The ClimEx project seeks to investigate the occurrence and impacts of extreme meteorological events on the hydrology in Bavaria (a federal state of Germany) and in Québec under changing climate conditions. Available time series of the observed climate are generally too short to produce a reliable portrait of extreme events. Longer time series can be obtained from large ensembles of Global Climate Model simulations but their coarse resolution is not appropriate for basin-scale studies. ClimEx aims at providing an appropriate dataset for addressing hydrological extreme events and their dependence on the evolving climate at finer spatial and temporal resolutions. The production of an unprecedentedly large ensemble of regional climate simulations will allow ClimEx partners to collaborate on the advancement of research in hydrological modelling of extremes, as well as develop innovative technologies for flood and low flow forecasting and risk assessment aimed towards effective adaptation measures to climate change in Bavaria and Québec.

**OBJECTIVES**

- Produce a dynamically downscaled version of the 50-member ensemble from the CanESM2-LE Global Climate Model at very high spatial (11 km) and temporal (1-3 hours) resolutions for Bavaria and Québec for the past and future reaching the year 2100.
- Apply this dataset in studies of past and future extreme hydrological events with multiple hydrological models over a series of basins of interest.
- Develop methods for model auditing and quality control in the hydro-climatological modelling chain.
- Obtain estimates of the natural climate variability and extreme events and their relationship with climate change over Bavaria and Québec.
- Develop multi-dimensional 3D visualizations from the data for communication, education and training.

**METHODOLOGY**

- Install, test and configure the CRCM5 regional climate model on the SuperMUC HPC.
- Prepare the experimental set-up and launch production of CRCM5 runs.
- Prepare data to use as an input to hydrological models (post-processing, statistical downscaling).
- Perform large ensembles of hydrological simulations over watersheds of Bavaria and Québec.
- Analyze the unprecedented long time series of climatic and hydrological variables with respect to natural variability and the climate change signal.
- Pursue sharing of knowledge, data, personnel and capacity building between members of the Québec-Bavarian International Collaboration on Climate Change (QBIC2).

**EXPECTED RESULTS**

- Better characterization of natural climate variability and of extremes at high resolution for both past and future periods.
- More robust statements on floods and low flows with return periods up to 1/1,000 years, with related changes in flood volumes up to the year 2100.
- Generation of a unique database allowing for a better assessment of the impacts of climate change on water resources.
- Production of climate scenarios for hydrology.

**BENEFITS FOR ADAPTATION**

Optimization of flood and low flow risk management and development of proactive adaptation strategies.

Establishment of scenario model environments to evaluate wide ranges of prevention, mitigation and adaptation strategies.

Collaborative development between Bavarian/Québec governmental agencies (LfU and MDDELCC) on flood and low flow risk management and on adaptation strategies.