**Gas Equilibrium Solubilities *–* Emily’s References**

Updated 10/25/18

**NOTE**:

These scripts calculate the aqueous concentration of each gas given their [atmospheric composition](http://ossfoundation.us/projects/environment/global-warming/atmospheric-composition), **except for NOsol, which calculates the pure gas solubility[[1]](#footnote-1)**. To find the concentration at a different partial pressure, the output concentration must be scaled:

where *x* is the desired dry gas mole fraction, *xatm* is the atmospheric fraction, and *Catm*is the output concentration.

**Sanity Check**

[Solubility of Pure Gases in Water (Engineering Toolbox)](https://www.engineeringtoolbox.com/gases-solubility-water-d_1148.html)

\*Note that these are the solubility of pure gases; need to multiply by the partial pressure.

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| **Gas** | **Reference** | **Equation #** | **Coeffs.** | **Definitions** |
| **N2** | Hamme & Emerson, 2004 | *C –* Eq. 1 | Table 4 | *C –* N2 concentration at equilibrium with a moist atmosphere at 1 atm total pressure [μmol kg -1 ] |
| **Ar** | Hamme & Emerson, 2004 | *C –* Eq. 1 | Table 4 | *C –* Ar concentration at equilibrium with a moist atmosphere at 1 atm total pressure [μmol kg-1] |
| **O2** | Garcia & Gordon, 1992 | *Co\** – Eq. 8 | Table 1 | *Co\* –* O2 concentration at equilibrium with 1 atm total pressure [μmol/kg] |
| **CO2** | Weiss, 1974 | *f* – Eq. 9, using Eq. 11 for *δ* and Eq. 6 for *B*  K0 – Eq. 12  C = *f*\*K0 | Table 1 | *f* – fugacity [unitless]  *δ –* Virial cofficient of CO2 in air [cm3 mol-1]  *B –* Virial cofficient of pure CO2 gas [cm3 mol-1] |
| **CH4** | Wiesenburg & Guinasso, 1979 | C\* – Eq. 7 | Table 6 | C\* – CH4 concentration at eqlibrium with moist atmosphere at 1 atm total pressure |
| **N2O** | Weiss & Price, 1980 | *F* – Eq. 13  *C\** – Eq. 8 | Table 2 | *F* – fitted function [mol L-1 atm-1] or [mol kg-1 atm-1]  C\* – N2O concentration at equilibrium; *F* multiplied by mole fraction of N2O in dry air [μmol L-1] or [μmol kg-1] |

1. This is because I don’t have a tabulated value for the atmospheric composition of NO. To calculate the NO concentration for a given gas mixture, multiply the output of NOsol(S,T) by *x* (the dry gas mole fraction of NO). [↑](#footnote-ref-1)