|  |  |
| --- | --- |
| Basin | log *K*d |
| Atlantic - overall | 6.52±0.32 |
| Shallow | 6.49±0.31 |
| Deep | 6.53±0.33 |
| Pacific -overall | 7.11±0.38 |
| Shallow | 6.97±0.45 |
| Deep | 7.15±0.35 |
| Arctic - overall | 6.74±0.53 |
| Shallow | 6.50±0.62 |
| Deep | 6.83±0.46 |

Table S1 Summary of average bulk log10 Kd for Hg as well as their standard deviation in shallow water (above 100 m depth), deep water (below 100 m depth) and overall ocean of the Pacific, Atlantic and Arctic.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Variables | PC1 | PC2 | PC3 |
| Pacific | residuals | 0.2815 | 0.4582 | 0.0301 |
|  | fPOM | -0.4008 | 0.5752 | -0.0385 |
|  | fCaCO3 | 0.0439 | -0.5457 | -0.5347 |
|  | fOpal | 0.0280 | -0.1606 | 0.6540 |
|  | fLitho | 0.1545 | -0.3000 | 0.5196 |
|  | fMn | 0.6095 | 0.1061 | -0.0991 |
|  | fFe | 0.6017 | 0.1856 | -0.0643 |
|  | % of Variance | 32.45 | 26.29 | 19.31 |
|  | Cumulative % | 32.45 | 58.73 | 78.04 |
| Atlantic | residuals | 0.4221 | 0.0233 | 0.0427 |
| fPOM | 0.6150 | -0.1687 | -0.2232 |
| fCaCO3 | -0.0886 | 0.8435 | 0.2962 |
| fOpal | -0.1866 | 0.1973 | -0.4365 |
| fLitho | -0.5914 | -0.2486 | -0.0706 |
| fMn | -0.2259 | -0.2764 | -0.0492 |
| fFe | 0.0137 | -0.2869 | 0.8141 |
| % of Variance | 32.52 | 16.66 | 14.94 |
| Cumulative % | 32.52 | 49.18 | 64.12 |
| Arctic | residuals | -0.1270 | 0.5021 | 0.5675 |
| fPOM | -0.5391 | 0.1295 | 0.2064 |
| fCaCO3 | 0.1485 | 0.4853 | -0.5653 |
| fOpal | -0.2796 | -0.4731 | -0.3635 |
| fLitho | 0.5808 | 0.0328 | 0.0688 |
| fMn | -0.1653 | 0.5202 | -0.4048 |
| fFe | 0.4779 | -0.0080 | 0.1229 |
| % of Variance | 39.46 | 21.12 | 14.64 |
| Cumulative % | 39.46 | 60.58 | 75.22 |

*Table S2 The first three principal component loadings, percentage of variance explained by each principal component, and their cumulative percentage of total variance including residuals and six particle compositions in the small size fraction of particles.*

Table S3 The slope of regression of log Kd against log SPM in the shallow (<100m) and deep (≥ 100m) water in three Ocean basins, respectively. The z-test was applied to compare the difference of slopes from the shallow and deep waters, the confidence value α=0.05. Note that the quantity of samples from upper 100 m samples were much less than the samples below 100 m, so we need more data points to really disentangle these two mechanisms.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | slopes of regression of log *Kd* against log SPM | | | Statistics results of z-test | |
|  | shallow (<100m) | deep (>=100m) | overall | z-score | P value (α=0.05) |
| Pacific | -1.455 | -0.448 | -0.367 | -4.333 | 0.0000147 |
| Atlantic | -0.673 | -0.564 | -0.423 | -0.311 | 0.756 |
| Arctic | -0.657 | -0.819 | -0.629 | 1.431 | 0.152 |