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Factors influencing DOC leaching from terrestrial ecosystems: a database analysis

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The lateral transport of dissolved organic carbon (DOC) is an important process linking terrestrial and aquatic ecosystems. Neglecting these fluxes can lead to biased of eddy covariance-based estimates of terrestrial ecosystem carbon sequestration. The necessity for integrating DOC leaching in carbon cycle models is thus clear, especially in view of future model development aiming at directly linking terrestrial, freshwater and ocean carbon cycles. However, to achieve this goal, more accurate information is needed in order to better understand and predict dissolved organic carbon dynamics. DOC concentrations mainly vary by geographical location, soil and vegetation types, topography, season and climate. Within this framework, we developed a database on DOC concentrations and fluxes with the aim of better understanding how those parameters determine DOC variations. This database compiles DOC concentrations and fluxes in soil solution and creeks at site or catchment level for different ecosystems around the world, but with special focus on the Northern Hemisphere and on peatland ecosystems. The database currently includes information from around 120 sites, gathered from published literature and datasets accessible on the internet. The database contains annual, seasonal and monthly data on DOC, dissolved inorganic carbon (DIC), dissolved organic nitrogen (DON) and dissolved inorganic nitrogen (DIN) and also includes other meta-data related to the site, such as land cover, soil properties, climate, annual water balance and other soil solution parameters. This compiled dataset allows to study the influence of several physical factors that determine DOC production in soils.

We will present the observed relationships between drivers, such as precipitation, drainage flows, soil pH, soil texture, and DOC concentration/ DOC fluxes at different levels, ecosystem types, temporal scales (monthly versus annual or seasonal), and soil depths. The same relations will be analysed for DIC, DON and DIN. Moreover, a meta-analysis will be carried out to link spatial and temporal variation in DOC concentration and fluxes to their respective drivers. The findings from this analysis will have two main important applications: firstly, the relationships achieved from this database can shed light on the factors that influence DOC formation and transport processes in the soil, and can therefore help in future design of strategies to mitigate soil organic carbon loss; secondly, the growing dataset will be very useful for the development, improvement and validation of DOC models, allowing to account for lateral DOC fluxes in global carbon models and thus improving the predictions of responses to climate change . Specifically, this database will support the future development of the DOC production module in the global land surface model ORCHIDEE, and will be used to test and validate the selected model structures.