

Abstract Submitted  
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**Direct Statistical Simulation of Climate**<sup>1</sup> BRAD MARSTON, Brown University — Non-equilibrium statistical mechanics opens up the possibility of modeling climate directly,<sup>2</sup> bypassing the traditional approach of accumulating statistics from lengthy numerical simulations. One way to implement such Direct Statistical Simulation (DSS) is by systematic expansion in equal-time cumulants.<sup>3</sup> Essential physics of the general circulation can be illustrated with idealized 1- and 2-layer models of the atmosphere.<sup>4</sup> A truncation at second order in the hierarchy of cumulants is equivalent to retaining the interaction between zonal mean flows and eddies. Eddy-eddy interactions appear at higher orders, but care must be taken to keep the higher-order expansions realizable with non-negative probability distribution functions. Live demonstrations of models, and their statistical mechanical solution, will be performed. Possible effects of polar amplification of warming, due to the melting of arctic sea ice, on the mid-latitude jet stream will be illustrated.

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<sup>2</sup>E. N. Lorenz, *The Nature and Theory of the General Circulation of the Atmosphere*, vol. 218. World Meteorological Organization (1967).

<sup>3</sup>J. B. Marston, E. Conover, and T. Schneider, *J. Atmos. Sci.* **65**, 1955 (2008).

<sup>4</sup>J. B. Marston, *Ann. Rev. Cond. Matt. Phys.* **3**, 285 (2012).

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