



Climatic and meteorological effects of land use changes in Hungary during the 20th century

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The final aim of the climate research is to create correct forecasts of the changing climate for the future. For this reason we have to identify the individual processes which can influence our climate. Knowing the different climate forcing processes and evaluating the effects of their changes can help to achieve this goal.

Potential effects of land use changes on the surface albedo and the evapotranspiration are considerable. The land use changes were significant in Hungary in the 20th century according to the database of the Hungarian Central Statistical Office, and different historical maps. Climatic effects of these land cover changes are further evaluated using the MM5 non-hydrostatic dynamical model. The lower boundary conditions are generated for two selected time period, i.e. about 1900 and 2000. The dynamical model has been run with the same detailed meteorological conditions of selected days from 2006 and 2007, but with modified lower boundary conditions. The set of the 26 selected initial conditions represents the whole set of the macrosynoptic situations (Peczely, 1983) for Hungary. In this way, 2x26 forecasts are performed with 48 hours of integration in each case. The effects of land use change under the different weather situations are further weighted by the long-term (1961-1990) mean frequency of the corresponding macrosynoptic types, to assume the climatic effect by these stratified averages. According to the comparisons, climatic effects of the land use changes on the near-surface meteorological variables were not negligible during the surveyed 100 years. In nation-wide average, they caused $+0.14 \pm 0.5$ K temperature rise and 0.17 ± 5 K increase in the dew point depression during the vegetation period, depending on the weather situation. In the selected vertically unstable cases, the land cover differences could significantly perturb the convective precipitation patterns and the area mean as well.