School of Earth and Environmental Sciences
Spring 2025 Colloquium Series

Wednesday, April 23, 2025
12:15 PM -1:30 PM
Science Building C-207

Zoom ID: 843 0287 5858
Passcode: 672323

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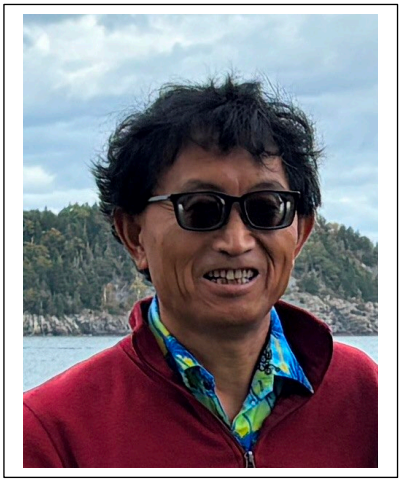
Integrating Nonlinear Dynamics into Ecosystem Respiration: The Michaelis-Menten Q10 Model



The temperature sensitivity of ecosystem respiration (Re), commonly described by the Q10 coefficient, is a key metric for understanding how respiration rates respond to temperature changes. Traditional models often treat temperature and other factors, such as water availability, independently, leading to limitations in capturing the complex interactions governing Re. In this study, we present a novel Michaelis-Menten (MM) Q10 model that integrates nonlinear dynamics to describe the coupled effects of temperature and water availability on ecosystem respiration. Using FLUXNET data from 136 globally distributed sites with available soil moisture measurements, we demonstrate that the MM Q10 model provides a more accurate representation of Re compared to widely used additive models. Our analysis reveals a convex relationship between Q10 and temperature, where water availability significantly modulates temperature sensitivity. These findings highlight the critical role of water limitation in reducing positive carbon-climate feedback in arid and semi-arid regions, offering a mechanistic framework for improving ecosystem models.