Title: **Parameters Controlling Ecosystem CO_2 Responses in Simulations of Duke and Oak Ridge FACE Experiments with ELM-FATES-CNP**

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BER Program: ESS

Project: Free Air CO_2 Enrichment Model Data Synthesis (FACE-MDS) (DOE Lab-led project)

Project Website: https://facedata.ornl.gov/facemds

Project Abstract: The response of temperate forests to elevated atmospheric CO_2 (eCO2) is constrained by nitrogen (N) availability and dynamics, which can interact with demographic traits and processes. Understanding these interactions is necessary to develop predictive understanding of forest ecosystem responses to eCO2 at climate-change relevant timescales (i.e. decades). However, even the long-term FACE experiments such as Duke and Oak Ridge only ran for about a single decade. Results over a single decade provide some information on eCO2, N, and demographic process interactions but our ability to understand longer-term vegetation processes remains limited. Furthermore, the heterogeneity of demographic states represented by FACE experiments is also limited. The Functionally Assembled Terrestrial Ecosystem Simulator (FATES) is a model with the demographic resolution that enables us to evaluate how demographic traits and processes might interact with eCO2 over longer timescales. Recent developments to bring nutrient cycling into ELM-FATES (ELM-FATES-CNP) now provide the N and other nutrient-related constraints that are known to be an essential driver of ecosystem eCO2 responses. In this poster we apply ELM-FATES-CNP to simulating the Duke and Oak Ridge FACE experiments. We use the two soil nutrient cycling hypotheses or conceptualizations that currently exist in ELM—relative demand and equilibrium chemistry approximation. Results presented in this poster are based on initial simulations and informal sensitivity analyses to investigate and define parameter sets and provide a baseline understanding of ELM-FATES-CNP responses to eCO2. These parameter sets and understanding will be used to develop and interpret an ensemble of demographic model simulations to evaluate the question: How have demographic processes shaped the responses to eCO2 observed at long-term FACE experiments?