1. Crop growth patterns are directly influenced by soil variability which can be detected with soil electrical conductivity measurements

2. Crop growth simulations must consider these structures to be improved at field-scale

Heterogeneity in crop growth, often caused by contrasting soil properties (Fig. 1), is difficult to model not least due to limited data availability. Measurements of the apparent soil electrical conductivity (ECa) have been proposed to obtain spatially consistent information about soil heterogeneity but have rarely been set into relation to plant measurements. Little work has also been done in validating crop models with respect to their ability to characterize the effect of field heterogeneity on crop growth. The aim of this study was to relate the ECa method with measurements of the green leaf area index (GLAI) and to validate a crop model with respect to its ability to reproduce the spatial variability of GLAI of two crops during two different years in Germany.

Crop models applied to heterogeneous fields need to be validated for different parts of the field as shown in Fig. 2. Heterogeneous patterns of crop growth in a sugar beet field in Germany in 2012 during a stress period. A: Unstressed crop in the morning. B: Stressed crop in the afternoon. Under stressed conditions crop heterogeneity patterns are obviously visible due to different soil conditions. C: ECa map of the same field indicating an ECa pattern identical with the crop growth pattern.

**Experimental Setup and Results**

**Hypotheses**

- GLAI correlates with ECa for winter wheat and sugar beet crops, indicating thereby that differences in soil properties affect GLAI (Figs. 4, 5).
- Crop models applied to heterogeneous fields need to be validated for different parts of the field as shown in Fig. 6.
- Sources of inaccurate simulations need to be further investigated. To which extent more detailed soil and crop physiological models, like GECROS, improve the model accuracy should be tested.

**References**


**Conclusion and future work**

- GLAI correlates with ECa for winter wheat and sugar beet crops, indicating thereby that differences in soil properties affect GLAI (Figs. 4, 5).
- Crop models applied to heterogeneous fields need to be validated for different parts of the field as shown in Fig. 6.
- Sources of inaccurate simulations need to be further investigated. To which extent more detailed soil and crop physiological models, like GECROS, improve the model accuracy should be tested.

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