THE UNIVERSITY OF CHICAGO

# Computational and Applied Mathematics Student Seminar

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## Transition Path Analysis of a Stratospheric Vacillation Model

Tuesday, October 6, 2020, 3:00 PM (CDT)
Zoom Meeting ID: 925 9810 5052
Password: euler

## ABSTRACT

Nonlinear dynamics in the atmosphere produce rare events that are hard to predict and attribute due to many interacting degrees of freedom. Sudden stratospheric warming is a spectacular example in which the winter polar vortex, typically a strong current, breaks down with a vast influx of heat. This can induce severe cold spells in the midlatitudes as arctic air dips south. Computational simulations can reproduce this phenomenon, but the complexity of the physics and data presents a challenge for interpretation. We propose and illustrate a new approach to describing rare weather events using Transition Path Theory, an established mathematical framework that defines and relates statistics of extreme events from data. Applying this methodology to a classical low-order stratospheric model, we compute optimal predictors, dominant pathways, and return times, and relate them to physically motivated observables. The study aims to motivate the broad potential utility of Transition Path Theory in meteorology.