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The response of vegetation carbon and net primary production (NPP) to land-use change in China

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The LPJ-DGVM (Lund-Potsdam-Jena Dynamic Global Vegetation Model) has the ability to simulate the three main woody plant functional types (PFTs) in China, that is, temperate broad-leaved evergreen tree (TeBE), temperate broad-leaved summer green tree (TeBS)čňand boreal needle-leaved evergreen tree (BoNE). In this paper, the approach of conditional nonlinear optimal perturbations (CNOPs) is applied to investigate the response of the vegetation carbon and the net primary production (NPP) of these three PFTs to some human activities and natural factors.

The results demonstrate that for the three PFTs, the relative change of the vegetation carbon is amplified with the increasing perturbations associated with the human activities and the natural factors. For the same magnitude of the above perturbations, the relative change of the vegetation carbon for the BoNE is greater than that for the TeBS. And the relative change of the vegetation carbon for the TeBE is the least among three PFTs. Also, we show that the vegetation carbon is reduced, but the NPP gains. Furthermore, it is demonstrated that the larger the perturbations related to human activities and natural factors are, the more significantly the total amount of NPP in China increases, which supports the results of DeFries et al. (1999) and DeFries (2002).

The relationship between the relative change of the vegetation carbon and precipitation and temperature is investigated. It is shown that the high availability of light and water favors the high growth of the TeBE in South China. And the response of the TeBE to the human activities and the natural factors is relatively weak. Contrarily, the low

availability of light and water weakens the growth of the BoNE in Northeast China. The BoNE is relatively sensitive to the human activities and the natural factors.