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Heat flux in soil amended with biochar: modelling approach

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Temperature of soil has important influences on many soil processes and plant growth. It depends on the energy balance on the active surface, where the process of energy exchange between the Earth's surface and the atmosphere occurs. Heat flux is one of the components of the energy balance and can be influenced by biochar application to the soil, along with inherent texture and variables: moisture, density, and temperature of soil, as well as external conditions like climate, topography and surface properties related to the land use and vegetation cover. In this work we present the statistical-physical modelling approach for predicting the thermal conductivity and soil heat flux dynamics, based on temperature and soil moisture measurements, obtained from bare and grass fields with different rates of biochar. Adding biochar caused significant reduction of the thermal conductivity, diffusivity and heat capacity of the soil in the dry state and their significant increase in the wet state. The soil heat fluxes in bare and grassed soil were similar or different, depending on weather conditions, insolation, plant growth stage and changed with the soil depth, moisture as well as the rate of biochar applied.