

First Lorenz workshop workshop Abstract

**A symmetric energy balance as a macroscopic constraint on Earth's climate?**

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**Abstract:**

Perturbations to the Earth's energy balance force climate change. The latitudinal variation of the energy balance establishes regional climate zones through its influence on the atmospheric and ocean circulations that, in turn, move heat poleward. We currently lack a quantitative understanding of how this energy balance and the poleward energy transport adjust to different forcings that determine climate change and no constraint exists to guide this understanding in either observations or models. This talk will use observations gathered over the past decade to show how the Earth's energy balance exhibits a remarkable symmetry about the equator. It will be further argued that this symmetry is a necessary condition of a steady state climate. Analysis will show that it is the clouds that are the principal agent that regulates this symmetry and sets the steady state. The existence of a thermodynamic steady-state constraint on climate and the symmetry required to sustain it leads to a number of speculative but potentially important inferences about the synchronous nature of climate changes between hemispheres, offering for example insights on mechanisms that can sustain global ice ages and insights on cloud feedbacks without resorting to the complex and intricate processes of cloud formation. It will also be shown that present-day climate models deviate substantially from the symmetric condition of Earth.