2.029 CANEXMIP: Intercomparison of models for simulating canopy-atmosphere exchange and chemistry of reactive compounds and aerosols .

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Abstract:

The so-called “big-leaf” approach has typically been used to represent surface emissions and deposition of reactive compounds and aerosols in large-scale atmospheric chemistry models. This has been a reasonable approach for studies focused on acidification and eutrophication research but consideration of the role of more reactive compounds, that undergo fast chemical transformation at timescales comparable to turbulent transport and deposition, requires the explicit consideration of interactions between emitted and depositing compounds within the canopy airspace. Consideration of canopy interactions is also relevant for assessing the efficiency of the release of emitted reactive compounds (and products) as well as for comparison of model simulated surface layer concentrations with observations. Temporal variability in these surface layer concentrations is largely determined by the canopy interactions that are not explicitly captured by the “big-leaf” approach. In addition, to assess the potential impact of pollutant deposition on ecosystem functioning, the role of canopy interactions in determining stomatal versus non-stomatal deposition must be considered. There is a suite of models that explicitly consider these canopy interactions and are applied mostly for field-scale analysis of concentration and flux measurements. In addition, there are also ongoing efforts to improve multi-layer canopy exchange models for incorporation in large-scale models. These models are now being compared and assessed by the joint iLEAPS (integrated Land Ecosystem-Atmosphere Processes Study) -GEIA (Global Emission Inventory Activity) Canopy EXchange Model Intercomparison Project (CANEXMIP).
We will present the rationale for the CANEXMIP activity and provide an overview of studies that have focused on these canopy interactions. In addition, we will present more details on the activities and initial intercomparison of canopy exchange models with tropical forest observations. Plans for assessing the model skills for simulating reactive trace gas and aerosol exchange will be discussed and needs for field observations will be described.