The Daisy Model Newsletter
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Daisy Newsletter no. 15

1 The Daisy code, v. 5.59

Version 5.59 is still the last version available on all platforms.

2 Link to Daisy Forum

We would like to highlight that a Daisy discussion forum exists since 2008. Please raise your questions and people from the agrohydrology group will try to reply as soon as possible. In that way, a database of questions will be created, and we hope that it will be beneficial for most of the Daisy users. The link to the forum is: https://groups.google.com/forum/#!forum/daisy-model.

3 Course and workshop

The course "Applied Agrohydrology II" on the use of Daisy was conducted at the end of August. This time we combined it with a networking event where the course participants and other Daisy users at PLEN and nearby briefly presented their planned or present work. Pizzas, beers and soft drinks helped provide a pleasant atmosphere and eased the discussions among participants. We will try to make this event a feature in the course week in the future.

4 Recent articles where Daisy has been used

Chen et al. (2018) compared different descriptions of nitrification and denitrification based on SoilN and Daisy, and evaluated the controlling parameters and variables as well as their sensitivities. The study does not compare the results to new measured data but refers back to earlier studies.

Ghaley et al. (2018) used Daisy to simulate effects of different levels of soil organic carbon (SOC) (0.7-2 %) and five nitrogen rates (0-200 kg N ha^{-1}) on winter wheat grain and above-ground biomass production. Plant available water was influenced by the SOC-levels investigated but had no significant effect on grain yield. Yield levels were mainly influenced by SOC when receiving 0-100 kg N ha-1 and SOC effects decreased till no effect at 150-200 kg N ha^{-1}.

Jabloun et al. (2018) described a very comprehensive calibration and sensitivity study of a maize-winter wheat system in China, using data from four fertilizer treatments over six years. 128 parameters were considered for sensitivity analysis. Parameterisation of the previous crop was found to influence parameters for the following crop. To carry out the sensitivity analysis, the group has developed the "RDAISY toolbox" which can serve as a basis for sensitivity analysis of the DAISY model, thus enabling the selection of the most influential parameters to be considered with model calibration. The RDAISY toolbox is given in the supplementary material to the article, at https://doi.org/10.1016/j.agrformet.2018.08.002.

Maharjan et al. (2018) reviewed the approaches to simulate the impact of tillage on soil physical properties and on vertical distribution of organic matter and nutrients implemented in 16 different agro-ecosystem models (APEX, APSIM, CropSyst, DAISY, DayCent, DNDC, DSSAT, EPIC, HERMES, HYDRUS-1D, LPJmL, MONICA, SALUS, SPACSYS, STICS, and SWAT). Most models simulate the incorporation or/and redistribution of organic matter, residues or/and nutrients in the soil. Some of the models simulate the tillage effects on soil bulk density, soil settlement, soil texture redistribution, and several soil hydraulic properties. To some extent, the changes in soil porosity, soil aggregates, and the soil organic matter content are considered. None of the models consider the changes in biochemical properties such as changes in soil microbial biomass and activity or redistribution of weed seeds after a tillage operation. The authors conclude that there is an urgent need to improve the tillage components in crop modelling due to its obvious impact on various soil and nutrient processes and consequently, on crop growth and yield.

Manevski et al. (2019) [that is what it says!] investigated nitrate leaching from outdoor (organic) pig production with and without trees (Poplars). Daisy and Coupmodel were used to

calculate the water balance. Annual nitrate leaching ranged from 32 kg N ha^{-1} in the poplar zone without pig access up to 289 kg N ha^{-1} in the control grass zone of NT. Even systems with trees require other measures to bring leaching to acceptable levels.

5 Other studies of general interest

Wang et al. (2017) reviewed and synthesized available information on temperature relationships for winter wheat, related to phenology, photosynthesis, respiration and related processes (RUE, biomass development). Inclusion of the temperature function for the phenology development in the reproductive phase in Daisy clearly improved the simulation of maturity dates (Styczen et al., 2018). Work is ongoing with respect to incorporation of the temperature function for the vegetative phase. Recent work (Styczen et al., 2018) indicates that the description of the temperature effect on development rate around 5-8 °C is crucial in order to catch the change in maturity date over time in Denmark, because particularly the months November and April show increases in temperature from 1990 and forward.

6 References

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Ghaley, B.B., Wösten, H., Olesen, J.E., Schelde, K., Baby, S., karki, Y.K., Børgesen, C.D., Smith, P., Yeluripati, J., Ferrise, R., Bindi, B., Kuikman, P., Lesschen, J-P., and Porter, J.R. (2018): Simulation of Soil Organic Carbon Effects on Long-Term Winter Wheat (Triticum aestivum) Production Under Varying Fertilizer Inputs. Front. Plant Sci. 9:1158. doi: 10.3389/fpls.2018.01158

Jabloun, M., Lie, X., Zhange, X., Taod, F., Hue, C., and Olesen, J.E. (2018): Sensitivity of simulated crop yield and nitrate leaching of the wheat-maize cropping system in the North China Plain to model parameters. Agricultural and Forest Meteorology 263 (2018) 25–40.

Maharjan, G.M., Prescher, A-K., Nendel,Cl, Ewert, F., Mboh, C.M., Gaiser, T., and Seidel, S.J. (2018): Approaches to model the impact of tillage implements on soil physical and nutrient properties in different agro-ecosystem models. Soil & Tillage Research, 210-221.

Manevski, K., Jacobsen, M., Kongsted, A.G., Georgiadis, P., Labouriau, R., Hermansen, J.E., and Jørgensen, U. (2019): Effect of poplar trees on nitrogen and water balance in outdoor pig production – A case study in Denmark. Science of the Total Environment 646 (2019) 1448–1458.

Styczen, M., Gudbjerg, J og Gregersen, J. (2018): Prognoser for høsttidspunkt. Report requested by the Agricultural Agency. Not yet public.

7 Articles of general interest

Wang et al. (2017): The uncertainty of crop yield projections is reduced by improved temperature response functions. NATURE PLANTS 3, 17102 | DOI: 10.1038/nplants.2017.102

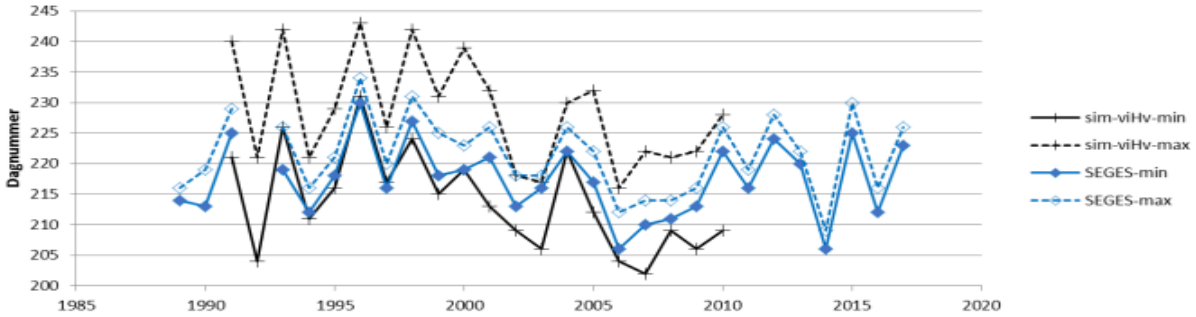

Figure 1. Simulated and observed maturity dates for winter wheat across Denmark. Black lines: first and last maturity date based on simulation of a point in each of 90 municipalities in Denmark using grid-weather files from DMI (1990-2010). Blue lines: Recorded maturity dates from variety trials carried out in Denmark (SEGES). Exact locality and sowing date are not known. Y-axis: Day number for maturity. From Styczen et al. (2018).