復旦大學
FUDAN UNIVERSITY

Applied Math
Ph.D. Seminar

Landscape Quantifies the Intermediate State and Transition Dynamics in Ecological Networks

Speaker: Jinchao Lv (Fudan University)
Time: 2023-11-02, 16:10 to 17:00
Location: Room 1801, Guanghua East Tower
Advisor: Chunhe Li (Fudan University)

Abstract: Understanding the ecological mechanisms associated with the collapse and restoration is especially critical in promoting harmonious coexistence between humans and nature. So far, it remains challenging to elucidate the mechanisms of stochastic dynamical transitions for ecological systems. Using an example of plant-pollinator network, we quantified the energy landscape of ecological system. The landscape displays multiple attractors characterizing the high, low and intermediate abundance stable states. Interestingly, we detected the intermediate states under pollinator decline, and demonstrated the indispensable role of the intermediate state in state transitions. From the landscape, we define the barrier height (BH) as a global quantity to evaluate the transition feasibility. We propose that the BH can serve as a new early-warning signal (EWS) for upcoming catastrophic breakdown, which provides an earlier and more accurate warning signal than traditional metrics based on time series. Our results promote developing better management strategies to achieve environmental sustainability.