Geophysical Research Abstracts
Vol. 19, EGU2017-10760, 2017
EGU General Assembly 2017

Investigating the connectivity between emissions of BVOC and rainfall formation in Amazonia using Genetic Programming

Celso Von Randow (1), Marcos B Sanches (1), Rosa Maria N. Santos (2), Marcelo Chamecki (3), and Jose D Fuentes (4)

(1) INPE, CCST, São José dos Campos, Brazil (celso.vonrandow@inpe.br), (2) State University of Amazonas, Manaus, Brazil, (3) University of California, Los Angeles, USA, (4) Penn State University, State College, PA, USA

A detailed field experiment measuring turbulent properties, trace gases and BVOCs was carried out from April 2014 to January 2015 within and above a central Amazonian rainforest, with the objective of understanding the role of emissions and reactions of BVOCs, formation and transport of aerosols out of the boundary layer on cloud formation and precipitation triggers. Our measurements show two-way aspects of connectivity: mesoscale convective systems transport ozone down from the middle troposphere, enriching the atmospheric boundary layer as well as the forest canopy and surface layer, and, through multiple chemical transformations, an ozone-enriched atmospheric surface layer that can oxidize rainforest-emitted hydrocarbons and generate aerosols that subsequently activate into cloud condensation nuclei, thereby possibly influencing the formation of new convective precipitation.

Qualitatively, we address the connectivity between emissions of BVOCs near the surface and rainfall generation, using the technique of Genetic Programing (GP), introduced by Koza (1992), based on the concepts of natural selection and genetics. The technique involves finding a mathematical expression that fits a given set of data, and constructing a population of mathematical models from different combinations of variables, constants and operators.

An advantage of GP is that it can flexibly incorporate multivariate non-linear relations, and obtained numeric solutions are possibly interpreted and checked for physical consistency. A number of state variables (for example, surface fluxes, meteorological conditions, boundary layer stability conditions, BVOC and Ozone vertical profiles, etc), representing possible influences on BVOC emissions and their interrelations along the way through secondary organic aerosol and CCN formation to rainfall will be used.