| As\_jan18 vs. As\_fev19 | -3,068 | -77,68 to 71,54 | >0,9999 |
| As\_jan18 vs. As\_jan20 | -2,489 | -78,96 to 73,98 | >0,9999 |
| Cd\_jan18 vs. Cd\_ago18 | -0,5176 | -66,59 to 65,56 | >0,9999 |
| Cd\_jan18 vs. Cd\_fev19 | 1,124 | -64,95 to 67,20 | >0,9999 |
| Cd\_jan18 vs. Cd\_jan20 | 1,065 | -65,01 to 67,14 | >0,9999 |
| Co\_jan18 vs. Co\_ago18 | -3,724 | -69,80 to 62,35 | >0,9999 |
| Co\_jan18 vs. Co\_fev19 | -2,128 | -68,20 to 63,95 | >0,9999 |
| Co\_jan18 vs. Co\_jan20 | -0,6706 | -66,75 to 65,40 | >0,9999 |
| Cr\_jan18 vs. Cr\_ago18 | -16,16 | -82,24 to 49,91 | >0,9999 |
| Cr\_jan18 vs. Cr\_fev19 | -0,6271 | -66,70 to 65,45 | >0,9999 |
| Cr\_jan18 vs. Cr\_jan20 | -4,229 | -70,30 to 61,85 | >0,9999 |
| Cu\_jan18 vs. Cu\_ago18 | -0,8412 | -66,92 to 65,23 | >0,9999 |
| Cu\_jan18 vs. Cu\_fev19 | -2,031 | -68,11 to 64,04 | >0,9999 |
| Cu\_jan18 vs. Cu\_jan20 | -2,187 | -70,43 to 66,05 | >0,9999 |
| Mn\_jan18 vs. Mn\_ago18 | -127,4 | -193,4 to -61,29 | <0,0001 |
| Mn\_jan18 vs. Mn\_fev19 | 22,94 | -43,13 to 89,02 | >0,9999 |
| Mn\_jan18 vs. Mn\_jan20 | 38,08 | -28,00 to 104,2 | 0,9863 |
| Ni\_jan18 vs. Ni\_ago18 | -7,676 | -73,75 to 58,40 | >0,9999 |
| Ni\_jan18 vs. Ni\_fev19 | -3,114 | -69,19 to 62,96 | >0,9999 |
| Ni\_jan18 vs. Ni\_jan20 | -3,8 | -69,88 to 62,28 | >0,9999 |
| Pb\_jan18 vs. Pb\_ago18 | -3,618 | -69,69 to 62,46 | >0,9999 |
| Pb\_jan18 vs. Pb\_fev19 | -85,76 | -155,3 to -16,23 | 0,0009 |
| Pb\_jan18 vs. Pb\_jan20 | -132,5 | -198,6 to -66,47 | <0,0001 |
| Pb\_jan18 vs. Zn\_jan20 | -9,594 | -75,67 to 56,48 | >0,9999 |
| Zn\_jan18 vs. Zn\_ago18 | -14,54 | -80,62 to 51,53 | >0,9999 |
| Zn\_jan18 vs. Zn\_fev19 | -1,888 | -67,96 to 64,19 | >0,9999 |
| Zn\_jan18 vs. Zn\_jan20 | -1,471 | -67,55 to 64,60 | >0,9999 |
| As\_ago18 vs. As\_fev19 | 0,4654 | -72,17 to 73,10 | >0,9999 |
| As\_ago18 vs. As\_jan20 | 1,044 | -73,50 to 75,59 | >0,9999 |
| Cd\_ago18 vs. Cd\_fev19 | 1,641 | -64,43 to 67,72 | >0,9999 |
| Cd\_ago18 vs. Cd\_jan20 | 1,582 | -64,49 to 67,66 | >0,9999 |
| Co\_ago18 vs. Co\_fev19 | 1,596 | -64,48 to 67,67 | >0,9999 |
| Co\_ago18 vs. Co\_jan20 | 3,053 | -63,02 to 69,13 | >0,9999 |
| Cr\_ago18 vs. Cr\_fev19 | 15,54 | -50,54 to 81,61 | >0,9999 |
| Cr\_ago18 vs. Cr\_jan20 | 11,94 | -54,14 to 78,01 | >0,9999 |
| Cu\_ago18 vs. Cu\_fev19 | -1,19 | -67,27 to 64,89 | >0,9999 |
| Cu\_ago18 vs. Cu\_jan20 | -1,346 | -69,59 to 66,90 | >0,9999 |
| Mn\_ago18 vs. Mn\_fev19 | 150,3 | 84,23 to 216,4 | <0,0001 |
| Mn\_ago18 vs. Mn\_jan20 | 165,4 | 99,37 to 231,5 | <0,0001 |
| Ni\_ago18 vs. Ni\_fev19 | 4,563 | -61,51 to 70,64 | >0,9999 |
| Ni\_ago18 vs. Ni\_jan20 | 3,876 | -62,20 to 69,95 | >0,9999 |
| Pb\_ago18 vs. Pb\_fev19 | -82,14 | -151,7 to -12,62 | 0,0025 |
| Pb\_ago18 vs. Pb\_jan20 | -128,9 | -195,0 to -62,85 | <0,0001 |
| Zn\_ago18 vs. Zn\_fev19 | 12,65 | -53,42 to 78,73 | >0,9999 |
| Zn\_ago18 vs. Zn\_jan20 | 13,07 | -53,00 to 79,15 | >0,9999 |
| As\_fev19 vs. As\_jan20 | 0,5784 | -79,83 to 80,99 | >0,9999 |
| Cd\_fev19 vs. Cd\_jan20 | -0,05882 | -66,13 to 66,02 | >0,9999 |
| Co\_fev19 vs. Co\_jan20 | 1,457 | -64,62 to 67,53 | >0,9999 |
| Cr\_fev19 vs. Cr\_jan20 | -3,602 | -69,68 to 62,47 | >0,9999 |
| Cu\_fev19 vs. Cu\_jan20 | -0,1563 | -68,40 to 68,09 | >0,9999 |
| Mn\_fev19 vs. Mn\_jan20 | 15,13 | -50,94 to 81,21 | >0,9999 |
| Ni\_fev19 vs. Ni\_jan20 | -0,6865 | -66,76 to 65,39 | >0,9999 |
| Pb\_fev19 vs. Pb\_jan20 | -46,78 | -116,3 to 22,74 | 0,8678 |
| Zn\_fev19 vs. Zn\_jan20 | 0,4171 | -65,66 to 66,49 | >0,9999 |
| Sal Aug 2017 vs. Sal Jan 2018 | 4,108 | -2,170 to 10,39 | 0,3659 |
| Sal Aug 2017 vs. Sal Aug 2018 | 4,048 | -2,230 to 10,33 | 0,381 |
| Sal Aug 2017 vs. Sal Feb 2019 | 4,071 | -2,207 to 10,35 | 0,3752 |
| Sal Aug 2017 vs. Sal 2020 | 4,152 | -2,126 to 10,43 | 0,355 |
| Sal Jan 2018 vs. Sal Aug 2018 | -0,06 | -6,338 to 6,218 | >0,9999 |
| Sal Jan 2018 vs. Sal Feb 2019 | -0,03706 | -6,315 to 6,241 | >0,9999 |
| Sal Jan 2018 vs. Sal 2020 | 0,04412 | -6,234 to 6,323 | >0,9999 |
| Sal Aug 2018 vs. Sal Feb 2019 | 0,02294 | -6,255 to 6,301 | >0,9999 |
| Sal Aug 2018 vs. Sal 2020 | 0,1041 | -6,174 to 6,383 | >0,9999 |
| Sal Feb 2019 vs. Sal 2020 | 0,08118 | -6,197 to 6,360 | >0,9999 |
| Silt+Clay Aug 2017 vs. Jan 2018 | 33,18 | -42,70 to 109,1 | 0,7394 |
| Silt+Clay Aug 2017 vs. Aug 2018 | 18,18 | -57,70 to 94,06 | 0,9625 |
| Silt+Clay Aug 2017 vs. Feb 2019 | 46,94 | -28,94 to 122,8 | 0,4236 |
| Silt+Clay Aug 2017 vs. Jan 2020 | 79,97 | 2,910 to 157,0 | 0,038 |
| Silt+Clay Jan 2018 vs. Aug 2018 | -15 | -90,88 to 60,88 | 0,9814 |
| Silt+Clay Jan 2018 vs. Feb 2019 | 13,76 | -62,12 to 89,65 | 0,9865 |
| Silt+Clay Jan 2018 vs. Jan 2020 | 46,79 | -30,27 to 123,8 | 0,4428 |
| Silt+Clay Aug 2018 vs. Feb 2019 | 28,76 | -47,12 to 104,6 | 0,8271 |
| Silt+Clay Aug 2018 vs. Jan 2020 | 61,79 | -15,27 to 138,8 | 0,1764 |
| Silt+Clay Feb 2019 vs. Jan 2020 | 33,03 | -44,03 to 110,1 | 0,7533 |
| Sand Aug 2017 vs. Jan 2018 | -66,24 | -218,1 to 85,60 | 0,741 |
| Sand Aug 2017 vs. Aug 2018 | -36,35 | -188,2 to 115,5 | 0,9626 |
| Sand Aug 2017 vs. Feb 2019 | -93,53 | -245,4 to 58,30 | 0,428 |
| Sand Aug 2017 vs. Jan 2020 | -159,1 | -313,2 to -4,877 | 0,0398 |
| Sand Jan 2018 vs. Aug 2018 | 29,88 | -121,9 to 181,7 | 0,9817 |
| Sand Jan 2018 vs. Feb 2019 | -27,29 | -179,1 to 124,5 | 0,987 |
| Sand Jan 2018 vs. Jan 2020 | -92,83 | -247,0 to 61,36 | 0,4516 |
| Sand Aug 2018 vs. Feb 2019 | -57,18 | -209,0 to 94,65 | 0,8305 |
| Sand Aug 2018 vs. Jan 2020 | -122,7 | -276,9 to 31,48 | 0,1824 |
| Sand Feb 2019 vs. Jan 2020 | -65,53 | -219,7 to 88,65 | 0,759 |
| OM Aug 2017 vs. OM Jan 2018 | 1,312 | -2,055 to 4,679 | 0,8125 |
| OM Aug 2017 vs. OM Aug 2018 | 0,6294 | -2,737 to 3,996 | 0,9849 |
| OM Aug 2017 vs. OM Feb 2019 | 0,6559 | -2,711 to 4,023 | 0,9824 |
| OM Aug 2017 vs. OM 2020 | 0,9706 | -2,396 to 4,337 | 0,9285 |
| OM Jan 2018 vs. OM Aug 2018 | -0,6824 | -4,049 to 2,685 | 0,9796 |
| OM Jan 2018 vs. OM Feb 2019 | -0,6559 | -4,023 to 2,711 | 0,9824 |
| OM Jan 2018 vs. OM 2020 | -0,3412 | -3,708 to 3,026 | 0,9986 |
| OM Aug 2018 vs. OM Feb 2019 | 0,02647 | -3,340 to 3,393 | >0,9999 |
| OM Aug 2018 vs. OM 2020 | 0,3412 | -3,026 to 3,708 | 0,9986 |
| OM Feb 2019 vs. OM 2020 | 0,3147 | -3,052 to 3,682 | 0,999 |