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Comparison of two interpolation methods for modelling crop yields in ungauged locations

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The crop models linked with a weather generator are often used in assessing sensitivity of crop yields to variability and changes in climatic characteristics or in probabilistic crop yields forecasting. In these situations, weather series representing present climate, future climate or weather forecast may be produced by the weather generator, which is typically calibrated using the site-specific weather observations. The problem arises when we want to simulate crop yields for a site, where no observational data are available. Two approaches are tested in this contribution to model yields in such site: 1) Model yield is interpolated from the surrounding stations where the observed weather series are available to run the crop model. 2) The crop model is run with the site specific input parameters (including soil type) and with weather series produced by weather generator whose parameters were interpolated from the surrounding stations. In both cases, we use the nearest neighbours interpolator, in which the interpolated value (being either crop yield or weather generator parameter) is defined as a weighted average from the surrounding stations' values corrected for the mean spatial (longitudinal, latitudinal and altitudinal) linear trends. In case of the first method, the discontinuity of the spatial distribution of soil properties (which significantly affect the crop yields) is accounted for: While interpolating model yield to any target site, the model yields in the surrounding stations as well as the regression coefficients for spatial trends correction relate to the same soil type as the one found in the target site. The two methods are tested to interpolate winter wheat yields in Czechia. We use STICS crop growth model [1] fed by daily weather series produced by Met&Roll stochastic weather generator [2, 3, 4, 5, 6, 7], which is calibrated with daily weather data from 125 stations. The soil conditions are represented by 21-soil-types map at

1x1 km resolution. The two interpolation methods are applied for two types of experiments: (1) uninterrupted n-year crop model simulation run for a single crop (winter wheat), (2) sequence of n 2-year crop-rotation simulations, in which alfalfa is simulated in the first year followed by wheat simulation in the second year. Accuracy of the interpolation methods will be assessed using the cross-validation technique. The set of 125 stations is split into two sets: the "learning" set includes 100 stations, from which we interpolate and which are used to derive spatial trends of variables being interpolated, and remaining 25 stations serve as "verification" stations, to which we interpolate and which are used to determine the measures of interpolation accuracy.

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References: [1] Brisson N. et al., 2003, Europ. J. Agronomy, 18, 309-332; [2] Dubrovsky M. et al, 2000, Clim. Change 46, 447-472; [3] Zalud Z. and Dubrovsky M., 2002, Theor. Appl. Climatol., 72, 85-102; [4] Dubrovsky M. et al., 2004, Clim. Change 63, 145-179; [5] Trnka M. et al., 2004, Theor. Appl. Climatol. 77, 229-249; [6] Trnka M. et al., 2004, Clim. Change 64, 227-255; [7] Kysely J. and Dubrovsky M., 2005, Int.J.Climatol. 25, 251-269.