

# Global CO<sub>2</sub> - everything but the missing sink.

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## Abstract

A simple (4-box) global atmospheric transport model has been created, using a blank sheet of paper as the starting point. The model is intended to be a reasonable approximation to the major components of the carbon cycle, i.e. to those components which have an important affect on the annual fluctuations of CO<sub>2</sub>. The key requirement of the model is that it provides reasonable estimates of the main carbon sources and sinks and of the atmospheric transport terms. By representing the key fluxes and processes in a simple, but quantitative, way the model is used to explore the sensitivities of the annual cycle to changes in individual fluxes. Five rival hypotheses about the primary cause of recent changes to the seasonal CO<sub>2</sub> cycle - anthropogenic, oceanic, enhanced autumnal-respiration, higher gross primary productivity, and phenology are tested. It is concluded that the springtime phenology of terrestrial biomes dominates. Warming temperatures have led to an increasing earliness of spring, to productivity variations and hence to pronounced changes to both the timing and the amplitude of CO<sub>2</sub> cycles throughout the year, but especially at the time of the late winter CO<sub>2</sub> maximum. Suggestions for ways in which the model could be further improved will be solicited. Can it be simplified even more? Does it need to be more complex? How does one decide whether a global model is adequate?