# 3.102 Stress-induced biogenic organic emissions and atmospheric chemistry interactions.

Presenting Author:
**Alex Guenther**, University of California, Irvine, alex.guenther@uci.edu

Co-Authors:
**Xiaoyan Jiang**, University of California, Irvine

Abstract:

Earth system model simulations have demonstrated that surface-atmosphere exchanges of mass, momentum and energy are fundamental processes that exert control over atmospheric chemical composition and climate. This includes the release and uptake of biogenic volatile organic compounds (BVOC) by terrestrial ecosystems. BVOC participate in chemical reactions that influence atmospheric distributions of air pollutants and short-lived climate forcers including organic aerosol, ozone and methane. These emissions are presently included in most earth system models as either static inventories or a simple model that responds only to a few variables such as temperature, solar radiation and vegetation foliage abundance. It is well known that at least some BVOC emissions are also highly sensitive to abiotic (temperature, drought, etc.) and biotic (fungi, herbivores, etc.) stresses but the complex relationships are typically omitted or are represented in models with highly simplified approaches. We describe efforts to assess the potential for stress-induced BVOC emissions to significantly impact atmospheric chemical composition and consider potential interactions and feedbacks. This was accomplished by synthesizing field and laboratory observations of stress-induced BVOC emission and incorporating the results into numerical algorithms suitable for regional and global numerical models. Model simulations using Model of Emissions of Gases and Aerosols from Nature (MEGAN), Community Earth System Model (CESM), and Weather and Research Forecasting model coupled with chemistry (WRF-Chem) are used to investigate the impact of stress-induced BVOC emission on atmospheric chemical composition and determine the potential for significant interactions and feedbacks. MEGAN simulations with and without stress are used to quantify the potential sensitivity of BVOC emission response. WRF-Chem regional model simulations are used to determine how the stress-induced changes can affect atmospheric chemistry. Finally, global CESM simulations are used to assess potential global interactions and feedbacks.