



Jul 13th, 11:30 AM - 11:50 AM

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Ogutu, K. B. Z.; D'Andrea, F.; and Ghil, M., "A simple integrated assessment approach to global change simulation and evaluation" (2016). *International Congress on Environmental Modelling and Software*. 78.
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A simple integrated assessment approach to global change simulation and evaluation

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Abstract: We further develop and study a Coupled Climate-Economy-Biosphere (CoCEB) model. This simple and highly idealized model constitutes the basis of our integrated assessment approach to simulating and evaluating global change. CoCEB is composed of a physical climate module, based on Earth's energy balance, and an economy module that uses endogenous economic growth with physical and human capital accumulation. A biosphere model is likewise under study and will be coupled to the existing two modules. We concentrate on the interactions between the two subsystems: the effect of climate on the economy, via damage functions, and the effect of the economy on climate, via a control of greenhouse gas emissions. Simple functional forms of the relation between the two subsystems permit simple interpretations of the coupled effects. The CoCEB model is used to make hypotheses on the long-term effect of investment in emission abatement, and on the comparative efficacy of different approaches to abatement, in particular by investing in low carbon technology, in deforestation reduction or in carbon capture and storage (CCS). The CoCEB model is very flexible and transparent, and it allows one to easily formulate and compare different functional representations of climate change mitigation policies. Using different mitigation measures and their cost estimates, as found in the literature, one is able to compare these measures in a coherent way.

Keywords: Integrated-assessment; climate-change; economy; biosphere; impacts; mitigation.