



Estimating the influence of regional forest cover changes on the frequency of severe weather events (heavy rains, wind gusts, fogs) from results of numerical experiments using the COSMO-Ru model

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Effects of forest cover changes within a large area of the East-European plain on the frequency of severe weather events, such as frosts, fogs, heavy rains, wind gusts, etc., were investigated by numerical experiments using the COSMO model with grid spacing of 6.6 km. For the numerical experiments the period of two years characterized by contrasting weather conditions was selected. Existence of the specified severe weather events was predicted on the basis of diagnostic ratios integrated within the COSMO-Ru model. The ICON global atmospheric reanalysis of the German Weather Service was used to quantify the initial and boundary conditions. The TERRA model is used within COSMO to describe the land surface-atmosphere interactions. It includes mathematical descriptions of most important processes influencing the energy and water vapor fluxes between land surface and the atmosphere such as evapotranspiration and canopy transpiration influenced by stomatal conductance, precipitation interception, root water uptake from different soil horizons, annual variability of snow cover properties, the temperature of water surface of internal reservoirs (FLAKE), etc.

Results of modeling experiments showed that the frequency of severe weather events depends significantly on the fraction of forest cover. Deforestation can lead to more frequent severe weather phenomena that are unfavorable for agriculture and any other economic activity (e.g. frosts, wind gusts). Influence of forest cover changes on fogs was ambiguous and dependent on time of days and regional synoptic processes.

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