



A model based assessment of carbon fluxes and stocks over India for the historical period and two future scenarios

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Global climate change has a large impact on the terrestrial carbon cycle with the regional feedbacks between the climate and the carbon cycle yet to be understood fully. In this study, we employ the dynamic vegetation-ecosystem model LPJ, driven by climate data from 24-CMIP5 climate models, to assess the dynamics of the terrestrial ecosystems over India in the 20th and 21st century. We assess the temporal changes in Net Primary Productivity (NPP), heterotrophic respiration (Rh), vegetation carbon (VegC), soil carbon (SoilC), Net Ecosystem Productivity (NEP) and Net Ecosystem Exchange (NEE) for the historical period (1901-2005) and two future emission Representative Concentration Pathway scenarios- the RCP 4.5 scenario and the RCP 8.5 scenario (2006-2100). The ensemble mean NPP from the 24 LPJ-DGVM simulations increases through the historical period by 11.3%. In the RCP 4.5 scenario, the mean NPP increases by 20% by the end of the 21st century compared to the 1996-2005 baseline, and by 62% in the RCP 8.5 scenario. When the anthropogenic influences, in terms of the land use change flux are considered along with the fire flux and NEP, the cumulative NEE for the Indian region is slightly positive for the historical period, indicating that the terrestrial ecosystems over the Indian region were neither a strong source nor a significant sink for carbon for the historical period (1901-2005). The terrestrial biosphere over India is projected to be a net source of carbon (positive cumulative NEE) in the RCP 4.5 scenario. However, in the RCP 8.5 scenario, possibly as a result of CO₂-fertilisation effect, the terrestrial biosphere over India is projected to be a net sink of carbon from 2006-2100. The results from this assessment could help design policy interventions for the adaptation and mitigation needs over the Indian region.