



Landscape-scale controls on the carbon budget of Lake Simcoe: a process-based modelling approach

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Lake Simcoe is a large (725 km²), regionally important lake in central Canada. Land cover in the watershed comprises a mixture of agriculture, forest and wetlands. The catchment is also subject to increasing urban pressures. There are twelve main tributaries and numerous smaller input streams. Here we report on the use of INCA-C (the Integrated Catchments model for Carbon) to simulate dissolved organic carbon (DOC) dynamics a subset of tributaries to Lake Simcoe.

We hypothesize that increasing human development in Lake Simcoe catchment will provoke changes in land use, thereby altering DOC export to the lake. Land use change including the loss of wetlands and increased urban development enhances mineralization of soil carbon and modifies DOC fluxes to the riverine aquatic. These changes will potentially impact on the future of Lake Simcoe water resources as DOC impair water quality and influence other water quality parameters such as trace metal toxicity and nutrient dynamics. However, less is known about the effect of land use changes on DOC fluxes in the environment.

The INCA-C applications presented here are the first in which the model has been used in agricultural and urban catchments. Our results show that INCA-C can be applied to large, non-forest dominated catchments. Model results show that forested, wetland, agricultural and urban landscape units have different seasonal DOC dynamics and suggest that increasing changes in land use may have large quantitative impacts on the carbon budget of Lake Simcoe.