



Determining Robust Impacts of Land-Use-Induced Land Cover Changes on Surface Temperature over China and surrounding regions: Results from the First Set of LUCID Experiments

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The project Land-Use and Climate, Identification of Robust Impacts (LUCID) was designed to address the robustness of biogeophysical impacts of historical land use–land cover change (LULCC). LUCID used seven atmosphere–land models with a common experimental design to explore those impacts of LULCC that are robust and consistent across the climate models. The biogeophysical impacts of LULCC were also compared to the impact of elevated greenhouse gases and resulting changes in sea surface temperatures and sea ice extent (hereafter SST/CO₂). Focusing the analysis on China and surrounding regions, the climate models involved in LUCID show, however, significant differences in the magnitude and the seasonal partitioning of the temperature change. The LULCC-induced cooling is directed by decreases in absorbed solar radiation, but its amplitude is 30 to 50% smaller than the one that would be expected from the sole radiative changes. This results from direct impacts on the total turbulent energy flux (related to changes in land-cover properties other than albedo, such as evapotranspiration efficiency or surface roughness) that decreases at all seasons, and thereby induces a relative warming in all models. The magnitude of those processes varies significantly from model to model, resulting on different climate responses to LULCC.