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**Effects of elevated atmospheric CO<sub>2</sub> and tropospheric O<sub>3</sub> on the hydrologic budget for communities of trembling aspen, paper birch, and sugar maple**

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Abstract:

Availability of water for human use and natural ecosystems during the coming decades is a significant concern. Water resources are greatly influenced by soil moisture losses to evapotranspiration, which could be significantly impacted by ongoing increases in atmospheric CO<sub>2</sub> and O<sub>3</sub>. Increases in CO<sub>2</sub> have been shown to increase plant growth, leaf-area-index and water use efficiency, while increases in O<sub>3</sub> have been shown to decrease plant growth and stomatal control; the results of these effects on plant growth may offset one another. The effects of CO<sub>2</sub>, O<sub>3</sub>, and their interaction on evapotranspiration and soil moisture were quantified throughout the 2006- 2008 growing seasons at the Aspen FACE Project in Rhinelander, WI seasons for the present study. Precipitation and evapotranspiration were quantified using micrometeorological data, stemflow, throughfall, and sap flux measurements, and soil moisture was quantified using electrical resistivity soil moisture probes placed at soil depths ranging from 5 to 100 cm. The data were vetted for outliers, binned by climatic and tree phenological stages, and analyzed using ANOVA. The ANOVA models used included a whole plot level factor for treatment, a stripped (non-randomized) subplot level factor for community, and species nested within community. Soil moisture depth was included as a block-level stripped (non-randomized) factor. Replicate (block) was treated as a fixed factor to account for a fertility gradient across the site. Soil moisture was greatly increased during certain periods of the year in the presence of elevated CO<sub>2</sub>.

Impact Statement:

This work was performed at the Aspen FACE experimental site located in Harshaw, WI in cooperation with the USDA Forest Service Institute for Applied Ecosystem Studies. The extensive integrated meteorological and subsurface datasets gathered throughout the 2006 - 2008 growing seasons provide an extraordinarily detailed basis for investigating the effects of increasing atmospheric CO<sub>2</sub> and ozone on the forest hydrologic cycle.

Category: Other Water Resource Topics  
Type of Presentation: Poster Presentation