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Nonlinear time series techniques to characterize wind and temperature intermittency above a crop canopy.

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One important problem for understanding the vegetation-atmosphere interactions in an agricultural field is the turbulent exchange of scalar and momentum in the atmospheric boundary layer - above and within the crop canopy. Air temperature time series within and above canopies reveal ramp patterns associated with coherent eddies that are responsible for most of the vertical transport of sensible heat. Van Atta (1977) used a simple step-change ramp model to analyze the coherent part of air temperature structure functions. However, some works reveal that even without linearization his model cannot account for the observed decrease of the cubic structure function for small time lag (Wenjun Chen et al., 2004).

Using considerations of scale effect and spatial variability of temperature and wind , the theory of multi-fractal processes, conservative or not, is introduced as a strategy for characterizing structure functions of temperature and vertical wind velocity at different scales of observation. We will show that kurtosis and phase coherence index characterize the intermittent nature of both series measured by a micrometeorological tower at different scenarios above the crop canopy.

References

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