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Evaluation of ozone deposition models over a subalpine forest

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Tropospheric ozone influences ecosystem vulnerability and photosynthetic performance. As forests are longterm sinks of carbon they play a key role in terrestrial ecosystem – atmosphere interactions. Any changes caused by e.g. detrimental effects of the ozone in their productivity, the capacity of assimilating carbon may have serious effects on climate feedbacks. Besides measurements of ozone deposition, modeling efforts are of high importance, since field measurement availability is limited and do not provide sufficient information on ozone concentration and fluxes to provide a reliable estimation on ozone effects on ecosystems.
Two widely used ozone deposition models were tested over a subalpine forest at the Niwot Ridge AmeriFlux site (Colorado, USA). Both investigated models are based on the resistance analogy and the so-called big-leaf concept but differ in the parameterizations of the resistance terms.
We present here a statistical and local sensitivity analysis to investigate the effect of model input data. Results show that model performance varies with time of the day, and the errors show a pronounced seasonal pattern as well. During daytime both over- and underestimation occurred depending on the season. Besides the modeling work we investigated the driving variables of ozone deposition for hourly, daily and monthly time steps based on eddy covariance field measurements. The results showed that measured gross primary production and ozone flux has a strong correlation although this relationship is not included in any of the formulas of ozone deposition calculation.