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Groundwater Geoscience program

É. Boisvert

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GROUNDWATER GEOSCIENCE PROGRAM

The Groundwater Geoscience program (GGP) is a federal research program conducted in the Lands and Minerals sector of Natural Resources Canada (NRCan) within the Geological Survey of Canada (GSC). The aim of the GGP is to characterize large aquifer systems to better understand groundwater distribution, quantity and flow dynamics.

The GGP activities study the role of groundwater through field studies, remote sensing and integrated numerical water models to support sustainable groundwater management and protection at the local, regional and national levels. To achieve these goals, the GGP also contributes to the development of new characterization methods that use three-dimensional numerical modelling and remote sensing. The GGP manages the data dissemination infrastructure (Groundwater Information Network, **gin.gw-info.net**) to ensure integrated access to groundwater-related data from various sources in Canada and the United States.

CURRENT SITUATION

- Groundwater accounts for more than 30 percent of Canada's drinking water supply and over 80 percent of the water supply in the country's rural regions.
- Increasing demand for groundwater is driven by growing populations, urbanization, climate change, and natural resources development and represents a serious challenge for Canada.
- Groundwater is a major component of Canada's overall water budget. Groundwater discharge contributes directly to lakes, streams and wetlands.
- Groundwater and surface water are hydraulically connected, but their interactions are often overlooked in water management and policy decisions.

PROGRAM FOCUS

- Study hydrogeological archetypes based on knowledge from new and previous studies.
- Improve characterization methods and techniques by using remote sensing and 3D numerical modeling to develop improved geoscience knowledge of large aquifer systems in Canada and to understand the regional groundwater flow dynamics.
- Define standards for the development and distribution of hydrogeological databases.
- Train and mentor a growing number of students to increase the pool of highly skilled personnel in the area of groundwater research in Canada.

APPROACH

Between 2019 and 2024, the GGP is focussed on the following activities:

- Define a framework for aquifer archetypes, on which end-users can rely to make science-based decisions for improved groundwater management;
- Develop new methods to assess the hydraulic parameters and flow dynamics of aquifer systems and to predict resources under various conditions;
- Develop and implement a standardized data delivery mechanism by using innovative web technologies;
- Contribute to regional assessment projects to study the cumulative effects of development projects on groundwater availability.

Six research projects were established:

- **Archetypal Aquifers in Canada:** aquifer classification, case studies, method development, modelling, and collaboration;
- **Groundwater Information Network:** national groundwater web portal and database for groundwater data;
- **Water Resources Characterization and Modelling:** development of hydrogeological characterization approaches, including designing devices that can translate geophysical data into hydraulic properties and high-resolution hydraulic testing for complex aquifers;
- **Assessment of aquifers in the Fox Creek area (Alberta):** study potential impacts of unconventional hydrocarbon projects on aquifers in an active production area;
- **Ring of Fire: Reconstructing long-term environmental records to support regional assessments (Ontario and Quebec):** characterize regional hydrogeology and conduct paleo-environmental reconstructions to assess cumulative effects over time;
- **Canada 1 Water:** model mainland Canada and Baffin Island. The project will use a modelling platform to include historical climatology and forward climate change scenarios.

CONTACT

For more information, contact:

Eric Boisvert, Program manager
Geological Survey of Canada
Email: eric.boisvert@nrcan-rncan.gc.ca

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