Geophysical Research Abstracts
Vol. 21, EGU2019-7223, 2019
EGU General Assembly 2019

Assessing the individual and combined impacts of land use land cover changes (LULC) and climate change on hydrological processes over India

Nikhil Ghodichore (1,2), Chandrika Thulaseedharan Dhanya (1), and Harrie-Jan Hendricks-Franssen (2)

(1) Department of Civil Engineering, Indian Institute of Technology (IIT) Delhi, New Delhi, India (nikhilghodichore@gmail.com), (2) Agrosphere (IBG-3), Forschungszentrum Jülich, Jülich, Germany

Aim of this work is the assessment of the individual and combined impacts of land use land cover change (LULC) and climate change (CC) on hydrologic processes, especially over regions like India which are affected by extensive land use land cover change. In this study, we quantify the contributions of LULC and CC on hydrological changes over the Indian subcontinent through a scenario-based approach, with Community Land Model version 4.5 (CLM4.5) model runs from 1981-2017. The approach involves four simulation scenarios: (i) the first scenario considers the ideal conditions without any LULC changes or CC (LULC is fixed and the atmospheric forcings for 1981-1990 are repeated in the decades afterwards); (ii) the second scenario considered only the impact of CC; (iii) the third scenario considered only the effect of LULC by updating the LULC every 10 years, and (iv) the fourth scenario considered the combined impact of LULC and CC. The results for the scenarios are analysed for various Koeppen- Geiger climate zones over India. Based on the results, it is observed that the LULC changes cause an overall decrease in the evapotranspiration (ET) by 2.64 %, while the available energy remains unaffected. On the other hand, CC caused an increase in the ET and available energy by 6.08 % and 0.63 % respectively. Among the LULC transitions, deforestation and urbanization are found to be the major causes for hydrological changes over the decades; their impact much smaller when compared to the impact of CC, however. The combined effect of LULC and CC also shows an increase in ET and available energy by 2.44 % and 0.97 % respectively. However, this increase in ET is less as compared to the impact of CC only, which may be due to the averaging-out of the opposite effects of LULC and CC on the water and energy cycles. CC has a greater impact on the hydrology over India than LULC, over the considered period 1981-2017. The outcome of this study is helpful in providing an in-depth understanding of the distinct contributions of LULC and CC on the hydrological processes in the tropical regions.

Keywords: Climate change, Landuse Landcover, Impact assessment, CLM4.5, India.