Exploring Climate Change Impacts on Global Water Resources

An Interactive Tool for Decision-Making and Adaptation

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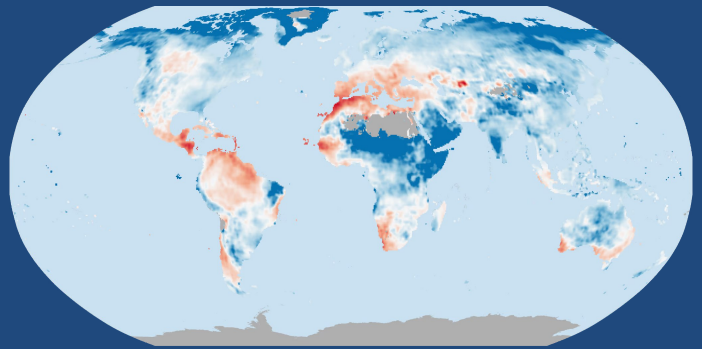
With the participation of Laura Müller, Petra Döll, Fabian Kneier and Julien Bardonnet



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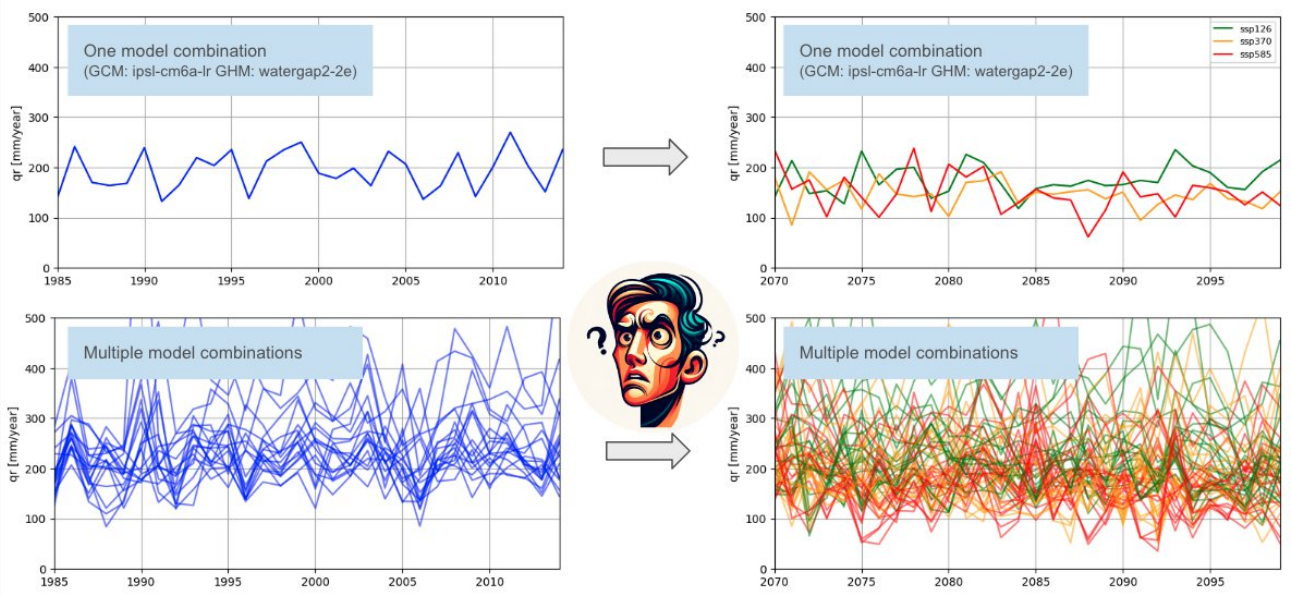
Quantifying Climate Change Hazards and Their Uncertainty is Challenging



Example of yearly groundwater recharge time series considering one or multiple combinations of models illustrating the variability of model outputs

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Availability of Water Resources Under the Effect of Climate Change

Our aim is to provide global data to measure your exposure to climate risks

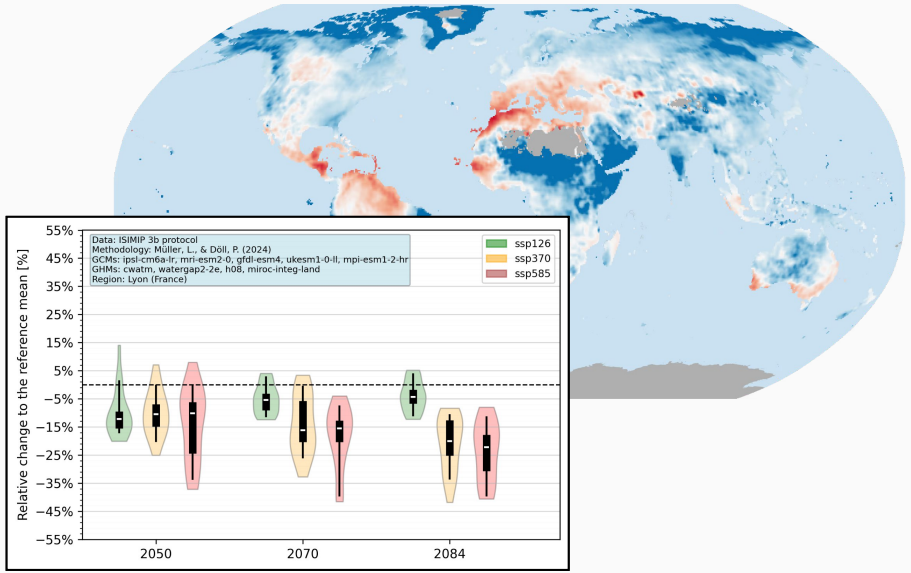
✔Determine the effects of different climate scenarios

✔Assess the level of consensus between models

✔Identify critical changes

✔Several indicators are available

Using a robust scientific approach[1] and authoritative climate data[2]



[1]Müller, L., and Döll, P. (2024): Quantifying and communicating uncertain climate change hazards in participatory climate change adaptation processes. Geosci. Commun., 7/2, 121–144. https://doi.org/10.5194/gc-7-121-2024

[2]Gosling S. N., Müller Schmied H., Bradley A., Burek P., Gedney N., Grillakis M., Guillaumot L., Hanasaki N., Ito A., Kou-Giesbrecht S., Koutroulis A., Nishina K., Otta K., Sahu R.-K., Satoh Y., Schewe J. (2024): ISIMIP3b Simulation Data from the Global Water Sector (v1.3). ISIMIP Repository. https://doi.org/10.48364/ISIMIP.230418.3

Data

Data Sources: ISIMIP3b / Water Global

Temporal Coverage:

- **Reference Period**: 1985–2014
- **Projection Period**: 2015–2100

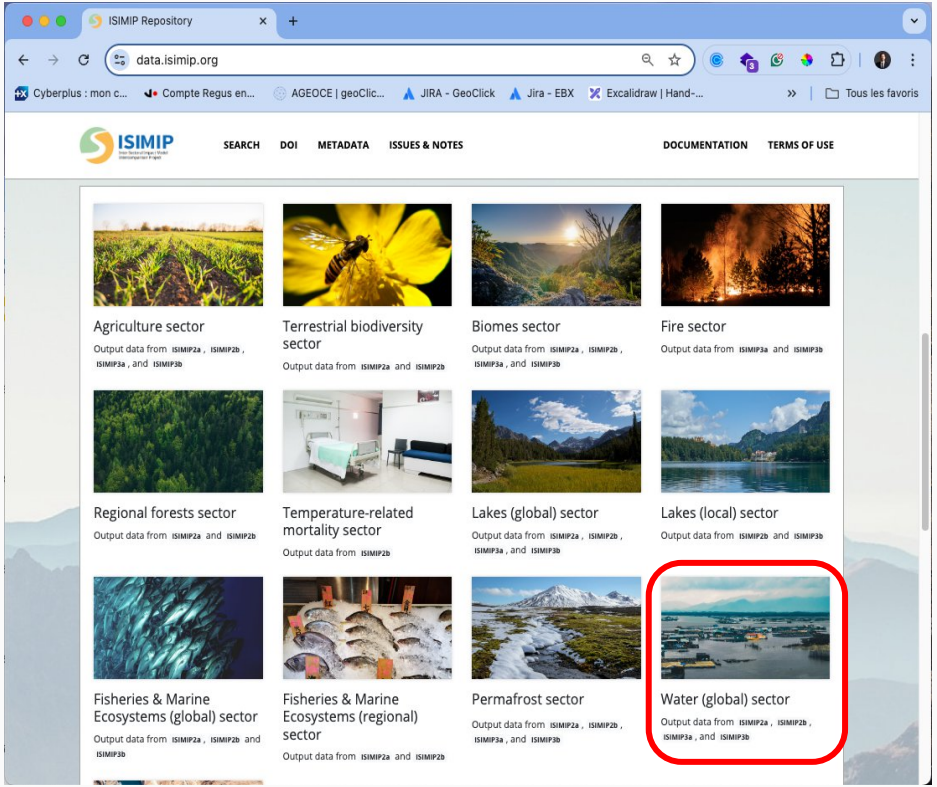
Emissions Scenarios (3): SSP1-RCP2.6, SSP3-RCP7.0, SSP5-RCP8.5

Hydrological models (4): JULES-ES-vn6p3, MIROC-INTEG-LAND, CWATM, WaterGAP v2.2e

Circulation models (5): MPI-ESM1-2-HR, UKESM1-0-LL, MRI-ESM2-0, GFDL-ESM4, IPSL-CM6A-LR

Variables :

- Total Runoff,
- Groundwater Recharge,
- Total Evapotranspiration



Processing

Creation of 30-years composites for each combination of models and scenario (GCM*, GHM*, SSP*)

- Calculate the yearly and seasonal averaged variables for historical and future periods
- For each combination, calculate the relative changes between the projection and the historical values (Müller & Döll 2014).

*GCM: Global Circulation model
*GHM: Global Hydrological Model
*SSP: Shared Socioeconomic Pathways

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Quantifying and communicating uncertain climate change hazards in participatory climate change adaptation processes

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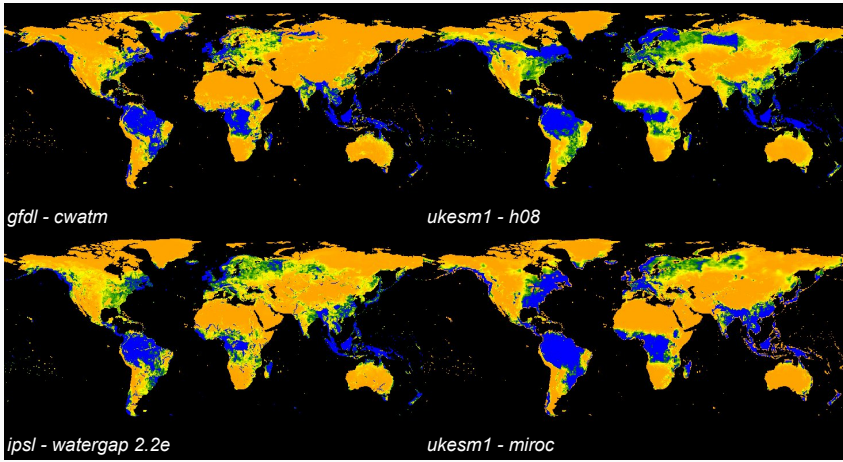

30 years annual averaged historical recharge (1985-2015) according to 4 GCM / GHM combinations (0 to 500 mm/year - orange to blue)

Technologies

- Data download and processing of netCDF file on a local machine into Cloud-Optimized GeoTIFF

- Ingestion and On-the-fly calculation using Google Earth Engine*

Google Earth Engine combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities.

Visit the explorer

https://ageoce.com/en/solutions/climate-change-water-explorer/

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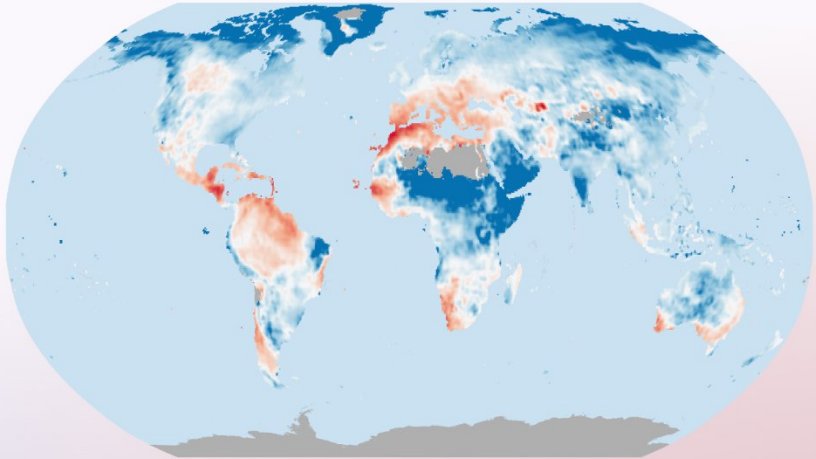
Explorer for climate change impacts on water resources

This web application is designed to visualize potential future changes in water resources worldwide. Developed through a collaboration with the Goethe University of Frankfurt, this tool leverages multi-model ensemble simulations from ISIMIP3b to support local climate change adaptation initiatives.

- Visualize how water resources might shift under different scenarios.
- Understand the agreement among models.
- Discover the percentage of models predicting changes that exceed user-defined thresholds.
- Dive into detailed data for actionable, location-specific adaptation planning.
- Account for uncertainties in greenhouse gas emissions and climate models.

Documentation | Live explorer | Request dataset



Explore potential future changes in water resources

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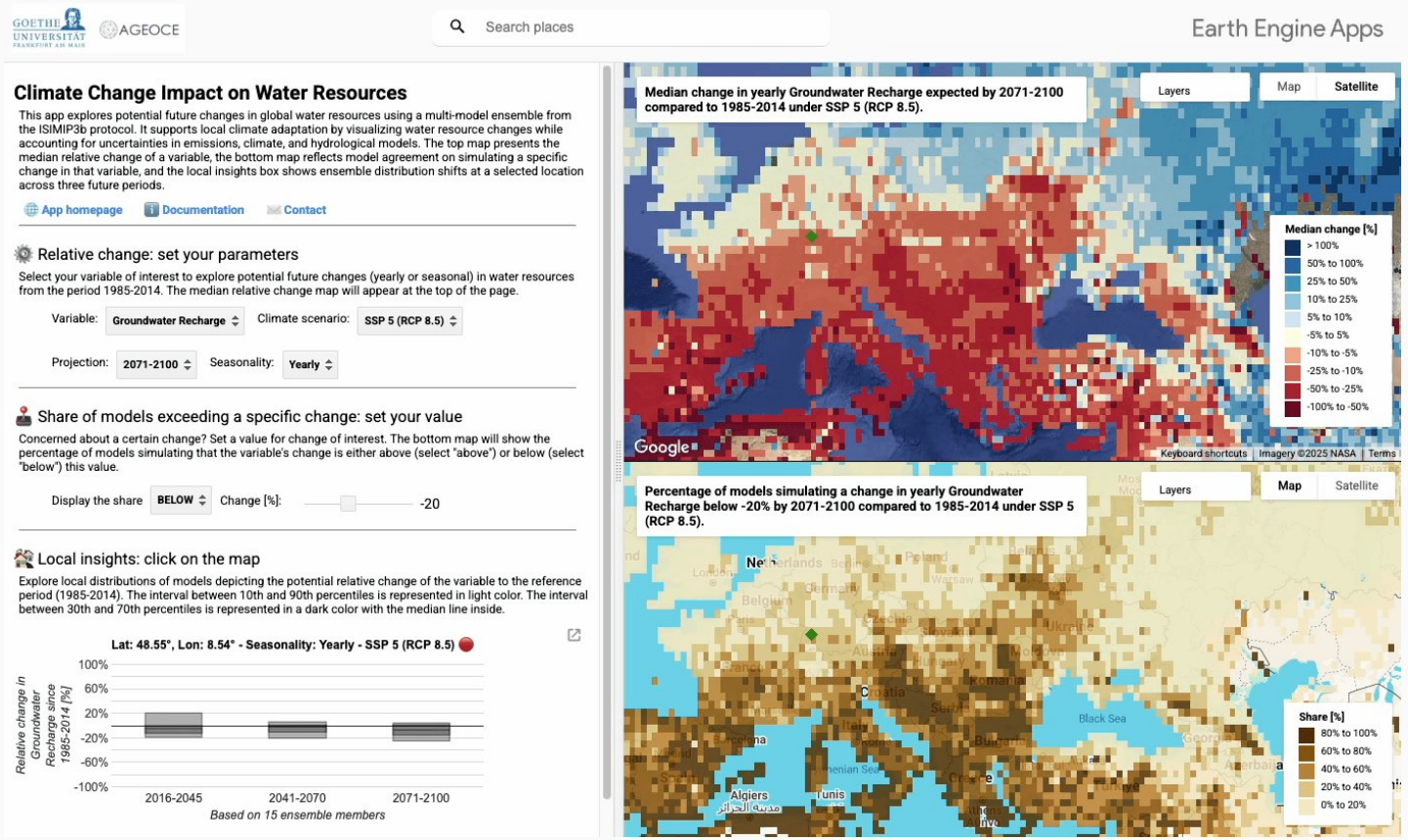

Determine where a certain change might occur

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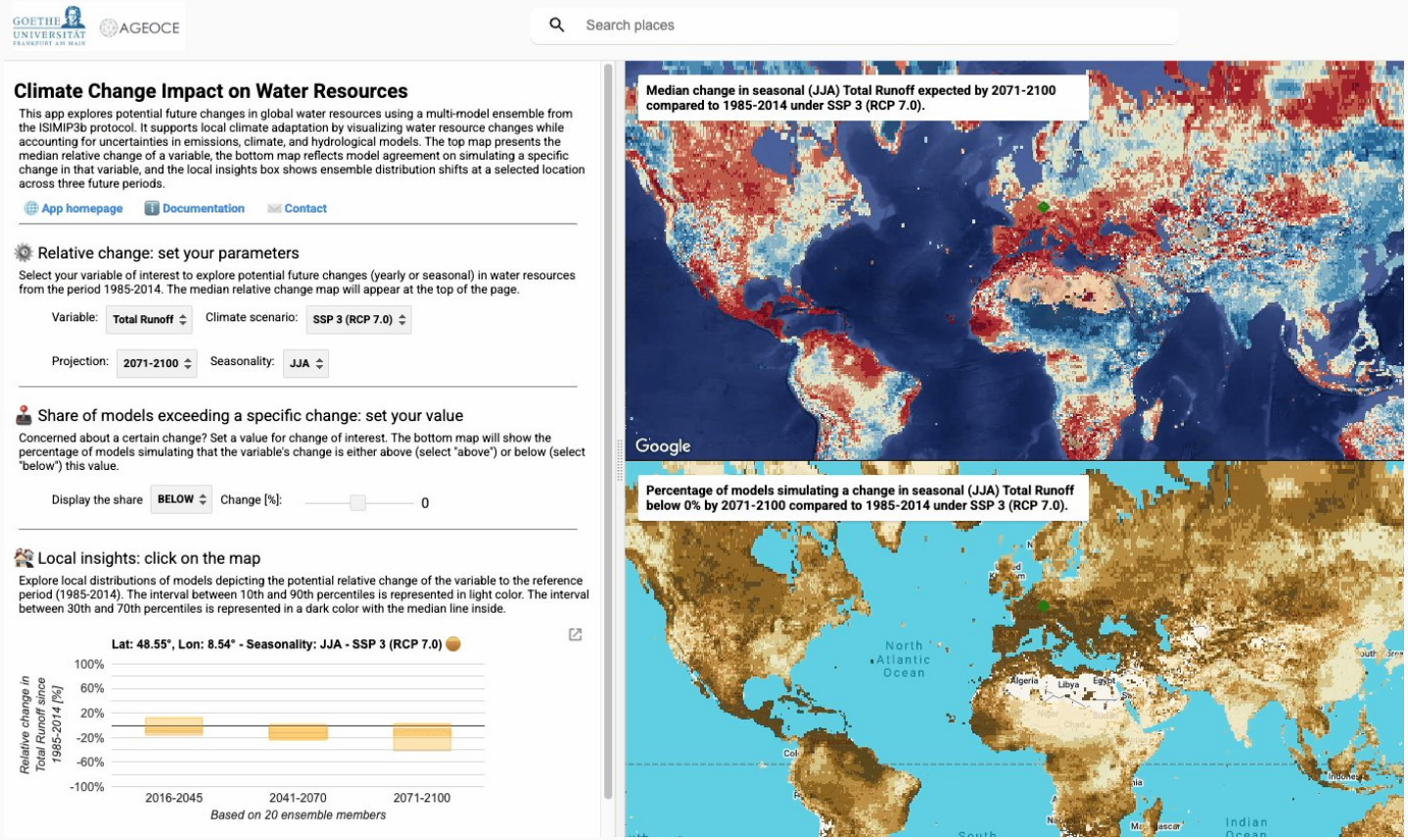

Get local insights with percentile boxes

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