Sensitivity of crop water and N stress to soil input data in regional crop yield simulations and the implications for data aggregation effects: a case study with the COUP-model

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The effects of aggregating soil input data on modelling crop yields at regional scale have been explored within the MACSUR- Crop M – WP3 scaling exercise for an ensemble of crop models [1]. The models were run for the North Rhine-Westphalia region in Germany with an average climate time-series (30 years) and soil data at resolution 1 km to 100 km. Aggregation effects showed substantial differences between the models [1]. This could be linked to differences in model structure and concepts and to different procedures for the parameterization of soil properties. A further analysis of the sensitivity of the outputs to key soil properties, for each '*model - method of parameterization*', could help in understanding differences observed within the model ensemble.

In this study, we explored the relationship between winter wheat yields, water and N-stress indexes and simple key-soil properties, based on the COUP-model [2] simulations. Soils were grouped into classes according to selected parameters (*i.e.* soil depth, soil texture and soil organic content). Preliminary results show that some of those soil classes are clearly associated with high water and / or N-stress and lower yields or with high inter-annual variation of the yield. As such they represent key factors explaining the spatial pattern of the simulated yield at the different resolutions. In addition we identified differences in the fractional area of those soil classes between high and low spatial resolutions ('*inherent errors*' due to data aggregation). How this may influence soil data aggregation effects on simulated yields will be further analyzed.

[1] Effects of soil and climate input data aggregation on modelling regional crop yields - Abstract MACSUR Science conference 2015, Hoffmann et *al.*

[2] COUP-model: model use, calibration, and validation. Jansson, P.E., 2012, Transaction of the ASABE 55 (4): 1335-1344.

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