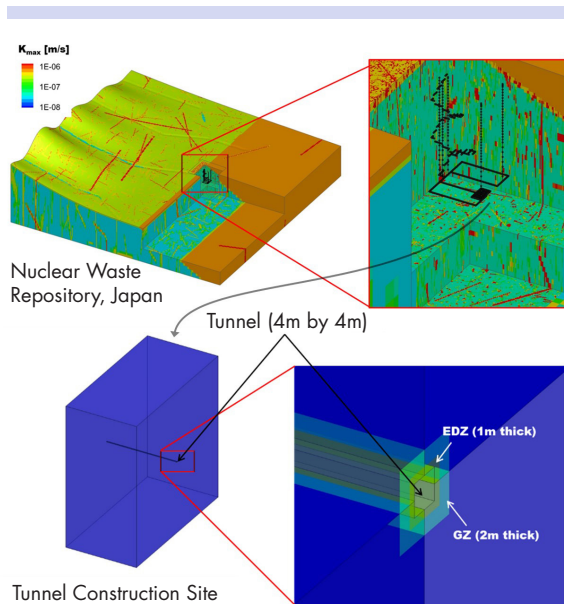




Integrated Hydrologic Modelling for Nuclear Waste Management

Integrated groundwater– surface water hydrologic modelling is ideal for assessing the viability of nuclear waste repository sites and site design performance, in terms of both long-term operations and contaminant release scenario analysis. The **HydroGeoSphere** (HGS) approach provides an accurate and robust method of simulating radionuclide transport in support of infrastructure decommissioning analysis. HGS also provides state-of-the-art means to investigate the potential impact of climate change on site hydrologic conditions, and on contaminant plume migration.



Tunnel BC supports distinct excavation damage (EDZ) and grout zones (GZ).

Benefits

- **Confidently seek regulatory approval**
- **Minimize uncertainty**
- **Increase operational efficiency**
- **Mitigate risk**
- **Improved understanding of surface/subsurface hydrology**

Applications

- Hydraulic and tracer experiments for site characterization
- Radionuclide transport simulations in decommissioned nuclear power plants
- Risk assessment for nuclear waste repository constructions
- Calculate travel time probability statistics for contaminant source identification
- Estimate dewatering needs of underground infrastructure/tunnels
- Geothermal energy modelling of water resources to ensure cooling capacity

Key Features

- **Minimize uncertainty** inherent in empirical modelling techniques by relying on HydroGeoSphere's physics-based approach to hydrologic modelling.
- **Increase operational efficiency** by removing the need for distinct surface/groundwater teams/models and ensure fidelity across surface and subsurface domains.
- **Mitigate risk** of environmental contamination through unlimited scenario analysis. Model the fate of radionuclide solutes across all model domains.
- **Optimize efficiency** of tunnel dewatering operations by incorporating excavation damage and grouted tunnel zones.
- **Improve precision** of flow solution in areas of interest using precise polygon tracking water movement through areas of any scale.
- **Improved understanding** of preferential flow paths via a dual domain formulation, or the incorporation of fracture networks as discrete model components.
- **Full support and integration** of MOFRAC generated discrete fracture networks.
- **Optimize site-location** of deep geologic repositories using the backward-in-time transport simulation capabilities.

FURTHER READING

Large-scale numerical simulation of groundwater flow and solute transport in discretely-fractured crystalline bedrock. In *Advances in Water Resources*, 2011.

Steady-state density-driven flow and transport: Pseudo-transient parameter continuation. In *Advances in Water Resources*, 2023.

Improving precision in regional scale numerical simulations of groundwater flow into underground openings. In *Engineering Geology*, 2020.



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.

HydroGeoHub™

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.

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.

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.

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