An Introductory Global CO2 Model is available with the following features:

(1)   The basic model consists of seven reservoirs (upper atmosphere, lower atmosphere, long lived biota, short lived biota, ocean upper layer, ocean deep layer and marine biosphere). With complete mixing assumed in each reservoir, the model consists of just seven initial-value ODEs that are integrated numerically, typically over the interval 1850 (preindustrial) to 2100 (the ODEs are CSTR material balances). The numerical integration is accomplished within Matlab by one of the library ODE integrators ODE45 (nonstiff) or ODE15S (stiff).

(2)   Ocean chemistry calculations address acidification (with ocean pH typically ranging from 8.2 to 7.8). These calculations illustrate some basic numerical procedures, e.g., a Newton solver applied to a fourth order polynomial to calculate pH and spline interpolation to provide additional model outputs. The problem of acidification, which has important implications for coral and the associated marine life, is addressed briefly by the model and associated documentation.

(3)   A basic global warming component based on CO2 buildup in the lower atmosphere gives an indication of the possible degree of global warming.

(4)   The relative (dimensionless) ODE dependent variables (fractional changes from 1850) are also expressed as absolute variables, typically GtC (gigatons of carbon), so that comparison of the model output with reported (literature) values is possible. Some brief comparisons are provided in the documentation file.

(5)   Projected anthropogenic CO2 emissions can be varied to investigate long-term responses (such as atmospheric ppm CO2 and ocean pH). As an application of the model, proposed emissions plans and goals can be evaluated, e.g., from the upcoming Copenhagen conference.

The model is available as a set of commented Matlab routines on a CD, with related documentation, through a request directed to wes1@lehigh.edu. Please provide a postal mailing address. A small package will be sent by US First Class mail or international air mail. We use the CD format because several of the files are for full-length papers from the literature and technical reports (e.g., chapters from the IPCC report) which in total, would be too large for e-mail distribution. A detailed discussion of the model and Matlab implementation is available in

http://www.lehigh.edu/~wes1/co2/model.zip

Please direct any questions to wes1@lehigh.edu.

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