

## OS23C-01: Simulating C fluxes along the terrestrial-aquatic continuum of the Amazon basin from 1861-2100 (Invited)

**Tuesday, 12 December 2017**

**13:40 - 13:55**

**📍 New Orleans Ernest N. Morial Convention Center - 275-277**

To date, Earth System Models (ESM) ignore the lateral transfers of carbon (C) along the terrestrial-aquatic continuum down to the oceans and thus overestimate the terrestrial C storage. Here, we present the implementation of fluvial transport of dissolved organic carbon (DOC) and CO<sub>2</sub> into ORCHIDEE, the land surface scheme of the Institut Pierre-Simon Laplace ESM. This new model branch, called ORCHILEAK, represents DOC production from canopy and soils, DOC and CO<sub>2</sub> leaching from soils to streams, DOC decomposition and CO<sub>2</sub> evasion to the atmosphere during its lateral transport in rivers, as well as exchange with the soil carbon and litter stocks in riparian wetlands. The model is calibrated and applied to the Amazon basin, including historical simulations starting from 1861 and future projections to the end of the 21<sup>st</sup> century. The model is found to reproduce well the observed dynamics in lateral DOC fluxes and CO<sub>2</sub> evasion from the water surface. According to the simulations, half of the evading CO<sub>2</sub> and  $\frac{2}{3}$  of the DOC transported in the rivers are produced within the water column or in flooded wetlands. We predict an increase in fluvial DOC exports to the coast and CO<sub>2</sub> evasion to the atmosphere of about  $\frac{1}{4}$  over the 21<sup>st</sup> century (RCP 6.0). These long-term trends are mainly controlled by increasing atmospheric CO<sub>2</sub> concentration and its fertilizing effect on terrestrial primary production in the model, while the effects of land-use change and increasing air temperature are minor. Interannual variations and seasonality of CO<sub>2</sub> evasion and DOC transported by the river are however mainly controlled by hydrology. Over the simulation period, the actual land C sink represents less than half of the balance between terrestrial production and respiration in the Amazon basin, while the larger proportion is exported through the terrestrial-aquatic interface. These results highlight the importance of the terrestrial-aquatic continuum in the global C cycle.

### Plain Language Summary

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