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AgroC model for carbon and nitrogen cycling in soils and plant organs across different fertilization levels

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An understanding of the impact of different levels of nitrogen fertilization on soil fertility and crop production is needed to develop sustainable farming practices. In conjunction with experimental data, simulation models provide insights into how agricultural systems function under various environmental conditions and can provide efficient interpretation of data. An important step in modelling simulations is to calibrate the model parameters for robust predictions as they are sensitive to location or cultivar and cannot be measured. Unfortunately, most crop or agroecosystem model calibrations are performed on temporal or spatial data that is sparsely resolved.

In this study, AgroC model was used to simulate soil hydraulics, crop biometrics, and the nitrogen fluxes in agricultural field trials with the aim to test the model efficacy after nitrogen cycle module was integrated in. Two high quality datasets covering the essential measurement variables were used for testing the model: a 4-year high-resolution lysimeter data from Dedelow and yearly data from suction cups and SoilNet sensors in Campus Klein Altendorf (CKA), both collected in Germany. These data are collected at high temporal resolution, with multi-site characteristics that focus on eroded soils and nitrogen leaching to the deep zone. Among other soil and hydrological state variables, the data in Dedelow specializes in flux measurements (e.g., evapotranspiration, precipitation, drainage) while the data in CKA specializes on carbon and nitrogen content of soil and plant organs at a bi-weeekly interval.