TwoPools nonlinearity in inputs

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Equation

Matrix notation of a simplified system could be defined as

$$\frac{dC}{dt} = I(t) \cdot N(C, t) + A(t) \cdot C(t) \tag{1}$$

Inputs I are modified by the term *theta* which is a function of humified C (C_O). We consider only two pools for simplicity, C_y and C_o. We adopt the notation of Jarvis and Meurer for the ICBM model (just a two-pools linear model), substituting h with ϵ.

Developing the matrices the model becomes:

$$\frac{dC}{dt} = \begin{bmatrix} I \\ 0 \end{bmatrix} \cdot \begin{bmatrix} \theta(C_o) & 0 \\ 0 & 1 \end{bmatrix} + \begin{bmatrix} -k_y & \epsilon \\ 0 & -k_o \end{bmatrix} \cdot \begin{bmatrix} C_y \\ C_o \end{bmatrix} \tag{2}$$

The nonlinearity defined by θ is a generic function of the old C pool content C_o, $\theta = f(C_o(t))$.

Draft parameter values

We can start from the 1996 ICBM parameterization for the parameter values: $k_y = 0.8$, $k_o = 0.00605$ and $\eta = h = 0.13$, ignoring the climatic scaling for the moment.

Note: the ϵ parameter for ICBM is dependent on input quality, this must be considered in the multimodel comparison also for all other models.