Abstract for an Invited Paper
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The Quantum and Fluid Mechanics of Global Warming[1]

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Quantum physics and fluid mechanics are the foundation of any understanding of the Earth's climate. In this talk I invoke three well-known aspects of quantum mechanics to explore what will happen as the concentrations of greenhouse gases such as carbon dioxide continue to increase. Fluid dynamical models of the Earth's atmosphere, demonstrated here in live simulations, yield further insight into past, present, and future climates. Statistics of geophysical flows can, however, be ascertained directly without recourse to numerical simulation, using concepts borrowed from nonequilibrium statistical mechanics[2]. I discuss several other ways that theoretical physics may be able to contribute to a deeper understanding of climate change[3].

[1]Supported in part by NSF grant no. DMR-0605619.

[2]J. B. Marston, E. Conover, and Tapio Schneider, "Statistics of an Unstable Barotropic Jet from a Cumulant Expansion," arXiv:0705.0011, J. Atmos. Sci. (in press).

[3]J. Carlson, J. Harte, G. Falkovich, J. B. Marston, and R. Pierrehumbert, "Physics of Climate Change" 2008 Program of the Kavli Institute for Theoretical Physics.