Future evolution of river discharge for the French Rhine basin in a context of climate change - An updated evaluation based on the AR5 IPCC climate simulations

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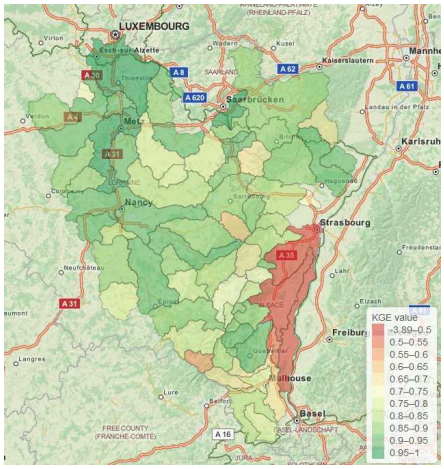
The MOSARH21 project

An updated evaluation based on the AR5 IPCC climate simulations

Fig. 1: Performance of the GRSD model over the MOSARH21 area



Needs to assess the future of water resources

The MOSARH21 project aims at updating our knowledge of future discharge for the Moselle-Sarre-Rhine area (Fig. 1) and at linking results with past studies that made use of different hydrological models, climate models/projections and study periods (Tab. 1).

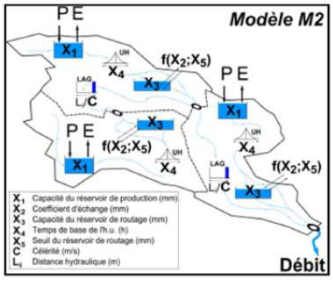


Fig. 2: The semi-distributed GR model (GRSD)

The MOSARH21 methodology

- Multi-hydrological model (HM) approach (Fig. 2&3).
- Re-use of AR4 climate simulation used in the Explore 2070 and Flow MS projects
- Use of new AR5 projections.
- Sources of uncertainties considered in the project: ARs, GCMs, downscaling methods, HMs, HMs calibration conditions.

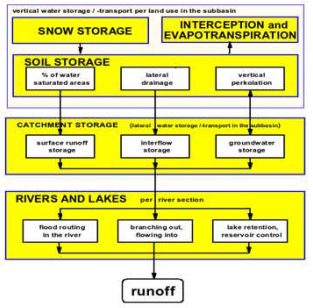


Fig. 3: The distributed LARSIM model

First results

Limited dependence of the performances of the semi-distributed model (GRSD) to the calibration periods.
High uncertainty on future precipitation evolution (Fig. 4&5).

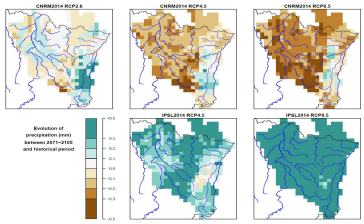
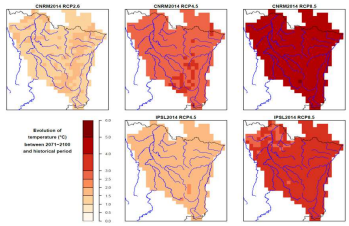


Fig. 4: Evolution of precipitation (left) and temperature (right) in far future (right) for CNRM and IPSL Drias projections.



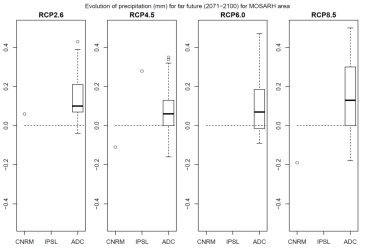
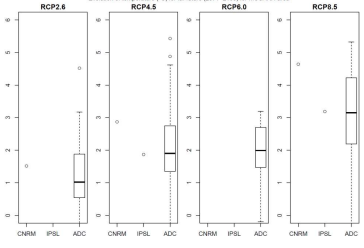


Fig. 5: Evolution of precipitation (left) and temperature (right) for far future for CNRM and IPSL Drias projections and for the Advanced Delta Change projections.



Some past studies on the basin

The high diversity in past studies settings makes it difficult to compare results, especially for transboundary basins.
Necessity to make links between studies to better understand differences.

Project	Rheinblick 2050	VULNAR	Explore 2070	FLOW MS
AR4 scenario	A1B	A1B, A2, B1	A1B	A1B
GCMs	2	7	7	1
Downscaling method	Regional Climate Models	Statistical weather-type approach	Statistical weather-type approach	Regional Climate Model
Hydrological model(s)	HBV	MODCOU and HPP-inv	GR4J and Isba-Modcou	LARSIM
Reference period	1961-1990	1961-2000	1961-1990	1971-2000
Future period(s)	2021-2050 and 2071-2100	2046-2065 and 2081-2099	2046-2065	2021-2050

Tab. 1: Outlook of past studies

Where we are…

The MOSARH21 project is ongoing. The HMs are almost ready (Fig. 1) and the climate simulations have been processed.
During the next months, the calibrations of LARSIM will be done and the hydrological projections will be run. An analysis of these outputs will be made through the computation of various floods and droughts indicators originating from previous studies.

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