



Modelling land use change in the Ganga basin

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Over recent decades the green revolution in India has driven substantial environmental change. Modelling experiments have identified northern India as a “hot spot” of land-atmosphere coupling strength during the boreal summer. However, there is a wide range of sensitivity of atmospheric variables to soil moisture between individual climate models. The lack of a comprehensive land use change dataset to force climate models has been identified as a major contributor to model uncertainty. This work aims to construct a monthly time series dataset of land use change for the period 1966 to 2007 for northern India to improve the quantification of regional hydrometeorological feedbacks. The Moderate Resolution Imaging Spectroradiometer (MODIS) instrument on board the Aqua and Terra satellites provides near-continuous remotely sensed datasets from 2000 to the present day. However, the quality and availability of satellite products before 2000 is poor. To complete the dataset MODIS images are extrapolated back in time using the Conversion of Land Use and its Effects at Small regional extent (CLUE-S) modelling framework, recoded in the R programming language to overcome limitations of the original interface. Non-spatial estimates of land use area published by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) for the study period, available on an annual, district-wise basis, are used as a direct model input. Land use change is allocated spatially as a function of biophysical and socioeconomic drivers identified using logistic regression. The dataset will provide an essential input to a high-resolution, physically-based land-surface model to generate the lower boundary condition to assess the impact of land use change on regional climate.