Review report for "**Evaluating climate change impacts on streamflow variability based on a multisite multivariate GCM downscaling method"** by Zhi and Jiming (2017)

The authors attempt to investigate the impacts of climate change on streamflow for the Jing River catchment on China's Loess Plateau. To achieve this objective, a statistical downscaling approach based on a transfer function and a stochastic weather generator is employed for downscaling daily precipitation and temperatures from five GCMs under four IPCC 2013 scenarios. The downscaling is performed at 18 meteorological stations. For generating streamflow, the downscaled variables are used as forcing data for a hydrological model (SWAT). Climate change signals for streamflow are evaluated for the period 2011–2040 relative to 1961–2005. The authors found that streamflow variability would be greater over most months at a seasonal scale due to the increase of monthly maximum streamflow and the decrease of monthly minimum streamflow. The increase in streamflow variability was mainly attributed to the larger positive contributions from increased precipitation variances than the negative contributions from increased temperature means.

General comments

The multi-site multivariate downscaling approach employed by the authors is promising especially its distribution-free attribute which shows performance close to existing parametric weather generators. Its ability to reproduce observed spatial and intervariable dependency structures is very attractive especially for flood adaptation studies.

Specific comments

- The authors claim that the study is restricted to the period 2011-2040 for purposes of near-term adaption planning. The study is carried out for 4 scenarios. However, there is really no difference in scenarios before 2050 after which they start to diverge. So I doubt how the authors used 4 scenarios for which the results would just look alike.
- Please include a paragraph at the end of the discussion which clearly states the purpose of this study and whether previous studies have been performed in the same study area, what were the limitations and why your study adds value to existing ones?
- What is the rationale for selecting the 4 ESMs used in this study?
- The statistical performance test plots in Figure 4 look too good. Are the weather gauges in the study area very homogenous with less inter-station differences? It could be that the stations are very similar synoptically, thus it is easy to reproduce the observed weather.
- Figure 5 shows that the weather generators could reproduce just the mean of streamflow but the variances and extremes were not well reproduced, something that is problematic for climate change impacts analyses. You would also notice that not just the magnitude is different but also the phasing of streamflow.
- Mean-all RCPs in Table 2: what is the purpose of averaging across RCPs? These are very different pathways and needless averaging them.

Technical corrections

- Change GCMs to ESMs. The CMIP5 products are earth system models because they close the carbon cycle.
- Page 5 line 1: climate changes, delete the "s" in changes.

- Figure 2: spatial/temporal downscaling and not spatially/temporally downscaling.
- Line 1 page 8: don’t start a sentence with 1960–1964. Say “The period 1960–1964…”