Table S1. Gas-liquid partitioning and aqueous phase equilibrium relationships\*

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| # | Equilibrium | Equilibrium Constant | Units |
| Gas-liquid partitioning | | | |
| 1 | O3 (aq) ↔ O3 (gas) | 0.0113a | molar atm-1 |
| 2 | H2O2 (aq) ↔ H2O2 (gas) | 7.4E+04a | molar atm-1 |
| 3 | Hg(0) (aq) ↔ Hg(0) (gas) | 0.11b | molar atm-1 |
| 4 | Cl2 (aq) ↔ Cl2 (gas) | 0.076c | molar atm-1 |
| 5 | OH•(aq) ↔ OH•(gas) | 25.0a | molar atm-1 |
| 6 | SO2 (aq) ↔ SO2 (gas) | 1.23a | molar atm-1 |
| 7 | HgCl2 (aq) ↔ HgCl2 (gas) | 1.4E+06d | molar atm-1 |
| 8 | Hg(OH)2 (aq) ↔ Hg(OH)2 (gas) | 1.2E+04d | molar atm-1 |
| Aqueous-phase equilibrium relationships | | | |
| 9 | SO2 ↔ HSO3- + H+ | 0.013a | molar |
| 10 | HSO3- ↔ SO32- + H+ | 6.6E-08a | molar |
| 11 | HgCl2 ↔ Hg2+ + 2 Cl- | 1.0E-14e | molar2 |
| 12 | Hg(OH)2 ↔ Hg2+ + 2 OH- | 1.0E-22e | molar2 |
| 13 | Hg2+ + SO32- ↔ HgSO3 | 5.0E+12f | molar-1 |
| 14 | HgSO3 + SO32- ↔ Hg(SO3)22- | 2.5E+11f | molar-1 |
| 15 | Cl2-H2O ↔ HOCl + Cl- + H+ | 5.01E-04c | molar2 |
| 16 | HOCl ↔ OCl- + H+ | 3.16E-08c | molar |

\* The equilibrium expressions listed in this table are based on aqueous-phase concentrations in units of *moles liter-1* (“molar”) and gas-phase concentrations in units of *atmospheres* (“atm”). These relationships are standard equilbrium ratios of the concentrations on the *right-hand side* of the relationship divided by the concentrations on the *left-hand side* of the relationship. So, for example, for #10, the expression can be written as follows, where all of the aqueous-phase concentrations are expressed in *molar* units:

[SO32- ] [H+] / [HSO3-] = 6.6E-08 molar

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