Geophysical Research Abstracts
Vol. 20, EGU2018-11626, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

Effect of elevated CO_2 on vegetation and hydrological dynamics under climate variability: Case Study in Jinghe River Basin of Loess Plateau, China

Richao Huang (1,2) and Xi Chen (1,2)

(1) State Key Laboratory of Hydrology-Water Resources and Hydraulic Engineering Hohai University, Nanjing, China, (2) College of Hydrology and Water Resources, Hohai University, Nanjing, China

Elevated CO_2 stimulates plant growth and increases water use efficiency by reducing evapotranspiration and thus increasing runoff. Nevertheless, such effects on vegetation and hydrological dynamics vary with wet and dry climate variability. In this study, the Lund–Potsdam–Jena dynamic global vegetation (LPJ) model was applied at Jinghe River Basin in China, where climate has frequently dry-wet variability and significant rise of CO_2 concentration. Results indicate that CO_2 concentrations were elevated from 319.7 to 391.2 ppm according to the history records during 1965∼2012, and will be elevated to 594.4 ppm from the prediction till the year of 2110. The elevated CO_2 would lead to that mean of leaf area index (LAI), fraction plant cover (FPC) and net primary production (NPP) increased by 7.9, 0.2 and 5.7% during 1965∼2012, and 15.3, 0.4 and 10.3% during 2013∼2109, respectively. Elevated CO_2 increases plant water-use efficiency, evidenced by 0.2 and 0.7% decrease of evapotranspiration and 2.8 and 8.7% increase of runoff for the history and future rises of CO_2, respectively. Moreover, effect of elevated CO_2 on vegetation and hydrological dynamics is proportional with the long-term rise of CO_2 concentration and varies with the short-term wet and dry climate variability. It is found that effect of elevated CO_2 on ameliorating dry climate induced decrease of NPP is stronger than its effect on enhancing wet climate stimulated increase of NPP. However, susceptibility of plant transpiration on elevated CO_2 is higher in wet climate than in dry climate. Therefore, estimation of elevated CO_2 effect on vegetation and hydrological dynamics should consider not only long-term climate change but also short-term climate variability.