Geophysical Research Abstracts
Vol. 17, EGU2015-5450-2, 2015
EGU General Assembly 2015

A scenario neutral approach to assess low flow sensitivity to climate change

Eric Sauquet (1,2) and Christel Prudhomme (2,3)

(1) Irstea, Villeurbanne, France (eric.sauquet@irstea.fr), (2) Centre for Ecology and Hydrology, Wallingford, UK, (3) Department of Geography, Loughborough University, Loughborough, UK

Most impact studies of climate change on river flow regime are performed following top-down approaches, where changes in hydrological characteristics are obtained from rainfall-runoff models forced by downscaled projections provided by GCMs. However, such approaches are not always considered robust enough to bridge the gap between climate research and stake holders needs to develop relevant adaptation strategy (Wilby et al., 2014).

Alternatively, 'bottom-up' approaches can be applied to climate change impact studies on water resources to assess the intrinsic vulnerability of the catchments and ultimately help to prioritize adaptation actions for areas highly sensitive to small deviations from the present-day climate conditions.

A general framework combining the scenario-neutral methodology developed by Prudhomme et al. (2010) and climate elasticity analyses (Sankarasubramanian et al., 2001) is presented and applied to measure the vulnerability of low flows and droughts on a large dataset of more than 400 French gauged basins.

The different steps involved in the suggested framework are:
- Calibration of the GR5J rainfall runoff model (Pushpalatha et al., 2011) against observations,
- Identification of the main climate factors influencing low flows,
- Definition of the sensitivity domain for precipitation (P), temperature (T) and potential evapotranspiration (PE) scenarios consistent with most recent climate change projections,
- Derivation of the response surface describing changes in low flow and drought regime in terms of severity, duration and seasonality (Catalogne, 2012),
- Uncertainty assessment.
Results are the basis for a classification of river basins according to their sensitivity at national scale and for discussions on adaptation requirements with stakeholders.

Catalogne C (2012) Amélioration des méthodes de prédétermination des débits de référence d'étiage en sites peu ou pas jaugés. PHD thesis, Université Joseph Fourier, Grenoble, 285 pp.
Pushpalatha R, Perrin C, Le Moine N, Mathevet T, Andreassian V (2011) A downward structural sensitivity analysis of hydrological models to improve low-flow simulation. Journal of Hydrology 411.1-2.
Prudhomme C, Wilby LR, Crooks SM, Kay AL, Reynard NS (2010) Scenario-neutral approach to climate change impact studies: application to flood risk. Journal of Hydrology, 390:198-209.
Sankarasubramanian A, Vogel RM, Limbrunner JF (2001) Climate elasticity of streamflow in the United States. Water Resources Research, 3(6):1771-1781.
Wilby R, Dawson C, Murphy C, O'Connor P., Hawkins E. (2014) The Statistical DownScaling Model - Decision Centric (SDSM-DC): conceptual basis and applications. Climate Research, 61(3):259-276.