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From point to spatial information – integrating highly resolved sensor observations into crop models

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High spatial variability of soil properties restricts the benefits of process-oriented modelling for management recommendations on field scale due to rare information about the soil inventory and its distribution. On the other hand, sensor measurements as geo-electrical mapping provide with a certain spatial pattern, but interpretation of the results is diverse and influenced by local conditions. In the present study, the model HERMES was applied to 60 soil sampling points of a well-documented field in North-Rhine Westphalia characterised by a wide range of soil texture. Validation of HERMES resulted in satisfactory root mean square errors (RMSE) for yield, water and nitrogen in soil. Values of conducted measurements (n = 5,000) of electrical conductivity (ECa) at the same field ranged from 20 to 90 mS/m and were assigned to the soil sampling points. Subsequent regression analyses resulted in a high correlation of clay and sand contents with measured ECa values and justified the calculation of soil texture at mapping points of ECa. Hence, an improved resolution of the key value soil texture was produced to initialize model simulation and to finally generate spatial patterns of simulated state variables (e.g. water and nitrogen content in soil).