

Workshop:
“Crop growth and soil processes modeling II & Response diversity study”

From 9th to 10th March 2015, Brno, Czech Republic
(noon of day 1 to noon of the day 2)



Venue:

Global Change Research Centre – Academy of Sciences of the Czech Republic – Bělidla 986/4b, Brno 603 00, Czech Republic

Coordinates: GPS: 49°11'13.200"N, 16°35'34.800"E

Accommodation:

Will be provided by local organizers in a hotel within walking distance from the workshop venue.

Hotel Austerlitz (<http://www.austerlitzhotel.cz/>)

Hotel Sharningham (<http://www.sharningham.cz/cs/>)

Organized by:

Global Change Research Centre – Academy of Sciences of the Czech Rep.

Mendel University in Brno (Institute of Agrosystems and Bioclimatology)

Main Organizers: Miroslav Trnka, Kurt Christian Kersebaum, Petr Hlavinka, Eva Jurkova

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Main aim of the study:

To simulate and assess crop growth and soil processes using multi-model ensembles within crop rotations.
To compare selected crop growth models and types of agro-management approaches under various soil-climatic conditions (i.e. considering various locations but also recent and future climatic conditions).
To analyze the response diversity change of wheat cultivars grown in Europe over time using objective methodology.

Background

We are observing impact of changing agroclimatic conditions (e.g. Trnka et al., 2012) and even larger shift could be expected in future (Trnka et al., 2013 and 2014). Therefore we would like to analyze in depth potential changes in key soil processes and crop growth. The invited participants have great deal of expertise in the presently “catchy” field of multi-models ensemble (e.g. Asseng et al., 2013; Palosuo et al., 2011; Rötter et al., 2012). This approach is currently considered as highly desirable way of applying crop growth models as it helps to determine the level of uncertainty at actual level of knowledge. However so far very few (almost none) studies focused on the “real-world” crop rotations and the use of multi-model ensembles. Absolute majority of climate change impact studies considered single crop monoculture approach which is not a realistic approach if research is aimed at finding the most suitable adaptation options as e.g. the effect of fertilization strategy (with and without organic fertilizers), crop residues management (exported or incorporated residues into the soil), effect of catch crops and tillage intensity on important soil processes, water regime and crop growth. We suggest crop growth model based study focused on simulating effect of climate change on “real” crop rotations. In this way e.g. the ability of soils (in connection with climatic conditions and selected farming approach) to be source or sink of CO₂ due to sequestration could be assessed. Simultaneously, expected trends in soil quality or soil water reserves could be assessed. The data, visualization methods and the whole chain of simulation data post-processing was developed and tested in the pilot study with Hermes model (e.g. Hlavinka et al., 2014). Now we would like to carry out study that could be used as “role” model for future climate change impact/adaptation studies in the field crop research.

Present status

During the first meeting the goals of the study were presented in detail together with the available datasets. The datasets for the baseline climate were distributed to the participants shortly after the workshop. During the workshop II we are expecting discussion on the “baseline” result analysis. Then sufficient time will be dedicated to the protocol for crop rotation run for the changed climate.

Participating models: HERMES, MONICA, DSSAT (3 teams), DAISY, CROPSYST, STICS, FASSET, AQUASYST, AGROTOOL

Expected participants: Christian K. Kersebaum, Claas Nendel, Gerrit Hoogenboom, *Vakhtang Shelia*, *Margarita Ruiz-Ramos*, Domenico Ventrela, Jozef Takáč, *Marco Bindi*, Marco Moriondo, Roberto Ferise, *Francoise Ruget*, Isik Ozturk, Behzad Sharif, *Jorgene Olesen*, Ana Gobin, *Reimund Rötter*, Alex Topaj, *Josef Eitzinger*

Invited guest: Helena Kahiluoto, *Karel Klem*

Those in italics are likely not to participate at the workshop II

Target crops:

Spring barley, winter wheat, silage maize, oil seed rape (canola) – calculated as continuous 5-year crop rotation (with winter wheat being repeated twice in the sequence)

Target parameters/processes:

Long-term dynamic of soil organic carbon content, Nitrogen balance, soil water balance, drought stress, crop development, crop growth and yields.

Target locations/soils:

Phase 1a: three central European rainfed locations (with temperature and precipitation gradient) with 2 typical soil profiles (Chernosem with high soil water holding capacity and Cambisol with low soil water holding capacity) – for the BASELINE – should be finished by the workshop beginning at the latest with data transfer to the coordinator;

Phase 1b: runs for expected climate conditions finished by May 15, 2015. First draft of the manuscript presented at the core group meeting at the end of June 2015.

Phase 2: The candidates (also out of Europe with possibility of modified crop rotations) will be discussed at workshop – start tentatively toward August 2015. Also depending on the AgMIP activities.

Program of workshop:

March 9

- 11:00-12:30 *Early joint Lunch – Sheringham restaurant (The same as the last time ☺)*
- 12:30-12:45 Objectives of the workshop
- 12:45-13:30 Present status – lecture by Peter Hlavinka
- 13:00-14:30 Baseline simulation summary experience – 5 minute brief overview given by each modellers, summarizing the present status, encountered problems and results.
- 14:30-15:20 Experience of DSSAT developers with simulating crop rotations and the AgMIP update (Prof. Geritt Hoogenboom) - 35 minutes lecture + 15 minute discussion
- 15:20-15:45 *Coffee Break with discussion*
- 15:45-16:15 Identifying and “correcting” the key methodological concerns depicted from team presentations
- 16:15 – 17:00 Clarifying the exercise protocol for the expected climate conditions, presentation of the climate change sceanarios – Mirek Trnka (15 minutes + 30 minute discussion)

March 10

- 8:15-8:45 Response diversity study – action status – Helena Kahiuloto and Jane Kaseva
- 8:45–9:45 Brief summary of data acquired so far and estimates by each team (5 minutes per team, 2 slides maximum)
- 9:45–10:15 Identifying and “correcting” the key methodological concerns depicted from team presentations –
- 10:15-10:30 Response diversity study ROAD MAP till June 2015 (Mirek, Helena, Jane & all partners]
- 10:30-11:00 *Coffee break with discussion*
- 11:00-11:30 Crop rotation study ROAD MAP till June 2015 (Peter, Mirek, Christian & all partners)
- 11:30-12:30 Final discussion block
- 12:30- Lunch and official end of the meeting

Mentioned references:

- Asseng, S., F. Ewert, C. Rosenzweig, J.W. Jones, J.L. Hatfield, A.C. Ruane, K.J. Boote, P.J. Thorburn, R.P. Rötter, D. Cammarano, N. Brisson, B. Basso, P. Martre, P.K. Aggarwal, C. Angulo, P. Bertuzzi, C. Biernath, A.J. Challinor, J. Doltra, S. Gayler, R. Goldberg, R. Grant, L. Heng, J. Hooker, L.A. Hunt, J. Ingwersen, R.C. Izaurralde, K.C. Kersebaum, C. Müller, S. Naresh Kumar, C. Nendel, G. O'Leary, J.E. Olesen, T.M. Osborne, T. Palosuo, E. Priesack, D. Ripoche, M.A. Semenov, I. Shcherbak, P. Steduto, C. Stöckle, P. Stratonovitch, T. Streck, I. Supit, F. Tao, M. Travasso, K. Waha, D. Wallach, J.W. White, J.R. Williams, and J. Wolf, 2013: Uncertainty in simulating wheat yields under climate change. *Nature Climate Change*, 3, 827-832.
- Hlavinka, P., Kersebaum, K.Ch., Dubrovský, M., Fischer, M., Pohanková, E., Balek, J., Žalud, Z., Trnka, M., 2014. Water balance and drought stress for field crop rotations in present and future conditions. *Climate Research*, (just before submission).
- Palosuo, T., Kersebaum, K.C., Angulo, C., Hlavinka, P., Moriondo, M., Olesen, J.E., Patil, R.H. Ruget, F., Rumbaur, C., Takáč, J., Trnka, M., Bindi, M., Caldag, B., Ewert, F., Ferrise, R., Mirschel, W., Saylan, L., Šiška, B., Rötter, R., 2011. Simulation of winter wheat yield and its variability in different climates of Europe: A comparison of eight crop growth models. *European Journal of Agronomy* 35: 103-114. ISSN 1161-0301.
- Rötter, R.P., Palosuo, T., Kersebaum, K.C., Angulo, C., Bindi, M., Ewert, F., Ferrise, R., Hlavinka, P., Moriondo, M., Nendel, C., Olesen, J.E., Patil, R.H., Ruget, F., Takac, J., Trnka, M., 2012. Simulation of spring barley yield in different climatic zones of Northern and Central Europe: A comparison of nine crop models. *Field Crops Research* 133: 23-36.
- Trnka, M., Brázdil, R., Olesen, J.E., Eitzinger, J., Zahradníček, P., Kocmánková, E., Dobrovolný, P., Štěpánek, P., Možný, M., Bartošová, L., Hlavinka, P., Semerádová, D., Valášek, H., Havlíček, M., Horáková, V., Fischer, M., Žalud, Z., 2012. Could the changes in regional crop yields be a pointer of climatic change? *Agricultural and Forest Meteorology* 166, 62-71.
- Trnka, M., Kersebaum, K.C., Eitzinger, J., Hayes, M., Hlavinka, P., Svoboda, M., Dubrovský, M., Semerádová, D., Wardlow, B., Pokorný, E., Možný, M., Wilhite, D., Žalud, Z., 2013. Consequences of climate change for the soil climate in Central Europe and the central plains of the United States. *Climatic Change* 120: 405-418.
- Trnka, M., Rötter, R.P., Ruiz-Ramos, M., Kersebaum, K.Ch., Olesen, J.E., Žalud, Z., Semenov, M.A., 2014. Adverse weather conditions for European wheat production will become more frequent with climate change. *Nature Climate Change*, Vol. 4, 637-643.