Simulation of the impacts of climate change on water budget in the Xitiao River Catchment, China

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Climate change is expected to affect water budget of a watershed. However, many future studies for assessing future hydrological and climatological change are weak in terms of large uncertainty. This study is conducted to quantify the impact of climate change on water budget in Xitiao River catchment, China using a distributed eco-hydrological process-based model (VIP) with the consideration to the change of 8 meteorological factors including temperature, precipitation, wind speed, sunshine duration, air pressure, water vapor pressure, radiation and pan-evapotranspiration estimated by General Climate Models (GCM). GIS data (dem, land use type, soil texture), Terra NDVI data and meteorological data are integrated to force the model. Trend analyses based on historical data of 8 meteorological factors from 1960 to 2009 showed that the rise of temperature and declines of sunshine duration and wind speed were significant, while the changes of precipitation, air pressure and vapour pressure didn’t past the significant test with a significant level of 0.05. The simulation of the VIP model showed that there was a decrease in runoff and soil moisture and increase of actual evapotranspiration. The hydrological responses to the future scenarios vary due to the differences among different GCMs. However, they exhibit a general more significant decrease in runoff and soil moisture, and increase in actual evapotranspiration than the changes in the history due to the integrated scenarios of temperature rising and precipitation decline. The research showed that even though there are uncertainties in quantifying climate scenarios, using the ensemble scenarios and physical-based eco-hydrological model can at least reduce the uncertainty.