Multi-model simulation for rice yield forecasts in Jiangsu (China)

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The multi-model approach in BioMA

- The BioMA (Biophysical Model Applications) platform provides the opportunity to run multi-model simulations against a shared spatially-explicit database.
- Different biophysical models are characterized by specific approaches for reproducing processes related to crop growth and development, thus they react in different ways to climatic and environmental conditions.
- The models implemented in the BioMA platform via the CropML component that were used in this study are CropSyst, WARM and WOFOST.

The case study

- CropSyst, WARM and WOFOST were used to simulate rice growth and development in Jiangsu province (China).
- The simulations were performed using ECMWF meteorological data at 25 x 25 km spatial resolution in a cold (1999) and a warm (2006) seasons.
- The models were previously calibrated using measured data collected in nine sites and two seasons in the central-western regions of Jiangsu.

Results

- Aboveground biomass values at maturity simulated by WARM followed the pattern of solar radiation, i.e. north-south and east-west in 1999 and 2006, respectively.
- CropSyst simulated a biomass trend similar to the WARM one. The absence of limitation for high temperatures led the model to maintain a high photosynthetical activity in the north-west part of the province, especially in the warmest season.
- The pattern depicted by WOFOST was markedly different. In particular, WOFOST reduced growth rates in the extreme north-west and in the southern areas, because of the double effect of high temperatures: on gross photosynthesis and on respiration.

Conclusions

- Similar performances were achieved by the three models during field level evaluation.
- The models performed differently when applied on a large area.
- The multi-model approach could improve crop monitoring systems, especially when anomalous seasons occur.

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