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Quantifying the impact of bioenergy plantations on the future regional climate in Germany

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Land use and land cover changes (LULCC) effect the environment including the local and regional climate. Due to current political strategies the area occupied by bioenergy plantations is likely to be increased in Germany. Thus, LULCC interactions with and feedbacks to future projected climate is gaining importance for decision makers in terms of choice of optimal management strategies. Therefore, the overall environmental and climatic effects of bioenergy plantations need to be evaluated.
To explore the impact of LULCC in terms of temperature and precipitation on the future regional climate suitable scenarios for future vegetation cover (which could be realistic) due to energy plants (maize, poplar, etc.) are selected for climate simulations over Germany. Using a Regional Climate Model (RCM: COSMO-CLM) coupled to a land surface scheme, the control scenario C20 and an emission scenario A1B are downscaled to a high resolution ($\sim$1km) over Germany with normal vegetation cover and with these modified vegetation scenarios. In order to quantify the magnitude and nature of the interactions between LULCC and climate change at regional scale the impact of the vegetation scenarios is compared to the impact of global warming. First, RCM simulations of present climate are compared with RCM simulations of future climate and normal vegetation to quantify the effect of global warming on the regional climate. Second, RCM simulations of present climate are compared with RCM simulations of future climate with normal vegetation cover and different vegetation scenarios in order to evaluate the effect of the vegetation scenarios on the regional climate. Whether the intended vegetation scenarios mask or amplify the impact of increasing CO_2 on the regional climate and their magnitude is discussed.