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Introduction to Conceptual Mathematical Climate Models.

Conceptual mathematical models for the Earth's climate system are obtained by simplifying more complex models through model reduction and clever guessing and retain only some essential aspects of the climate system. They are typically given as systems of ordinary differential equations, sometimes with time lags or with spatial dependence. Such models are often still capable of reproducing faithfully quite complex climate phenomena. They may lead to new scientific questions, can serve as test cases for new methodologies, and have at times given rise to new terms and concepts in climate science. This talk reviews some well-known examples such as energy balance models that can explain global glaciation phases, box models for oceans that can explain thermohaline circulation, and oscillator models for ocean-atmosphere interaction explaining El Niño - Southern Oscillation. (Received January 19, 2015)