EGU21-5755, updated on 04 Dec 2022
https://doi.org/10.5194/egusphere-egu21-5755
EGU General Assembly 2021

Transport of isoprene and its oxidation products by deep convective clouds in the Amazon

Roman Bardakov[1,2], Joel Thornton[3], Ilona Riipinen[2,4], Radovan Krejci[2,4], and Annica Ekman[1,2]

[1]Department of Meteorology, Stockholm University, Stockholm, Sweden (roman.bardakov@misu.su.se)
[2]Bolin Centre for Climate Research, Stockholm University, Stockholm, Sweden
[3]Department of Atmospheric Sciences, University of Washington, Seattle, United States
[4]Department of Environmental Science (ACES), Stockholm University, Stockholm, Sweden

Transport of organic trace gases by deep convective clouds plays an important role for new particle formation (NPF) and particle growth in the upper atmosphere. Isoprene accounts for a major fraction of the global volatile organic vapor emissions and a significant fraction is emitted in the Amazon. We examined transport and chemical processing of isoprene and its oxidation products in a deep convective cloud over the Amazon using a box model. Trajectories of individual air parcels of the cloud derived from a large eddy simulation are used as input to the model. Our results show that there exist two main pathways for NPF from isoprene associated with deep convection. The first one is when the gas transport occurs through a cloud with low lightning activity and with efficient gas uptake of low-volatile oxidation products by ice particles. Some of the isoprene will reach the cloud outflow where it is further aged and produces low volatile species capable of forming and growing new particles. The second way is via transport through clouds with high lightning activity and with low gas uptake by ice. For this case, low volatile oxidation products will reach the immediate outflow in concentrations close to the values observed in the boundary layer. The efficiency of gas condensation on ice particles is still uncertain and further research in this direction is needed.