Daisy Newsletter no. 41

1 The Daisy code, v 7

A new version (7) is officially released for all platforms. It can be downloaded from github, where it is also possible to access the code, follow the development of the new versions and add comments and wishes to future versions. The reference manual can also be downloaded here (it is no longer automatically distributed with the Daisy program. In addition, you should be aware that the procedure for configuration with textpad has changed a bit, see the guide.

Daisy 7 includes a number of new features, of which we here want to highlight:

A) A new ammonium sorption parameterization. The default values for linear ammonium sorption to clay and organic matter (K_clay and K_OC) has been changed as the earlier linear sorption parameters (the "NH4"-model) was based on a wrong parameterization of the vS_S-model. The changed sorption parameters will in general result in a higher NH_4^+-N crop uptake and a lower NO_3^--N crop uptake, due to lower sorption. Nitrification is reduced too. A complete description of the parameterization of ammonium sorption, together with some tests investigating the effect of the different parameterizations is available in the Technical Documentation Chapter 7 and appendix 7.1 (both soon to be published).

B) A new SOM breakdown parameterization. In relation to writing the Technical Documentation we discovered a mistake in the parameterization of the SMB2->SOM2 pathway, implemented when the C++ version of Daisy was written. This, together with the later added bio-incorporation model with an efficiency of 50 %, resulted in too high a loss of C, especially from non-tilled systems. In Daisy version 7 two new SOM parameterizations are implemented: SOM2000 similar to the breakdown parameterization of the C^{++} versions of Daisy before version 7 and SOM2025 similar to the breakdown parameterization in the old Fortran version of Daisy. We recommend using the SOM2025 parameterization. See more in the Technical Documentation Chapter 9 and appendix 9.4 (both soon to be published).

C) An option to extend Daisy with a user-defined Python code for selected processes. One such process is adsorption, where we will present an air-water-interface PFAS adsorption on the lunch meeting 2nd of April. Another process is a generalized chemical reaction, which we hope to describe applied for denitrification at a lunch meeting on the 4th of June.

See more in the presentations from the Daisy 7 launch on the 19th of March to be found here.

2 Upcoming events

The 2nd of April we will have the first in our new series of Daisy-user meetings taking place physical and online the first Wednesday of the month. The theme for the April meeting will be simulating PFAS sorption and transport with Daisy and the new Python interface presented by Camilla Jakobsen (UCPH) and Per Abrahamsen (UCPH).

These will be followed by a presentation on the sensitivity and calibration of the SWAT-SSOC model in Daisy by Laura Delhez (ULiége) (7th of May) and a presentation on N_20 modelling with Daisy by Tobias Klöffel (UCPH) (4th of June).

The meetings will take place at Thorvaldsensvej 40, Room T532. If you want to receive future invitations including the online links, please write to daisy@ku.dk.

3 Technical Documentation

Chapter 6 and 11 of the Technical Documentation are now available at the homepage, describing solute transport in the soil and the management module, respectively. Together with appendix 2.4 describing the SSOC-SVAT model.

4 Recent articles where Daisy has been used

Delhez et al. (2025) have carried out a global sensitivity analysis of Daisy including the SWAT-SSOC module focusing on crop yield, CO_2, N_2O and energy fluxes. To evaluate the N_2O-flux from denitrification, they estimated the ratio $N_20/(N_20+N_2)$ depending on soil pH, water-filled pore space and NO_3 concentration. They compared the applications of global sensitivity analysis using temporal or aggregated (cumulated or RMSE) results and found that both methods identified the same main influential parameters, but the temporal analysis revealed dynamic changes (at weekly and hourly scale) in parameter sensitivity and identified critical periods for calibration.

Rashid et al. (2025) evaluated the performance of biobased recovered nitrogen fertilizer in European cropping systems using Daisy. The analyzed harvested N, N use efficiency, total N losses (leaching and gasses) and changes in soil organic N stocks for 10 cropping systems representing the different geoclimatic regions and farm types in Europe when applying ammonium sulphate, digestate or liquid fraction of digestate either as full or partial replacement for current fertilization practices. They found that the replacement of current fertilizations practices with biobased fertilizers had minimal impact on N yield, nitrogen use efficiency and total N losses compared to the baseline.

5 References

Delhez, Laura, Benjamin Dumont, and Bernard Longdoz. 2025. 'Leveraging Temporal Variability in Global Sensitivity Analysis of the Daisy Soil-Plant-Atmosphere Model'. *European Journal of Agronomy* 165 (April):127533. https://doi.org/10.1016/j.eja.2025.127533.

Rashid, Muhammad Adil, Yun-Feng Duan, Jan Peter Lesschen, Piet Groenendijk, Sander Bruun, and Lars Stoumann Jensen. 2025. 'Evaluating the Performance of Biobased, Recovered Nitrogen Fertilizers in European Cropping Systems Using Modelling'. *Farming System* 3 (2): 100141. https://doi.org/10.1016/j.farsys.2025.100141.