Organic carbon pathways in the Seine River System

Audrey Marescaux[1], Josette Garnier[1], Vincent Thieu[1]

[1]CNRS-UPMC UMR 7619 METIS, France

Contact: Audrey.marescaux@upmc.fr

Summary:
This proposed research program is taking place in the ‘’Carbon Cascades from Land to Ocean in the Anthropocene’’ (C-Cascades) project. This interdisciplinary research project will train young scientists to work on the role of the carbon cycle in regulating the earth’s climate. The aim is to make important progress in understanding the carbon transfer between land and ocean and the consequences for atmospheric CO_2 and climate. This integrated and cutting-edge research programme will be guided by 9 academic and 4 intersectoral Europeans partners (http://c-cascades.ulb.ac.be/).
Transport, transformation and fate studies of organic carbon along the land, streams, rivers and oceans are essential in the carbon cycle. The Seine Basin where Paris and its environs represent 2/3 of its population, and agriculture is particularly intensive, is a eutrophic system. The main aim of this research is to understand and quantify how an excess of anthropogenic nutrients entering the Seine River system may locally enhance primary production and C sequestration and how the modification of organic C loads can influence C metabolism (autotrophic-heterotrophic) and CO_2 emission. An improvement of the pre-existing River Seine model should help to reach this aim.
RiverStrahler is a biogeochemical modelling approach, including microbiological processes, both in the water column and at the water sediment interface and involves C, O_2, N, P and Si cycles from source to coastal zones. The model calculates delivered fluxes and takes into account dissolved and particulate organic carbon (DOC and POC) under 3 classes of degradability. CO_2 is not explicitly represented (Billen et al., 2007). We will by data analysis from regional and national databases, field studies of CO_2 emissions and DOC and POC determination (land-river & ground-surface water) and using C bioavailability from lab experiments and photosynthesis and respiration calculations, develop a new module in the RiverStrahler model for evaluating the CO_2 dynamics in the river network of the Seine Basin.
Once validated and evaluated the model will be used to explore scenarios related to improvements in waste water treatments, alternative agriculture and urbanisation of the ‘’Grand Paris’’ in the downstream river axis (Paris-Rouen-le Havre), as well as hydrological changes related to climate scenarios.

Billen, G., Garnier, J., Némery, J., Sebilo, M., Sferratore, A., Barles, S., Benoit P., Benoît, M. (2007). A long-term view of nutrient transfers through the Seine river continuum. Science of the Total Environment, 375(1-3), 80–97.