The implication of input data aggregation on upscaling of soil organic carbon changes

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In regionalization studies the spatial resolution of driving data is often restricted by data availability or limited computational capacity. Method and level of spatial driver aggregation in upscaling studies are sources of uncertainty and might bias aggregated model results. The suitability of upscaled model results using aggregated driving data depends on both the sensitivity of the model to these model drivers and the scale of interest to which the model output will be aggregated. An important component of soil plant atmosphere systems is the soil organic matter content influencing GHG emissions and the soil fertility of croplands.

The implications of driver aggregation schemes on different system properties of croplands have been examined in a scaling exercise within the joint research project MACSUR. In this study, meteorological driving data and data on soil properties on several aggregation levels have been used to calculate the organic carbon change of cropland soils of North Rhine-Westphalia with an ensemble of biogeochemical models.

The results of this scaling exercise show that the aggregation of meteorological data has little impact on modeled soil organic carbon changes. However, model uncertainty increases slightly with decreasing scale of interest from NUTS 2 level to smaller grid cell size. Conversely, the aggregation of soil properties resulted in high uncertainty ranges constraining the predictable scale of interest for all models. The study gives an indication on adequate spatial aggregation schemes in dependence on the scope of regionalization studies addressing soil organic carbon changes.