Beyond Climate Sensitivities: Climate Response And Prediction

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Response theory provides formidable methods for addressing many problems in statistical mechanics. Recently, it has been proposed as a gateway for the provision of a rigorous conceptual framework for computing climate response to a variety of forcings. In this contribution, we would like to present some new results showing for the first time how one can use linear response theory to effectively predict the impact of the increase of the CO_2 concentration on selected climatic observables in a General Circulation Model of the atmosphere. We also show how this framework allows to put on firm theoretical ground the operational definitions of Climate Sensitivity, and to address rigorously the problem of predicting climate response at different time-scales. Given its prognostic and diagnostic power, we believe that the proposed approach constitutes a mathematically rigorous and practically effective way to approach the problem of climate change assessment from a radically new perspective.