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How Flow Regimes Could Be Affected by Climate Change? The Experience in Quebec within Ouranos Studies

ANDRÉ MUSY[1], RENÉ ROY[2], MICHEL SLIVITZKY[3], ANNE FRIGON[4]

[1]*Executive Director and Senior Scientist, consortium Ouranos*

[2]*Emeritus professor, INRS-ETE and Ouranos*

[3]*Climate Change Project Manager, Hydro-Québec / Ouranos*

[4]*Senior Scientist, consortium Ouranos*

The potential consequences of climate change on the hydrological regime could have significant impacts on different sectors of activities related to water uses such as drinkable water (its quality and quantity), recreational and commercial navigation, agriculture and the hydroelectric generation. Some of these impacts can be estimated through the use of regional climate and hydrological models. Ouranos, a consortium on Regional Climatology and Adaptation to Climate Change, has developed a climate model at the regional scale, which is adequate for hydrological applications. On site, we currently run the Canadian Regional Climate Model (CRCM) over North America at a 45 km resolution and Meteo-France's ARPEGE-Climat global stretched grid climate model. For specific applications, Ouranos uses hydrological conceptual models, such as the well-known HYDROTEL model, and can also directly use the simulated runoff generated by the CRCM. This later approach could be improved if we better describe the processes at the interface between land and atmosphere like those modeled in the Canadian Land Surface Scheme (CLASS). This communication presents the methodology developed to examine the current and future hydrological regimes as well as some results obtained on several watersheds located in Northern Quebec. Special attention is paid to this region because is represents the main source of hydroelectricity potential and production in the province. The results of such studies can be very useful to decision-makers in the long-term management of water resources, namely for hydro-electricity companies such as Hydro-Quebec and for government agencies that are responsible for the control and security of hydraulic infrastructures. From the perspective of Quebec's economic and energy security, it is also important to determine the impacts of climate change on the current hydroelectric installations. This must also be borne in mind when planning future facilities, since within the life span of large hydroelectric systems, climate change effects may occur. Thus, it is important to make the effort required to better understand the global conditions that determine runoff and to develop tools and models allowing for a finer spatial resolution of the various phenomena so as to predict the impacts of climate change on the hydrological regimes of Québec's watersheds and to elaborate adequate adaptation strategies over the upcoming decades.