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A European vision for hydrological observations and experimentation

How to quantify regional hydrological change impact: some examples from France

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Regional hydrology vibrates to the rhythm of the weather intercepted by the soil-vegetation continuum and controlled by human abstraction and managements.
How can we interpret the observations? Does an observed trend is a signal of climate change? or natural variability ? Is the absence of trend associated to compensating trends?

To do so, long-term observations are indeed a key issue. I'll show a study on the Seine basin, for which we wanted to assess the impact of the Atlantic Multidecadal Variability on the river & groundwater flows. To do so, 60-years is barely enough, and it was necessary to cover all the XXth century. There are few research networks on such long period, and the required observations come mostly from the public survey. Several issues were to face: data rescue, re-interpretation of the data (from river level to river discharge) and the combined study of modeling and observations. It remains hard to interpret all the observed variations, especially due to the strong artificialization of the basin. However, it helps interpret the impact of natural variability, and how it could impact the basin in the next decades.

Long term lysimetric observations can help interpret the impact of land cover change and agricultural practices change on the regional hydrology. By using a 60-year lysimeter data set with several crop rotations and a bare soil, we were able to assess the impact of climate change and the impact of catch crop on the groundwater recharge. Unfortunately, such data set are not that common, and it is one of the objectives of the OneWater French research program to help building a lysimeter long term network in France.

Another challenge is to estimate the effect of human management on the water resource. For groundwater and river abstraction, most of the time, the observations are partial and most often at an annual time scale. Among the human impact, those associated to large reservoirs are difficult to hide. If in Spain, there is free access to the associated data, it is more difficult in France if they are devoted to hydroelectricity or irrigation. Small dams are far more numerous, but their direct and cumulative effects are not easy to quantify, especially, since there are few information on how the reservoir fill and spill, and how the water is used. I'll show some elements on how the combination of biotic and abiotic data can be used to assess the impact of small reservoirs and how their impact can change with climate change.

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