

Re-Source : Geochemistry assessment, impact of soil type and Land Use Land Cover (LULC) on water quality at regional scale of Monteregie.

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Water quality is one of the main challenges that societies start to face during the 21st century. Ever-increasing population growth, rapid urbanization, the release of industrial effluents from industry and Land Use Land Cover Change (LULCC) are the main factors contributing to the deterioration of water quality. Indeed, within the hydrological cycle, the water leaches anthropogenic contaminant in vadose zone. Capillary water contained in soil pores represents a relevant tracer of its contaminants and of the processes influencing solute transport to the saturated zone.

In Monteregie, second most populous region in Quebec, the deterioration of water availability and quality stands is a major concern. Cropland covers 86% of the territory, and about two-thirds of this area is cultivated, making it the largest agricultural region in Quebec. Unfortunately, the continual anthropogenic pressure complicates the development of mitigation solutions, particularly because of the systematic diffuse pollution present at regional scale.

To investigate it, with the help of Vaudreuil-Soulanges Watershed Council (COBAVER-VS), the Monteregie region has been divided into 29 Recharge Response Units (RRU) created using slope, permeability and LULC. A total of 44 soil profiles were sampled and sub-sampled at regular intervals. Up to 24 samples per profile are sampled along 2-m depth profile to perform leaching experiment [1]. Soil was analyzed for water and organic mater content, then pore water was analyzed for pH and major ion content.

Ionic contents of water show considerable heterogeneity, both within the same column and compared with others, particularly for cations. Irrespective of recharge units, the cation exchange capacity of soils is minimal from a depth of 40-cm. Nevertheless, magnesium and calcium were strongly and rapidly retained mainly by ion exchange in the thin organic (O) litter-layer especially in forestry units. Moreover, in these same units, sulfate dynamics differ from those of other anions. At depths of over 1-m, the retention capacity of sulfate increases. This observation of sulfate retention can be described as a soil-solution equilibrium phase.

[1] Colombel, L. (2011). Caractérisation du comportement à la lixiviation : quels essais pour quels objectifs ? Rapport final. BRGM/RP-60088-FR. 76p., 13 fig., 8 tab., 2 ann.