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The dry deposition process at the substrate- to global scale

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Recent findings indicate the importance of a realistic representation of gaseous and aerosol deposition processes in large-scale models. It has been demonstrated that commonly applied approaches to calculate dry deposition in large-scale models, providing first-order estimates of the efficiency of removal by substrates (e.g., cuticle, soils, snow) should be revisited. Deploying recently developed measurement technology has resulted in direct observations of surface exchanges of a selection of compounds. These observations do not only suggest a different uptake efficiency compared to the commonly applied approach but have also indicated about the important role of emission and dry deposition interactions urging for a more coupled model representation of surface exchanges. The observations are generally conducted over vegetation with a limited number of observations of ocean-, cryosphere and bare soil- atmosphere exchanges. This bias poses a serious limitation to the implementation of dry deposition in- and use of Earth system models to assess the potential consequences of anticipated climate- and global change on atmospheric chemistry and climate.

We will discuss the importance of a renewed focus on the dry deposition process as an activity relevant to different research communities such as IGBP's iLEAPS, SOLAS and IGAC and the ACCENT and air quality community. Such an activity should focus on a mechanistic representation of substrate- to global scale removal processes, their interaction with emission processes and observations of dry deposition- or surface exchange fluxes of gases and aerosols over non-vegetated surfaces.