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ESTIMATING ATMOSPHERIC RADIATIVE FORCINGS USING SENSITIVITY MONTE CARLO METHODS

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ABSTRACT. One aspect of climate change analysis is the quantification of radiative forcings, i.e., the change of top-of-atmosphere (TOA) net radiative flux induced by an isolated, instantaneous change in surface or atmospheric constitution. In this paper, we discuss recent advances in path-integral formulations for producing reference estimates of radiative forcings, in the form of partial derivatives we call "sensitivities". We present the theoretical framework and highlight the role of computer science acceleration techniques in making the computational cost insensitive to the system's multidimensional and multiphysics complexity. The approach is demonstrated by estimating the flux sensitivity to the concentration of two greenhouse gases.

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