Geophysical Research Abstracts
Vol. 18, EGU2016-13442, 2016
EGU General Assembly 2016

Impacts of climate change and internal climate variability on french rivers streamflows

Gildas Dayon (1), Julien Boé (1), and Eric Martin (2)
(1) CECI, CERFACS-CNRS, Toulouse (FRANCE), (2) RECOVER, Irstea, Aix-en-Provence (FRANCE)

The assessment of the impacts of climate change often requires to set up long chains of modeling, from the model to estimate the future concentration of greenhouse gases to the impact model. Throughout the modeling chain, sources of uncertainty accumulate making the exploitation of results for the development of adaptation strategies difficult. It is proposed here to assess the impacts of climate change on the hydrological cycle over France and the associated uncertainties. The contribution of the uncertainties from greenhouse gases emission scenario, climate models and internal variability are addressed in this work.

To have a large ensemble of climate simulations, the study is based on Global Climate Models (GCM) simulations from the Coupled Model Intercomparison Phase 5 (CMIP5), including several simulations from the same GCM to properly assess uncertainties from internal climate variability. Simulations from the four Radiative Concentration Pathway (RCP) are downscaled with a statistical method developed in a previous study (Dayon et al. 2015). The hydrological system Isba-Modcou is then driven by the downscaling results on a 8 km grid over France. Isba is a land surface model that calculates the energy and water balance and Modcou a hydrogeological model that routes the surface runoff given by Isba. Based on that framework, uncertainties uncertainties from greenhouse gases emission scenario, climate models and climate internal variability are evaluated. Their relative importance is described for the next decades and the end of this century.

In a last part, uncertainties due to internal climate variability on streamflows simulated with downscaled GCM and Isba-Modcou are evaluated against observations and hydrological reconstructions on the whole 20th century. Hydrological reconstructions are based on the downscaling of recent atmospheric reanalyses of the 20th century and observations of temperature and precipitation. We show that the multi-decadal variability of streamflows observed in the 20th century is generally weaker in the hydrological simulations done with the historical simulations from climate models.

References:
Dayon et al. (2015), Transferability in the future climate of a statistical downscaling mehtod for precipitation in France, J. Geophys. Res. Atmos., 120, 1023-1043, doi:10.1002/2014JD022236