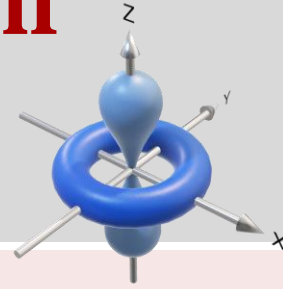




Department of Physics Colloquium

October 16, 2023



3:00 PM

The enduring mystery of energy imbalance in observing atmospheric exchanges with ecosystems

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The physics and climate of Earth's lower atmosphere is strongly regulated by the activity of biological organisms that underlay it. Borrowing on techniques from turbulent fluid mechanics, we can observe that regulation at fine space and time scales. We do so by deploying spectrometers and anemometers 10-100 m above ground on so-called flux towers, through what is called the eddy covariance technique. Hundreds of sites now established around the world span the tropics to poles and provide critical constraints on projections of the fate and impact of fossil fuel emissions driving our rapidly changing climate. However, an enduring mystery persists regarding the nature of thermodynamic energy exchange. Virtually all of these observing sites demonstrate an imbalance in the observed incoming and outgoing energy. Several possible culprits are hypothesized to contribute to this "energy imbalance" problem, some of which are lending new insight into the dynamics of the atmosphere. To investigate some of these, I led an extensive field campaign in 2019, the Chequamegon Heterogeneous Ecosystem Energy-balance Study Enable by a High-density Extensive Array of Detectors (CHEESEHEAD19). Here, I will present our understanding the role of ecosystems in Earth's climate, along with solutions to our enduring mystery that we have learned from this and related studies.

This colloquium will be held in-person, at SERC 116 unless announced otherwise.