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# The impact on the present and future East Asia climate of the land cover changes simulated by dynamic vegetation model

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Land surface properties are important because of their known impact on the East Asian monsoon circulation. Historical and future changes in land cover changes give influences on the monsoon rainfall and circulation over the Asian summer monsoon region. The dynamic vegetation model, as one of the key process of the Earth System model, simulates the terrestrial biosphere where the fraction of tree and grass species is a function of the local climate state. The potential effect of the simulated land cover distribution needs to be individually evaluated in present and future climate simulations. Since it is reported that the simulated land surface properties could give influence on the systematic biases in monsoon rainfall and add an impact in the future projection via feedback with the dust loading of the atmosphere [Martin and Levine, 2012]. Motivated by the previous study, we investigate the impact of land cover change generated by the interactive terrestrial carbon cycle in the HadGEM2 Earth System configuration over East Asia under present-day and possible future climate condition. Data in this study is HadGEM2-A runs using HadGEM2-ES land cover distribution in Martin and Levine [2012]. In present-day run, over the northern China region to the west of Korea, bare soil increase distinctly in HadGEM2-ES rather than HadGEM2-AO. ES land cover by interactive vegetation model gives influences on JJA rainfall and temperature. There is interaction with model systematic biases in the present-day climate. JJA dry bias is larger when HadGEM2-ES land cover distribution was used for Korea. Dust aerosol effect contributes to the dry bias. As bare soil fraction increases, more emitted dust aerosol has direct effect of negative net downward SW, cooling the land surface, weakening monsoon inflow, inducing dry bias over Korea. In the other hand, over bare soil expanded area, changes in roughness length and soil evaporation, the subsequent latent heat flux changes contribute to local surface warming in JJA. In global warming, warmer and wetter climate in JJA is expected in East Asia. Relative to global warming, ES land cover and dust direct effects are small and the details are presented.

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