Dr. Gil Bohrer, Assistant Professor in Civil, Environmental and Geodetic Engineering at The Ohio State University recently completed an Ohio WRC 104(b) funded project. This project titled "**Green-house-gas budgets of constructed wetlands: understanding the sources to maximize benefits"** aims to evaluate the factors affecting methane emission from wetlands. Since wetlands restoration is gaining momentum nationwide due to its function of cleaning water, removing nutrients and sequestering carbon, evaluating the optimal conditions that enhance these ecosystem services while keeping methane emissions, a potent greenhouse gas, at minimum is imperative.

This research involves continuous high-frequency measurements of weather conditions, such as air and soil temperature and humidity, incoming solar radiation, wind, and the fluxes of heat, water vapor, CO_2 and methane from a central flux tower above the wetland (Figure 1). Using data from this high-tech flux tower, and periodic manual measurements of methane and CO_2 from chambers we have discovered that in addition to the predictable relationships between the thermal state of the wetland (soil water and air temperatures) and methane flux, there is also a tight relationship between vegetation activity and methane emission, which was not anticipated (Figure 2). Different management strategies may be developed to control the physical conditions - water temperature and heat flux for example could be reduced by trees that shade the water, and the ecological state. It seems that macrophyte plants, such as cattails, play a critical role in transport and production of methane and provide one of the imported controls to methane emission rates.

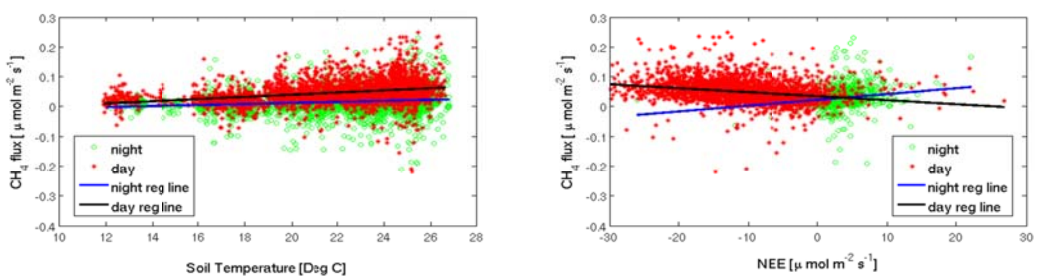

Figure 2 Environmental drivers: Soil temperature (left) and vegetation photosynthesis rates (NEE, right) Vs. methane flux.

Researcher: Dr. Gil Bohrer develops and uses physical and empirical models of the interactions between individual biological organisms and atmospheric and hydrological processes. His research bridges the physical scale gap between regional atmospheric processes and individual plant-scale function and structure. He develops new approaches to parameterization of the effects of small-scale heterogeneity on surface fluxes, on water movement from the soil through plants to the air, and on advection and dispersion of green-house gasses, VOCs and particulate matter. He uses a range of models, from high-power parallel large eddy simulations to simple empirical models, and remote sensing to study the structure of vegetation and land-cover at individual-plant resolution. He conducts meteorological and eddy-flux observations in forests and wetlands to provide the needed information to force, parameterize and evaluate models of green-house gas budgets of ecosystems and the effects of small-scale heterogeneity and intermediate disturbance on these fluxes.