Title
Overview of Terrestrial Ecology Observation Systems

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CENS Center for Embedded Networked Sensing

Terrestrial Ecology Observing Systems: overview of embedded networked systems

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Integration of information from a diverse set of sensor data

Above-ground Processes

Carbon Assimilation

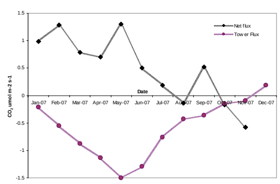


Figure 1. Comparing leaf level CO_2 measurements eddy covariance tower measurements. The purple line represents eddy covariance measurements, whereas the grey line based on leaf chamber measurements.

Leaf Phenology

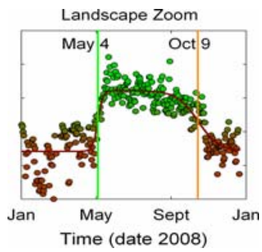


Figure 2. Using Pan-Tilt-Zoom cameras for an integrated "green-up" date estimation.

Water Loss

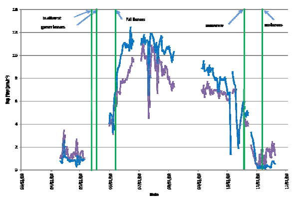
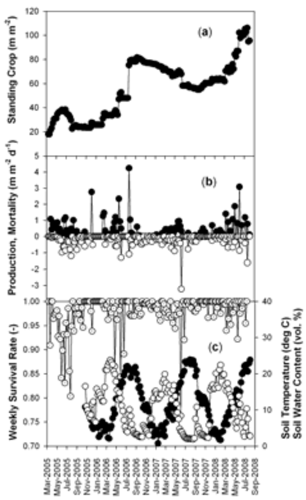


Figure 3. Mean daily sample flow rates (transpiration rates) for two Oak trees during the 2008 growing season.

Below-ground Processes

Root and Fungal Dynamics



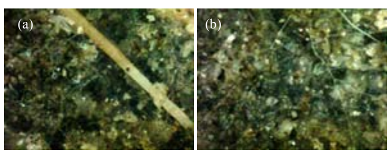


Figure 4. Image of (a) arbuscular mycorrhizal fungi colonizing a plant root and (b) fungal hyphae using the new automated minirhizotron camera.

Figure 5. Standing crop length of fine roots (solid circle) (a), weekly average production rates (solid circle) and mortality rates (open circle) (b), and weekly survival rates (dotted circle) and weekly average soil temperature (solid circle) and soil water content (open circle) (c). To contrast differences, mortality rates are plotted in negative values.

Soil CO_2 Efflux

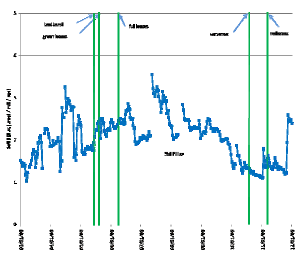


Figure 6. Mean daily soil CO_2 efflux at the James Reserve during the 2008 growing season. Soil CO_2 efflux was calculated using the CO_2 gradient flux method based on CO_2 concentrations within the soil profile.

Wavelet coherence analysis to study temporal co-variance between soil CO_2 production and soil temperature and soil moisture

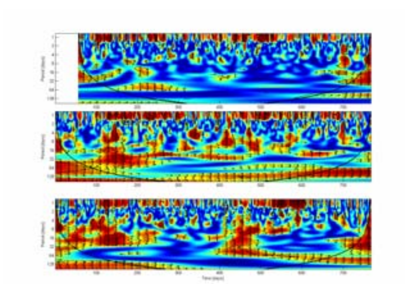


Figure 7. Wavelet coherence analysis and phase differences between soil CO_2 production (Ps) and soil temperature (a) mature woody vegetation, (b) young woody vegetation, and (c) herbaceous vegetation from January 2006 to February 2008. The phase difference is shown by arrows: in phase pointing right, anti-phase pointing left. The color codes for power values are from dark blue (low values) to dark red (high values).

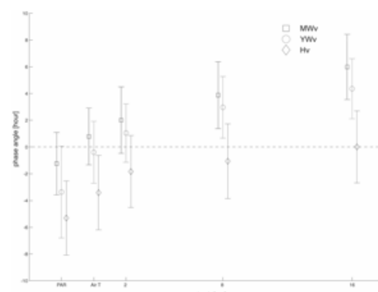


Figure 8. Average phase difference between soil CO_2 production (Ps), photosynthetic active radiation (PAR), air temperature, and soil moisture at 2, 8, and 16 cm depth for the 1-day period when the wavelet coherence power was significant ($\alpha = 0.05$). Dashed line represents zero shift (in hours) between variables.