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Separation of tile drainage runoff components using a temperature mixing model

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As the temperature of water is much easier to measure than the concentration of any chemical or isotopic tracer, we tried to use temperature as a *sui generis* tracer to distinguish where different portion of water in small streams and tile drains come from. A simple mixing model is presented which can be used for separation of two components of runoff based on its temperature and the temperature of expected end members. The process of successive equilibration of temperatures between the component water and the environment on the way of the water from its hypothetical place of origin to the closing profile is simulated as either linearly or exponentially dependent on the initial temperature difference and time. In addition, continuous (rather than sudden) production of the end member can be taken account, realising that the end-member temperature and its rate production at its place of origin may vary in time. The model can be used in an inverse way in order to estimate the temperature of an end-member water if the other end-member temperature is known and the separation has been made using a different technique.

The model is applied to some measured data on tile drainage runoff from a small agricultural catchment Dehtáře in the Bohemo-Moravian Highland, where the tile drainage is located on slopes and the soils are mainly loamy Cambisols, developed on weathered paragneiss and similar acid crystalline rocks and their products of weathering and erosion. Preliminary results indicate that the two-component separation based on water temperature oversimplifies the picture and that other data, such as groundwater table, must be taken into account, or more than two components must be assumed.