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Title: Carbon Isotopic Studies of Assimilated and Ecosystem Respired CO₂ in a SE Pine Forest.

P.I. Institution P.I. Jeffrey Chanton, Co-P.I. Behzad Mortazavi

Dept. of Oceanography, Florida State University, Tallahassee, Florida 32306-4320

Total FY 2006-2007 requested of NICCR program:
FSU TOTAL \$ 50,986 (equipment \$ 0/0/0; travel \$2550)

1. Objectives. Our first objective in year 3 is to continue the determinations of the response of the $\delta^{13}C$ signature of soil- ($\delta^{13}C_s$), foliage- ($\delta^{13}C_f$), and ecosystem-respired ($\delta^{13}C_r$) CO₂ at the 80 year old Ameriflux site (Austin Carey Forest) near Gainesville, Florida to soil moisture, canopy vapor pressure deficit and temperature. Our second objective is to determine spatial variations in these parameters to contrast with our two primary seasonal sites, the Donaldsonville tract and the Austin Carey forest. We wish to determine the representativeness of our two primary sites in the overall forest mosaic.

2. Location. The research will take place in at and near to the two Ameriflux sites near Gainesville, Florida

3. Hypothesis 1. $\delta^{13}C_f$, $\delta^{13}C_r$ and $\delta^{13}C_s$ will respond to canopy height/age and moisture deficits by exhibiting greater $\delta^{13}C$ enrichment. The degree of the response will be $\delta^{13}C_f > \delta^{13}C_r > \delta^{13}C_s$. Younger shorter stands will respond to a greater degree to VPD than do older/taller stands.

Hypothesis 2: Isotopic variations in wax composition will co-vary with isotopic variations in leaf soluble sugars and leaf respiration with a temporal delay and damping which can be quantitatively related to wax turnover times and ecosystem respiration.

4. Approach

1. continue studies at the 80 year old Ameriflux sites quantifying as a function of VPD $\delta^{13}C$ of foliage ($\delta^{13}C_f$), soil ($\delta^{13}C_s$) and ecosystem ($\delta^{13}C_r$) respired CO₂, $\delta^{13}C$ of sugars.

2. Investigate gradients in tree-height/age in the vicinity of and including the two tower sites to determine the effect of tree age/height on of the $\delta^{13}C$ of foliage respired CO₂, leaf sugars and leaf waxes and to determine if the response of these parameters to VPD varies as a function of tree height/age.

5. We will determine how climatic variables, operating by affecting LI, and the balance between autotrophic and heterotrophic respiration affect the isotopic composition of ecosystem respired carbon dioxide ($\delta^{13}C_r$). Data from our site indicate that $\delta^{13}C_r$ does not remain constant, and is $\delta^{13}C$ enriched during periods of low precipitation. For this project our deliverables will be the determination of the temporal variation at an 80 year old site and spatial variation of trees of $\delta^{13}C$ of trees of differing heights in areas surrounding the primary site.