**SUPPLEMENT ON CURVE FIT PROCEDURE for the article titled "Breathing Planet Earth: Global Respiratory Quotient (RQGlob) from Keeling's Data and CO2-Budget among the Atmosphere, Land and Oceans . Part I: Brief Review on RQ and Global Respiratory Quotient of Earth"**

Supplement describes the procedure used for obtaining the curve fit constants for Keeling's data

***Curve Fit Constants for Keeling's Curves***

**a) Curve Fit Constants With sawtooth pattern:** Curve fit constants were obtained by plotting Keeling's data vs days/10, days since Jan 1990 .

$CO_2$ in in ppm = $a_0' + a_1'*x'$ , linear fit , x'= days/10, days since 1991, $a_0'$=350.50, $a_1'$=0.057, $R^2$= 0.9709

$O_2$ in ppm = $b_0' + b_1'*x'$ linear fit, x'= days/10, $b_0'$=209488, $b_1'$= -0.1216, $R^2$=0.9839

$CO_2$ in ppm= $c_0' + c_1'*x' + c_2'*x'^2$ for quadratic fit, x'= days/10, $c_0$= 354.08, $c_1'$=0.04036, $c_2'$= $1.5175 \times 10^{-5}$, $R^2$= 0.9804

$O_2$ in ppm = $d_0' + d_1'*x' + d_2'*x'^2$ where x'= days/10, $d_0'$ = 209,480, $d_1'$= -0.083306, $d_2'$= $3.2631 \times 10^{-5}$, $R^2$= 0.9896

by using x'= x*(365/10) where x is in years,

$CO_2$ in in ppm = $a_0 + a_1*x$, linear fit, x in years since 1991, $a_0$=$a_0'$=350.5 ppm, $a_1$= $a_1'$*(365/10) = 2.0805 ppm/year, $R^2$= 0.9709

This checks with 2 ppm/year in Ref. [1]

$O_2$ in ppm = $b_0 + b_1*x$ linear fit, x in years since 1991, $b_0$=$b_0'$=209,488 ppm, $b_1$= $b_1'$*(365/10) = -4.4384 ppm/year, $R^2$= 0.9839

The 4.438 ppm/year is close to 4 ppm/year quoted in Ref. [1].

$CO_2$ in ppm= $c_0 + c_1*x + c_2*x^2$ for quadratic fit, x in years since 1991, $c_0$=$c_0'$=350.5 ppm, $c_1$= $c_1'$*(365/10) = 1.4731 ppm/year, $c_2$= $c_2'$*$(365/10)^2$ = 0.01889 ppm/year$^2$, $R^2$= 0.9804

$O_2$ in ppm = $d_0 + d_1*x + d_2*x^2$, x in years since 1991, $d_0$=$d_0'$=209,480 ppm, $d_1$= $d_1'$*(365/10) = -3.0407 ppm/year, $d_2$= $d_2'$*$(365/10)^2$ = -0.04347ppm/year$^2$, $R^2$= 0.9896

**b) Curve Fit Constants Based on Annual Average Concentrations of $CO_2$ and $O_2$ (Without Saw-tooth Pattern):**

Curve fit constants were obtained by averaging concentrations over the whole year then plotting the results for $CO_2$ and $O_2$ vs year.

$CO_2$ in in ppm = $a_0 + a_1*x$, linear fit, x in years since 1991, $a_0$=349.94 ppm, $a_1$ = 2.045 ppm/year, $R^2$= 0.9944

This checks with 2 ppm/year in Ref. [1]

$O_2$ in ppm = $b_0 + b_1*x$ linear fit, x in years since 1991, $b_0$=209,488 ppm, $b_1$ = -4.3486 ppm/year, $R^2$= 0.9937

The 4.3486 ppm/year is close to 4 ppm/year quoted in Ref. [1].

$CO_2$ in ppm= $c_0 + c_1*x + c_2*x^2$ for quadratic fit, x in years since 1991, $c_0$=353.09 ppm, $c_1$= 1.4544ppm/year, $c_2$= 0.01905 ppm/year$^2$, $R^2$= 0.99954

$O_2$ in ppm = $d_0 + d_1*x + d_2*x^2$, x in years since 1991, $d_0$=$d_0'$=209481 ppm, $d_1$ = -2.9998 ppm/year, $d_2$= -0.0435 ppm/year$^2$, $R^2$= 0.9997

# References

[1] Duursma, E. K., & Boission, M. P. R. M. , "Global oceanic and atmospheric oxygen stability considered in relation to the carbon cycle and to different time scales.," *Oceanologica Acta,* vol. 17, pp. 117-141, 1994.