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# Assessing global biogeophysical effects of reconstructed land use and land cover change on climate since 1950 using a coupled land–atmosphere–ocean model

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Land use and land cover change (LULCC) is one of the most important forcings affecting climate in the past century. This study evaluates the global biogeophysical LULCC impacts in 1950–2015 by employing an annually updated LULCC map in a coupled land–atmosphere–ocean model. The difference between LULCC and control experiments shows an overall land surface temperature (LST) increase by 0.48 K in the LULCC regions and a widespread LST decrease by 0.18 K outside the LULCC regions. A decomposed temperature metric (DTM) is applied to quantify the relative contribution of surface processes to temperature changes. Furthermore, while precipitation in the LULCC areas is reduced in agreement with declined evaporation, LULCC causes a southward displacement of the intertropical convergence zone (ITCZ) with a narrowing by 0.5°, leading to a tripole anomalous precipitation pattern over the warm pool. The DTM shows that the temperature response in LULCC regions results from the competing effect between increased albedo (cooling) and reduced evaporation (warming). The reduced evaporation indicates less atmospheric latent heat release in convective processes and thus a drier and cooler troposphere, resulting in a reduction in surface cooling outside the LULCC regions. The southward shift of the ITCZ implies a northward cross-equatorial energy transport anomaly in response to reduced latent/sensible heat of the atmosphere in the Northern Hemisphere, where LULCC is more intensive. Tropospheric cooling results in the equatorward shift of the upper-tropospheric westerly jet in both hemispheres, which, in turn, leads to an equatorward narrowing of the Hadley circulation and ITCZ.