

Differences between Swap3.2.36 and Swap4.0.1

This document summarizes major differences between 2 releases on internet: Swap3.2.36 in November 2009 and Swap4.0.1 in July 2017.

Theory and user manual of SWAP4 are described in [1] and extensions for nitrogen and carbon in crop and soil are described in [2].

There is an extensive logbook for detailed differences at code-level resulting from almost 8 years work on and with the model Swap in numerous projects. This logbook is not made public because it is very technical, cryptic and requires an explanation which is too time consuming at this stage. Therefore we limit ourselves in this document to the major changes:

1. General
 - Code restructured and standardized to Fortran2003
 - Date-format in all output files changed into yyyy-mm-dd
 - Initialisation improved to enable restarts with different management options
2. Soil
 - Soil physics improved and 2 options (MVG and tables) resulted in more stable solutions
 - Soil carbon cycle implemented
3. Solutes
 - Solute transport and salinity stress are simplified and more accurate
4. Atmosphere
 - Atmospheric CO₂ can be used as input to crop growth
 - Partitioning of ET has a new option (PMdirect) which applies Penman-Monteith with basic weather and crop data and facilitates calibration to data of remote sensing and field experiments
5. Plant
 - Oxygen stress extended with soil gas transport and diffusion
 - Crop modeling using WOFOST-modules extensively tested using field experiments
 - Crop modeling extended with a sowing-emergence crop development period
 - Crop modeling extended for grassland with options for mowing and grazing
 - Crop modeling extended for pulse crops like soy bean and includes nitrogen fixation
 - Crop modeling extended for winter crops and includes vernalisation
6. Nitrogen in soil and crop
 - Crop modeling uses LINTUL-approaches for partitioning of N within crop
 - Mineralisation of organic material results in N which can be taken up by the crop

References

- [1] Kroes, J.G., J.C. van Dam, R.P. Bartholomeus, P. Groenendijk, M. Heinen, R.F.A. Hendriks, H.M. Mulder, I. Supit, P.E.V. van Walsum, 2017. SWAP version 4; Theory description and user manual. Wageningen, Wageningen Environmental Research, Report 2780. Available at: <http://library.wur.nl/WebQuery/wurpubs/fulltext/416321>
- [2] Groenendijk, P., Boogaard, H., Heinen, M., Kroes, J., Supit, I., & Wit, A. De., 2016. Simulation of nitrogen-limited crop growth with SWAP / WOFOST. Report 2721. Alterra Rapport, 2721. Available at: <http://edepot.wur.nl/400458>