



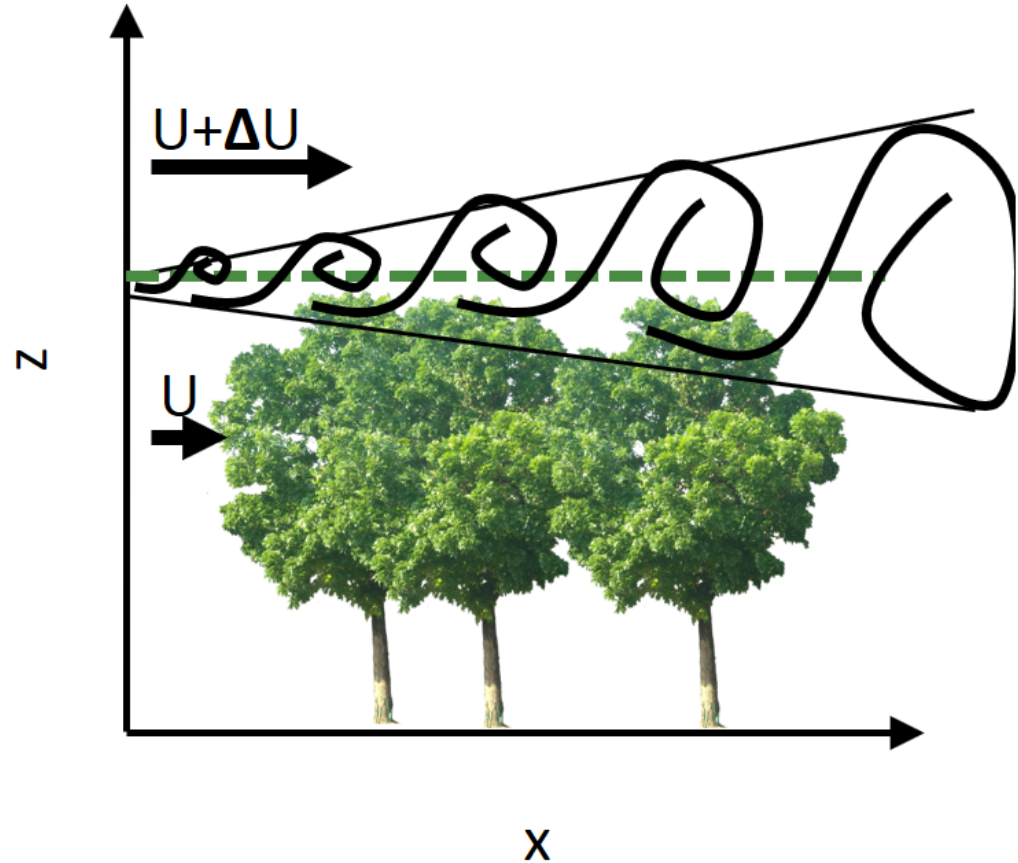
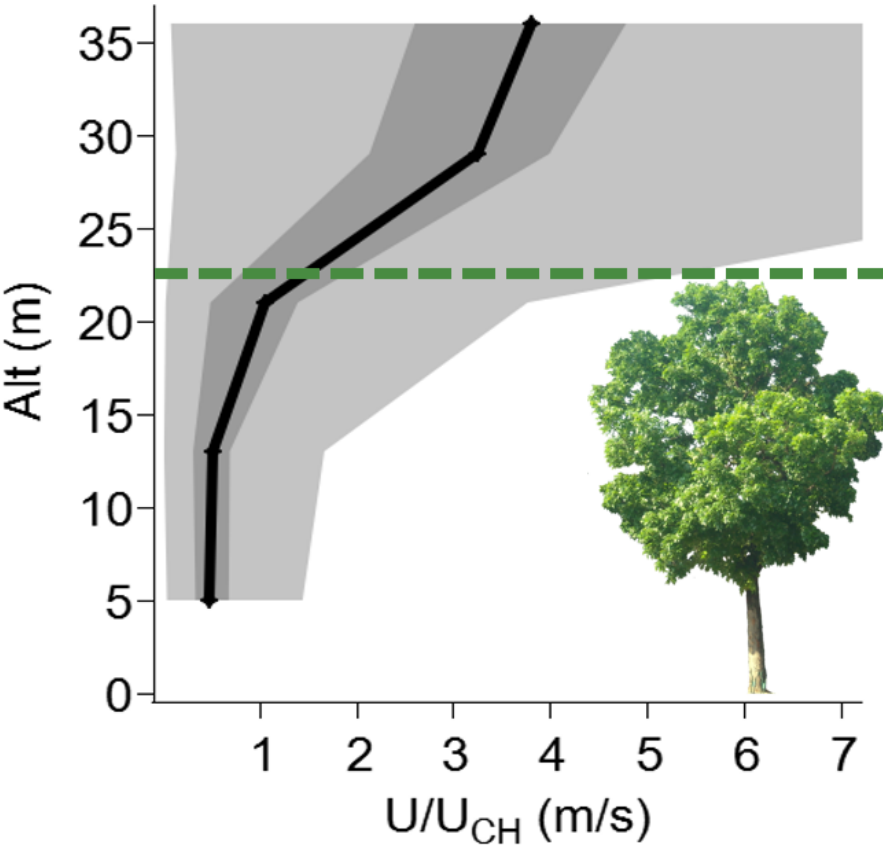
In-Canopy Turbulence: How Do Coherent Structures Affect Fluxes In and Out of the Canopy?



Sarah C. Kavassalis¹, Jennifer G. Murphy¹, and Allison L. Steiner²

¹University of Toronto, Department of Chemistry, Toronto, Ontario, Canada

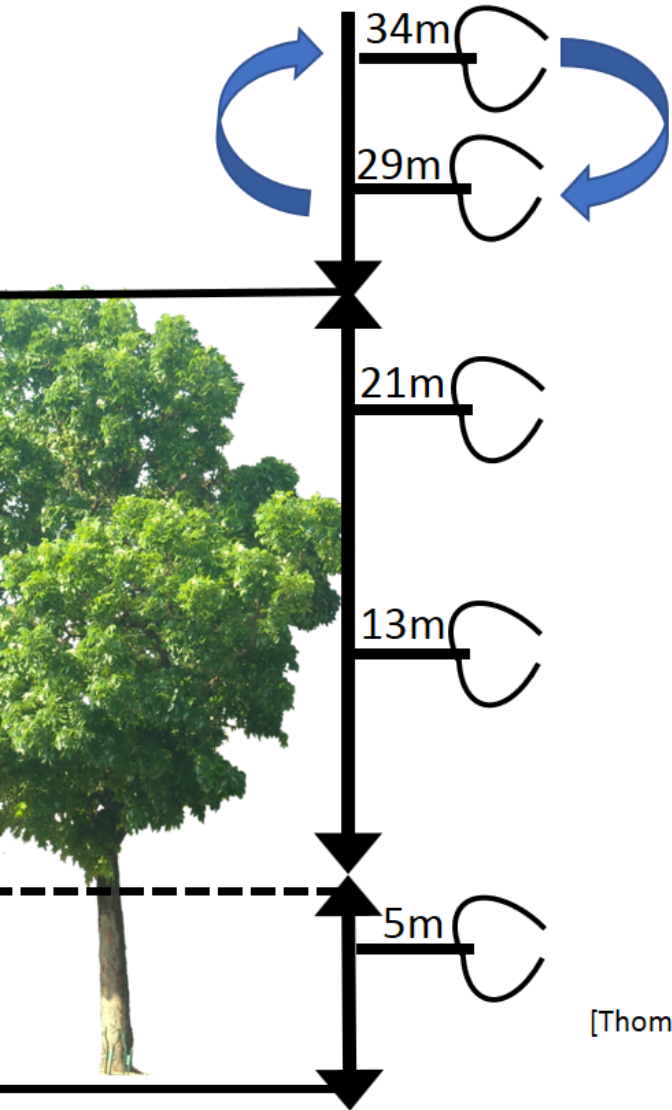
²University of Michigan, Climate & Space Sciences & Engineering, Ann Arbor, Michigan, USA



The exchange of heat, momentum, and trace gases between the canopy and the atmosphere is driven by turbulence. In dense vegetation canopies, this is dominated by large coherent structures that intermittently move air in and out of the canopy in 'bursts' and 'sweeps', coupling the canopy with the atmosphere above.



In-Canopy Turbulence: How Do Coherent Structures Affect Fluxes In and Out of the Canopy?

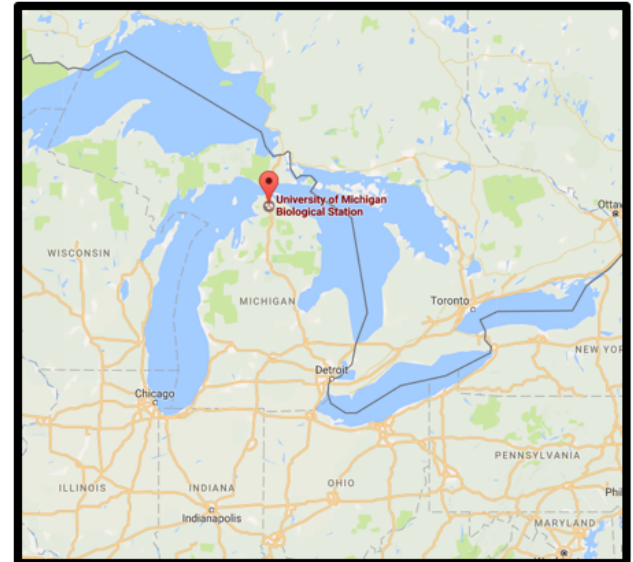


- 3D sonic anemometers logging 10Hz wind speed and sonic temperature
- Coordinate rotation is applied and data filtered for incomplete records, rain events, weak wind conditions, and wind directions from behind the tower
- Presence of coherent turbulent structures identified using wavelet analysis.
- Canopy coupling classification was determined by the covariance of kinematic heat fluxes between sonic anemometers

[Thomas and Foken 2007, Steiner *et al.* 2011].

PROPHET-AMOS Campaign
July 1st – 31st, 2016

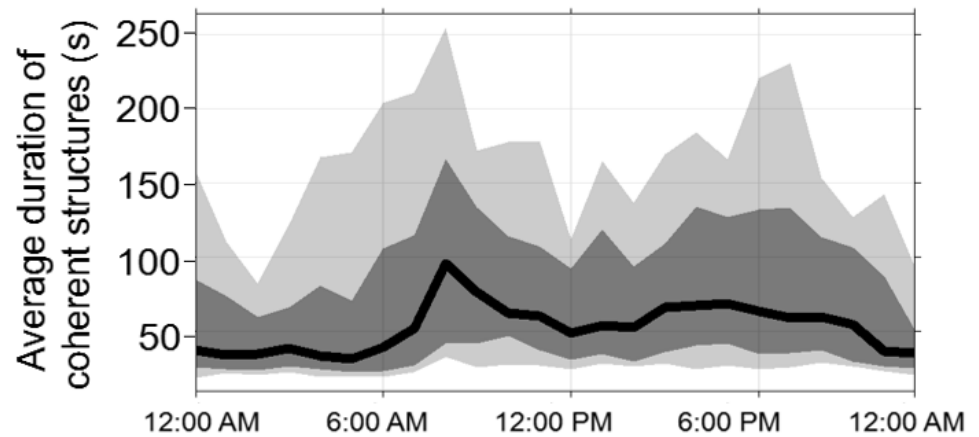
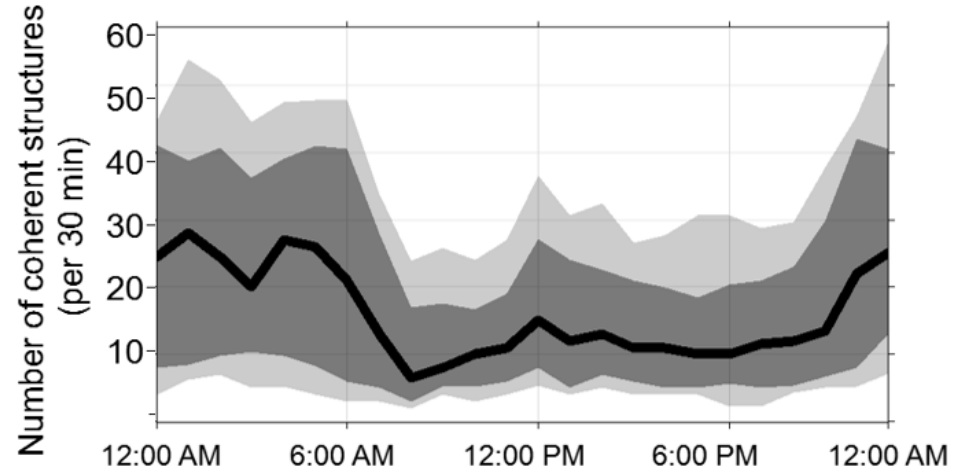
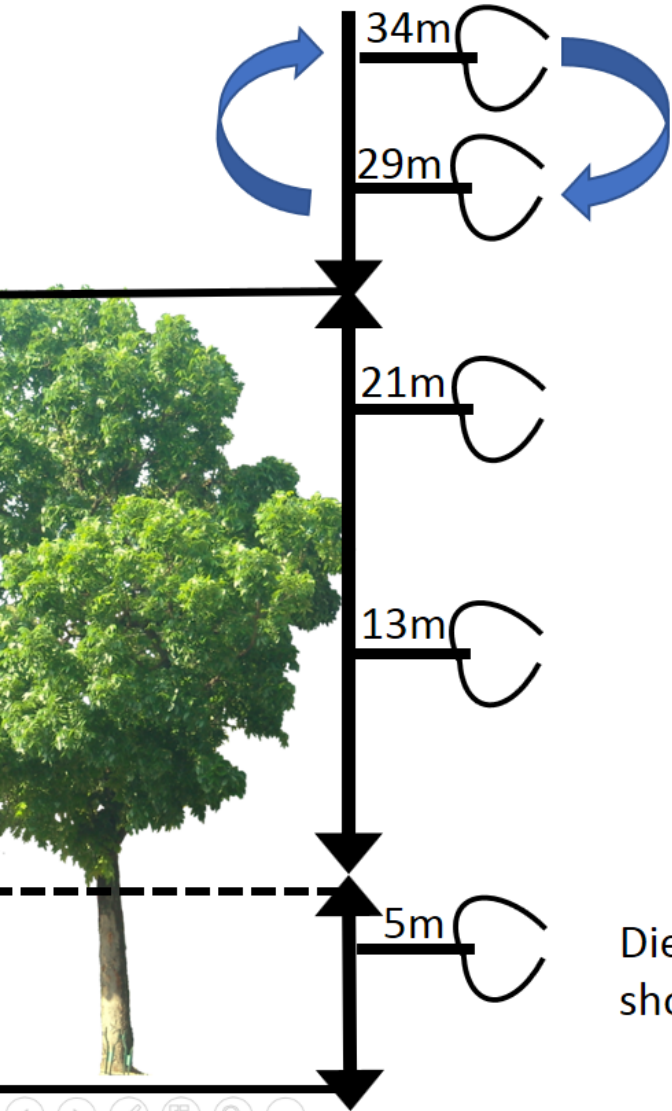
University of Michigan Biological Station



- Temperate-Boreal transition forest (mixed wood)
- Average LAI 3.3 m²/m²
- Site houses two flux towers (PROPHET 34m, AmeriFlux 46m) and one lab



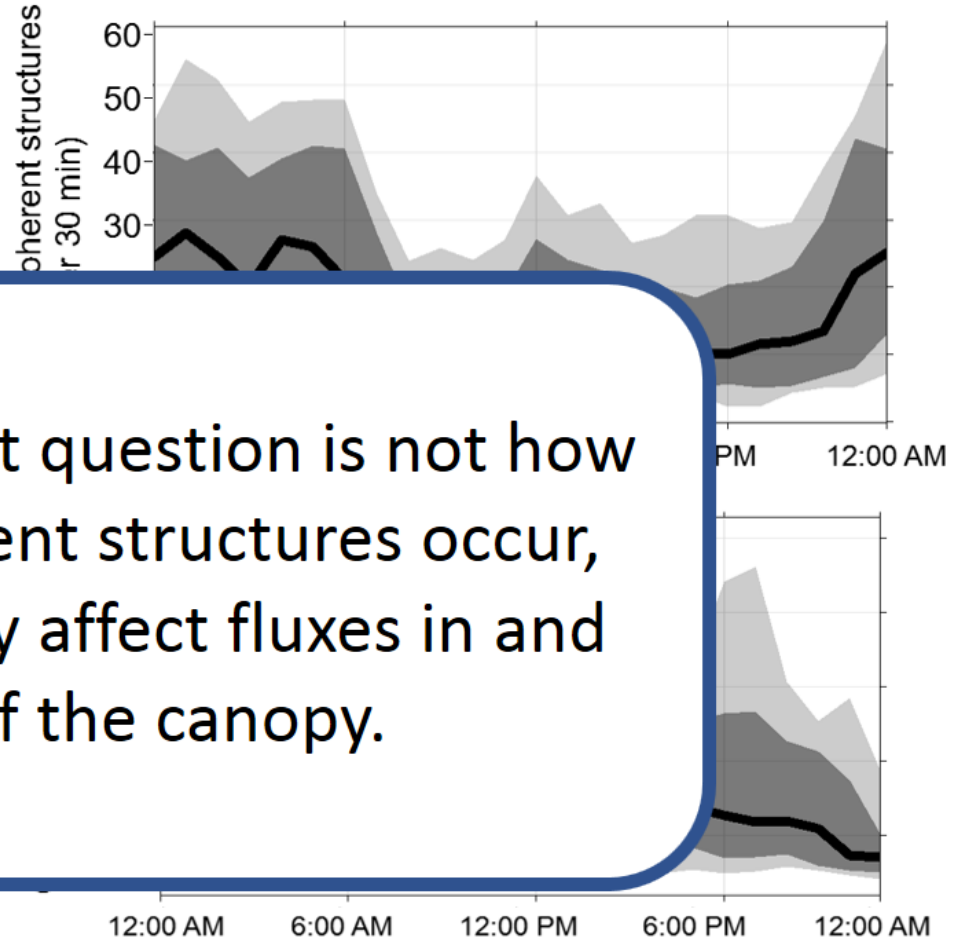
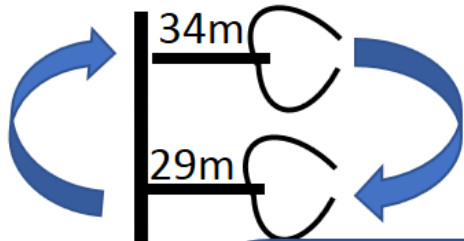
In-Canopy Turbulence: How Do Coherent Structures Affect Fluxes In and Out of the Canopy?



Diel plots of the number and average duration of coherent (s) showing campaign median, 25th/75th, and 5th/95th quantiles.



In-Canopy Turbulence: How Do Coherent Structures Affect Fluxes In and Out of the Canopy?

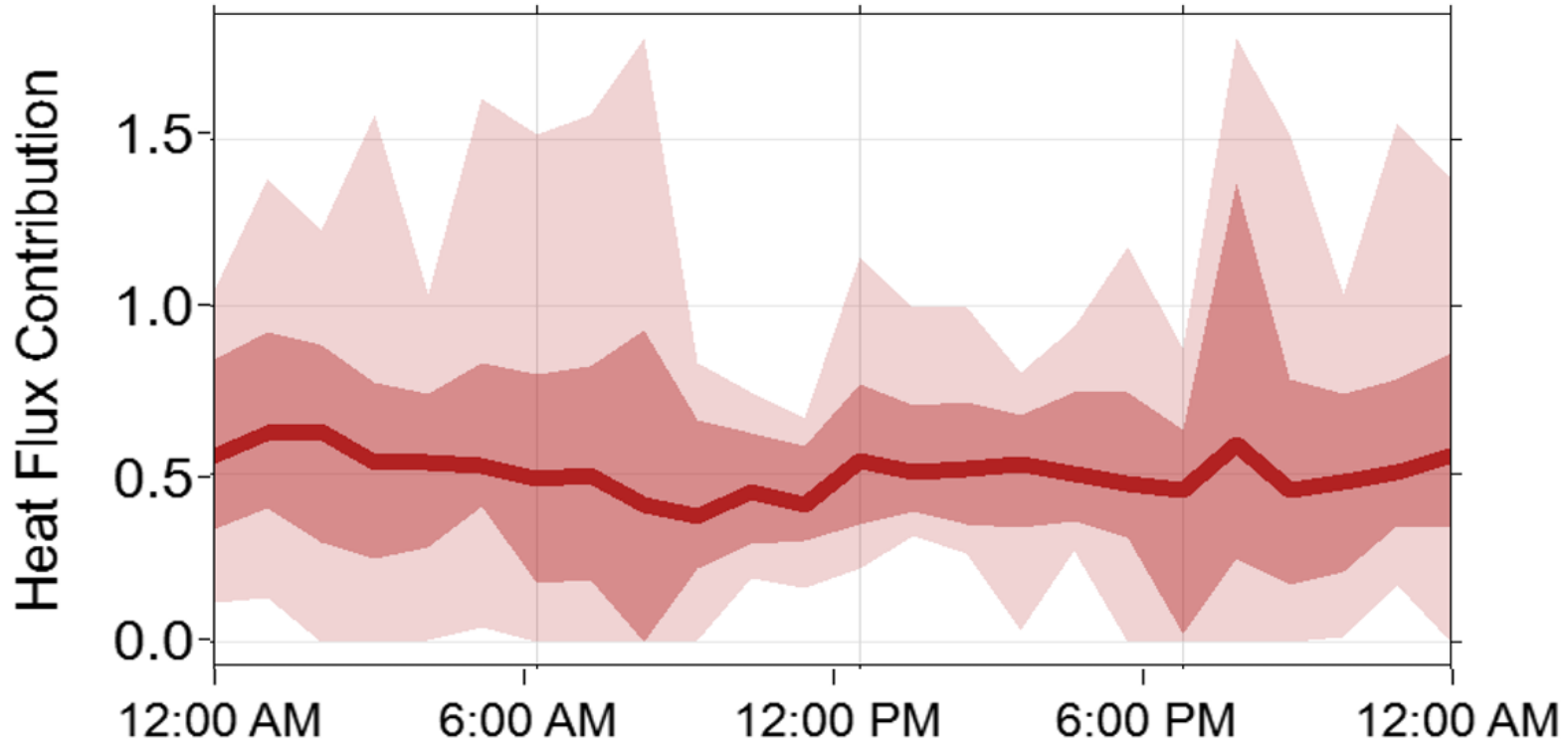


The important question is not how many coherent structures occur, but how they affect fluxes in and out of the canopy.

Diel plots of the number and average duration of coherent (s) showing campaign median, 25th/75th, and 5th/95th quantiles.



In-Canopy Turbulence: How Do Coherent Structures Affect Fluxes In and Out of the Canopy?



Diel plot of the fractional contribution of coherent structures to kinematic heat flux showing campaign median, 25th/75th, and 5th/95th quantiles.



In-Canopy Turbulence: How Do Coherent Structures Affect Fluxes In and Out of the Canopy?

