Geophysical Research Abstracts
Vol. 16, EGU2014-7437, 2014
EGU General Assembly 2014

Stepwise analogue downscaling for hydrology (SANDHY): validation experiments over France

Sabine Radanovics (1), Jean-Philippe Vidal (1), Eric Sauquet (1), Aurélien Ben Daoud (2), and Guillaume Bontron (2)

(1) Irstea, UR HHLY Hydrology and Hydraulics Research Unit, Villeurbanne, France (sabine.radanovics@irstea.fr), (2) Compagnie Nationale du Rhône, Lyon, France

Statistical downscaling aims at finding relationships between local precipitation (predictand) and large-scale predictor fields, in various contexts, from medium-term forecasting to climate change impact studies. One of the challenges of statistical downscaling in a climate change context is that the predictor-predictand relationship should still be valid under climate change conditions. A minimum requirement is therefore to test the performance of the downscaling method on independent data under current climate conditions.

The downscaling method considered is the Stepwise ANalog Downscaling method for HYdrology (SANDHY). ERA-40 reanalysis data are used as large scale predictors and daily precipitation from the French near surface reanalysis (Safran) as predictand. Two 20-year periods have been selected from the common archive period of the two data sources: 1958–1978 (“early”) and 1982–2002 (“late”). SANDHY has been optimised over the late period in terms of geopotential predictor domains individually for 608 target zones covering France.

The validation setup consists of 4 experiments, that all use the parameters as optimised for the late period and that are compared in terms of continous ranked probability skill score (CRPSS) with climatology as reference:

1. **Reference simulation.** A simulation of the late period is performed using the late period as an archive for searching the analogue dates, thus representing the best possible case. The CRPSS shows a spatial distribution similar to the one of the mean precipitation.

2. **Out-of-sample validation.** The early period is simulated using the late period as an archive for searching the analogue dates. The idea is to simulate a period whose local data is not “known” by the model as it would be the case in any application. The average skill loss compared to the reference simulation is reasonable with some more skill loss in the northern part of the country and no loss in the southeastern part.

3. **Alternative archive.** The late period is simulated using the early period as an archive for the analogue search. Using the alternative archive leads to small and spatially uniform skill loss compared to the reference simulation.

4. **Imperfect predictor domains.** The early period is simulated using the early period as an archive for the analogue search. The results are very similar to the out-of-sample validation in terms of mean skill loss and spatial distribution.

The results of experiment 2 indicate that SANDHY is quite robust at most locations. Experiment 3 shows that both archives are suitable for downscaling. Experiment 4 shows that the skill loss observed in experiment 2 stems rather from the imperfect predictor domains than from the imperfect archive. Overall the results increase the confidence in applying SANDHY for downscaling in various contexts over France.