

**ADVANCES IN DYNAMIC MODELLING
OF LANDSCAPE PROCESSES:
THE EXAMPLE OF SOIL COMPACTION**

**AKTUELLE ENTWICKLUNGEN BEI DER DYNAMISCHEN
MODELLIERUNG VON LANDSCHAFTSPROZESSEN:
DAS BEISPIEL BODENVERDICHTUNG**

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SUMMARY

Landscape ecology has long used models to analyse processes and relationships in landscapes. Of particular importance is the dynamic modelling since landscape processes change continuously in space and time. Recent advances such as increased processing power, higher memory and data availability make it possible to map spatio-temporal dynamics in models with increasingly high resolution and to gain new insights from these models. In this context, particular importance is attached to open source data and programs, as well as the associated trend towards “reproducible research”.

The example of soil compaction is used to show how recent advances affect the modelling and assessment of soil compaction risk. The soil compaction risk varies daily depending on the soil conditions and the machines used and is therefore a highly dynamic process. By using free software (R, MONICA), free data (Sentinel 2) and today’s common computing power, the SaSCiA model (“Spatially Explicit Soil Compaction Risk Assessment”) is used to show how these dynamics can be mapped on different spatial scales. On the regional scale, the soil compaction risk can be analysed at a previously unattained high spatial-temporal resolution. On the field scale it becomes clear how the soil compaction risk changes continuously due to permanent wheel load changes during the driving process. By integrating tramlines into soil erosion modelling, it is exemplarily shown how soil compaction affects the erosion process during erosive precipitation.

Current and future technical developments will lead to even more precise modelling. In particular, techniques such as machine learning will bring many further advances and new insights into the modelling of landscape ecological processes. A critical aspect, however, remains the lack of data availability in individual subject areas such as soil data. However,