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Effects of Climate Change and Land Usecover Change on the Eco-Hydrology Process

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Abstract: As the increasing affections of climate change and land use/cover change (LUCC) to terrestrial eco-hydrology processes, it is necessary to understanding mechnisims of water resources formations under new conditions, which would be important to guarantee the security of water resource. The trendency of clmate warming and drying is obvious in Jinghe River basin over the past decades. Affected by both the climate change and LUCC, the fragiled condition of ecological environment has changed to more deterioration. Researches on the effects of climate change and LUCC on basin's water circulation and water resources are urgently demanded. By using laboratory experiment, field investigation, GIS technology and eco-hydrological model (SWAT), this paper explored the effects of climate change and LUCC to eco-hydrology process of Jinghe river basin. In yearly scale, this paper calculated the ratioes of climate change and LUCC contributions to the basins runoff and evapotranspiration from 1970 to 2006 respectively. The main outcomes were following:
1970s ∼1980s, under the interaction of climate change and LUCC, Jinghe river basin yearly runoff were increased. Mean annual runoff increased 29.75 m3s-1. And climate change made it increased 26.07 m3s-1, and is the +87.62% of all affection that climate and land-use change to the basin's mean annual runoff. The LUCC made it increased 2.30 m3s-1, and is the +7.73% of the affection. Others factor affection occupied +4.64%. On the other hand, under the interaction of climate change and LUCC, Jinghe river basin yearly evapotranspiration were decreased. Mean annual evapotranspiration decreased 78.39mm. And climate change made it decreased 30.03mm, and is the -38.31% of all affection that climate and land-use change to the basin's mean annual evapotranspiration. The LUCC made it decreased 37.93mm, and is the -48.38% of the affection. Others factor affection occupied -13.31%.1980s∼1990s, under the interaction of climate change and LUCC, Jinghe river basin yearly runoff were decreased. Mean annual runoff decreased 12.59 m3s-1. And climate change made it decreased 7.04 m3s-1, and is the -55.92% of all affection that climate and land-use change to the basin's mean annual runoff. The LUCC made it decreased 6.83 m3s-1, and is the -54.25% of the affection. Others factor affection occupied +10.17%.On the other hand, under the interaction of climate change and LUCC, Jinghe river basin yearly evapotranspiration were increased. Mean annual evapotranspiration increased 72.53mm. And climate change made it increased 47.19mm, and is the +65.06% of all affection that climate and land-use change to the basin's mean annual evapotranspiration. The LUCC made it increased 33.46mm, and is the +46.13% of the affection. Others factor affection occupied -11.21%.1990∼1999, under the interaction of climate change and LUCC, Jinghe river basin yearly runoff were decreased. Mean annual runoff decreased 15.65 m3s-1. And climate change made it decreased 6.59 m3s-1, and is the -42.11% of all affection that climate and land-use change to the basin's mean annual runoff. The LUCC made it decreased 11.06 m3s-1, and is the -70.67% of the affection. Others factor affection occupied +12.18%. On the other hand, under the interaction of climate change and LUCC, Jinghe river basin yearly evapotranspiration were increased. Mean annual evapotranspiration increased 34.15 mm. And climate change made it increased 37.01mm, and is the +108.37% of all affection that climate and land-use change to the basin's mean annual evapotranspiration. The LUCC made it decreased 10.09 mm, and is the -29.55% of the affection. Others factor affection occupied +21.18%.
Keywords: SWAT model, Jinghe river basin, Climate change, LUCC, Runoff, Evapotranspiration