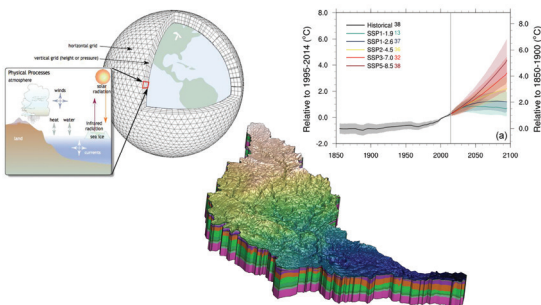# Climate Change Impact Analysis for Water Resources Management

An integrated approach to coupling climate and hydrologic sciences is critical to securing water resources in an uncertain future, requiring a comprehensive understanding of the interdependence between atmospheric and terrestrial components of the water cycle. Aquanty's physics-based approach to modelling both climate and hydrologic systems reduces the uncertainty inherent in statistical hydro-climatic modelling as climatic drivers drift further from historical norms. Aquanty has pioneered the ambitious **Canada1Water** initiative, leveraging the full range of our climate, land-surface and integrated hydrologic modelling capabilities to evaluate climate change impacts on ground and surface water sustainability across continental Canada and place water resources modelling and decision support tools in reach of all Canadians.

Hydro-Climatical Modelling of the Grand River Watershed using Dynamically Downscaled Regional Climate Models

FURTHER READING

Canada1Water, open-access data and modelling framework to guide climate-related water risk assessment and adaptation plans.

Evaluating Climate Change Impacts on Soil Moisture and Groundwater Resources Within a Lake-Affected Region, in Water Resources Research, 2019.

Projected Changes in Precipitation Extremes for Western Canada based on High-Resolution Regional Climate Simulations, in Journal of Climate, 2016.

Benefits

- **Support climate adaptation plans**
- **Improve resilience to extreme weather**
- **Scenario analysis & historical reanalysis of events**
- **Reduce uncertainty through a physics-based approach**
- **Incorporate regional climate drivers (lakes & mountains)**

Special Projects/ Applications

- **Canada1Water:** a continental scale analysis of climate change impacts on surface water, groundwater, and seasonal soil moisture conditions. The analysis considers physical drivers of climate specific to the Canadian landscape, like mountain ranges, lakes and permafrost, providing decision makers and policy planners the tools to develop effective climate change adaptation strategies.

- **Grand River Watershed Climate Analysis:** the first study of its kind to couple dynamically downscaled climate projections with a fully integrated hydrologic model in order to assess climate change impacts on groundwater and soil moisture in a region where the local climate is heavily affected by major surface water bodies.

- **Dog Lake climate and land use study:** an advanced integrated hydrologic model was constructed to support a land-use planning analysis and evaluate how wetland management scenarios can maintain summer baseflow throughout the Dog Lake watershed. Dog Lake is one small part of Ontario's network of hydroelectric infrastructure.

Key Capabilities

- Aquanty's **physics-based approach** to modelling atmospheric processes and integrated hydrology **reduces the uncertainty** inherent in statistical approaches to environmental simulations.

- **Support climate adaptation** plans with advanced coupling of atmospheric and sophisticated land surface models is the most reliable and realistic way to model land surface changes including **permafrost retreat, snow depth & density projections**

- Direct coupling of atmosphere and integrated hydrologic models provide a robust framework for custom scenario analysis to **improve resilience to extreme weather** events.

- **Leverage the strengths of machine learning** techniques and large climate projection ensembles for flood forecasting, drought impact analysis and for historical reanalysis of regional climate/hydrology.

- Our user-friendly **decision support** systems provide decision makers, policy analysts and planners the tools they need to **understand climate risk** and **develop actionable mitigation strategies**.

For more information contact us at **info@aquanty.com** or visit **Aquanty.com**

aquanty

Aquanty – World-Class Water Resources Science and Technology

Aquanty specializes in predictive analytics, simulation and forecasting, and research services. Our technology and services are deployed globally across a broad range of industrial sectors including; agriculture, oil and gas, mining, watershed management, contaminant remediation, and nuclear storage and disposal. Aquanty's scientists are recognized as leading international experts in integrated climate, groundwater & surface water modelling. Our mission is to deliver holistic water resource and climate solutions to support informed decision making for our clients in a rapidly changing world.

HydroGeoSphere™

The world's most powerful hydrologic modelling platform

- **Fully integrated surface and groundwater simulations** provide a holistic understanding of complex and interconnected watershed dynamics for water resources management.
- **Reactive solute and thermal energy transport** capabilities give you the tools to predict contaminant fate and travel time probability statistics for source identification.
- **Advanced numerical methods** to support simulations of unprecedented scale and complexity; fully-implicit coupling for all domains provides for a robust, mass conserved solution.
- **A physics-based approach** to hydrology greatly reduces the inherent uncertainty of empirical modelling techniques and provides the most robust approach to simulating the effects of climate change.

HGS REAL TIME

Reliable hydrologic forecasting powered by HydroGeoSphere

- **Multi-objective hydrologic forecasting** for flood, drought, base-flow, soil moisture, surface water and groundwater.
- **Enhanced decision support** for water resources management based on a holistic, integrated approach to watershed hydrology.
- **Synergize operational data sources** including near-real-time field observations and remote sensing products with meteorological predictions to produce reliable forecasts.
- **Cloud-computing architecture** supports ensemble of weather forecast scenarios, forecast outputs analyzed and reported in a probabilistic framework.

HydroClimateSight™

Aquanty's web architecture puts earth system modelling within reach of every person

- **Unify data management and analytics** for an integrated understanding of hydrology, geology, meteorology and climatology.
- **White label web infrastructure** to deliver best-in-class hydrologic modelling and decision support to your clients.
- **Flexible and extensible** architecture to handle any data pipeline world-wide, putting the right information in front of the right people at the right time.
- **Analytical tools and custom workflows** to simplify your unique operational requirements.

Modelling On Demand™

Automatic web-based simulations for decision support and scenario analysis

- **Time saving through automation:** models constructed at the click of a button using comprehensive geological data framework producing results in minutes for rapid decision support.
- **Flexible and agile** model inputs allow you to adapt to changing requirements. When needs evolve, models can be created or modified as necessary, enabling quick responses to dynamic situations.
- **Globally scalable, versatile and ready to deploy** for field-scale soil moisture forecasting and pesticide/nutrient runoff and fate; watershed-based customizable scenario analysis and climate change assessment.

Proud Partner of the Canada1Water initiative   www.canada1water.ca