AZODYN-rapeseed: a dynamic crop model to simulate the performance of winter rapeseed crop in constrasting environnements

S. Gervois, M. Langlois, X. Pinochet

Terres Inovia, Thiverval-Grignon

M. Valantin-Morison

INRA, UMR Agronomie, Thiverval-Grignon, France

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Context and Objectives

Context

- The AZODYN-rapeseed crop model can be useful as a support tool.
  - to help fertilization management
  - to quantify the abiotic stress levels in a network trials (Poster 421)
  - To test scenarios with several sowing fertilization * sowing dates to reduce pests damages in autumn
- Irregular climate events occured last years
  - Severe droughts in September/October or in Spring
  - Strong rainfalls in Spring
- In the next years, these events would be more and more common

Objectives

- We tested the model performance over the years with irregular climate events

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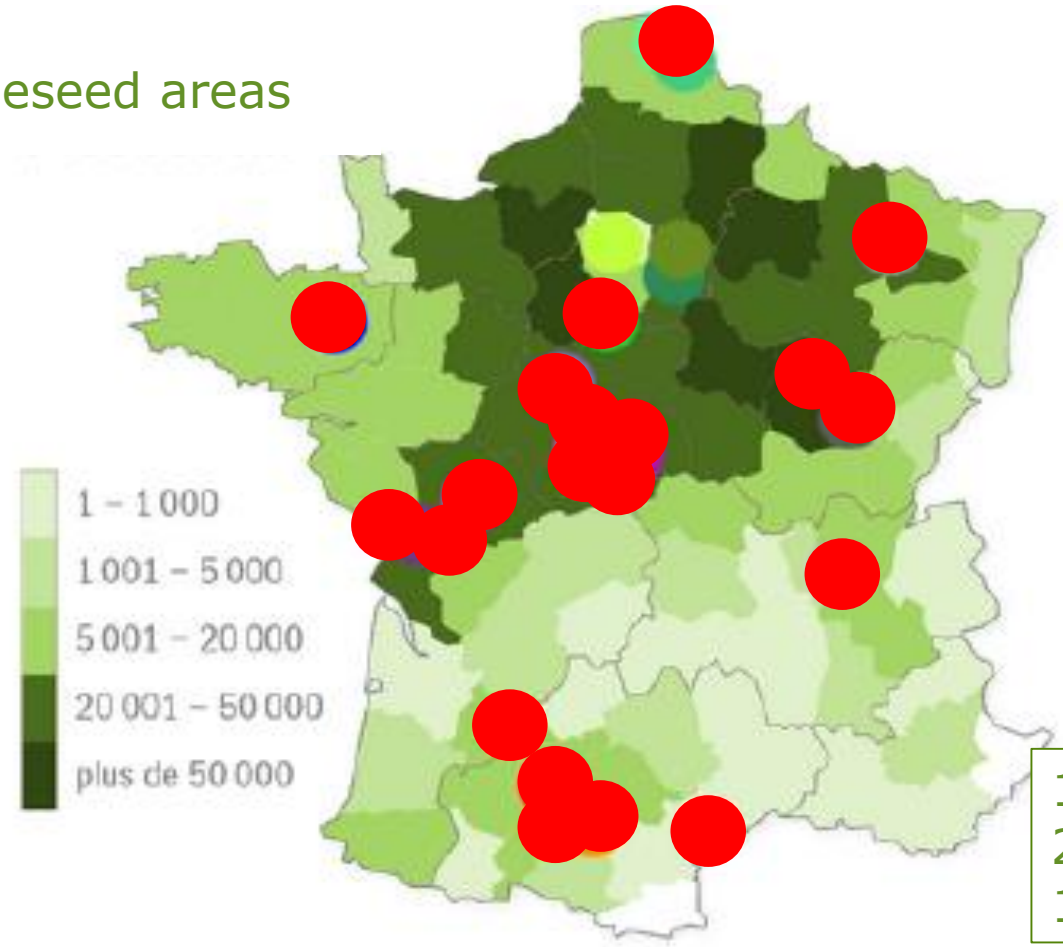
Data

Location of the 48 experiments (32 different locations)

Rapeseed areas



12 superficial soil (<60 cm)
25 median soil (60-100 cm)
11 deep soil (>100 cm)

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AZODYN-rapeseed dynamical crop model

Daily climate data

Management practices

Aboveground biomass (and dead leaves)
N Plant content
Water N and light stress
Phenological stages

Water and N contents / root depth

Soil characteristics

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Method : to classify the experiments

We define 2 classes

- situations with irregular climate event
- situations without irregular climate events

We computed total rainfall for 5 periods (a couple of months)

September – October / November – December

January – February / March – April / May - June

For the current year and the average of the last 20 years

We compute the relative difference (%)

If the difference is lower than 50% or higher than 200%

⇒ It is an irregular climate event

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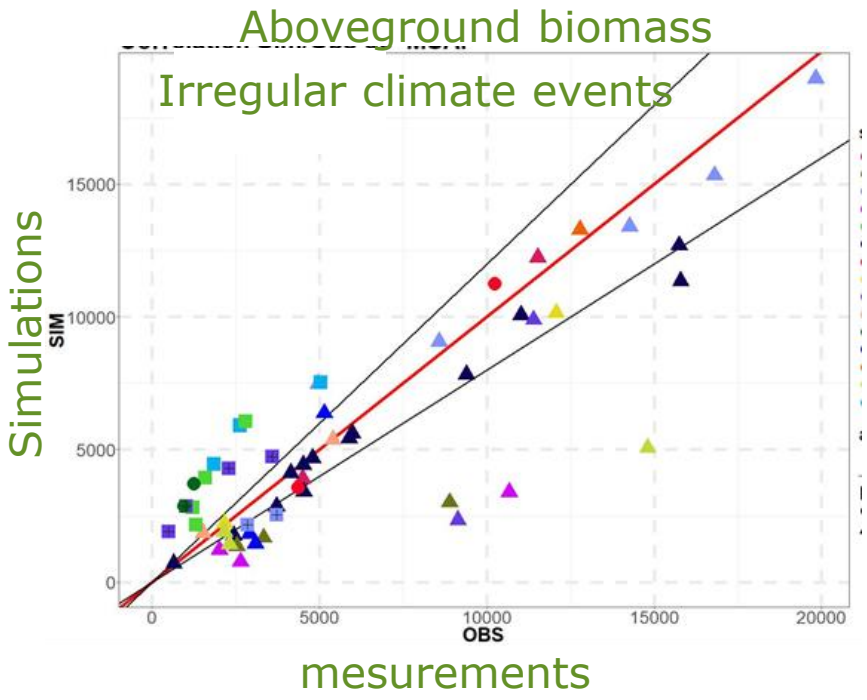
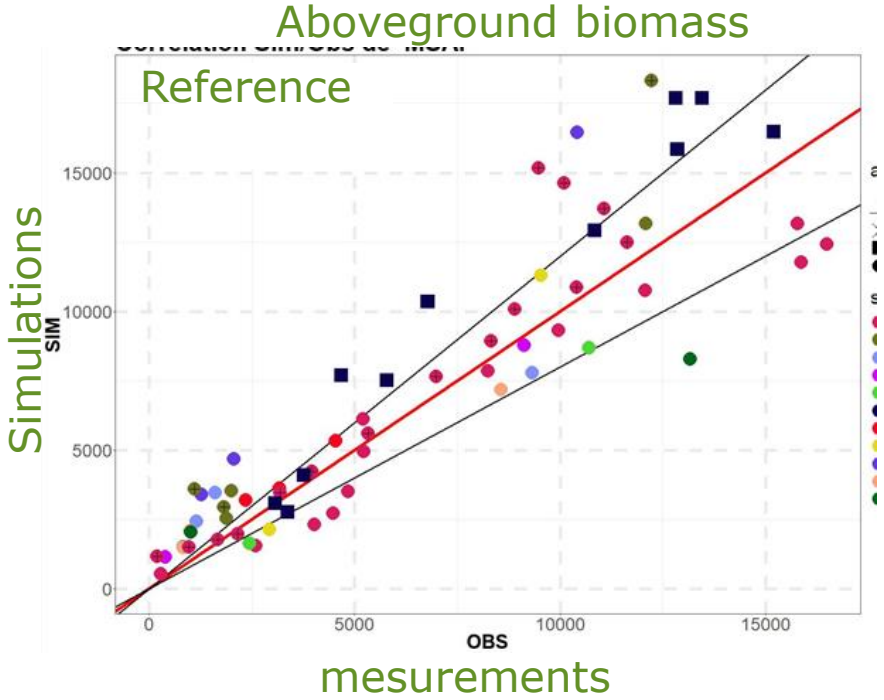
Results

- 21 experiments without irregular climate events (Reference)
- 27 experiments with irregular climate events

We compared the model performance

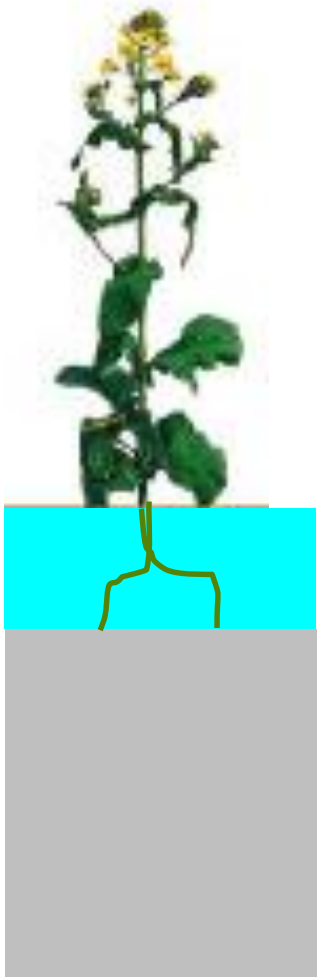




- Model performance is quite similar in the situations with irregular climate events than other situations
- 3 situations with calcareous soil and severe droughts in spring are underestimated

Calcareous soils

AZODYN

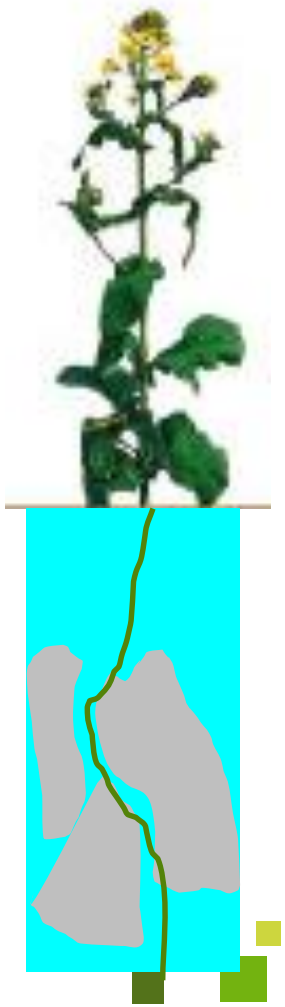


In the model rocks are continous, root cannot explore the underlying bedrock

In the real life, the underlying bedrock is fissured, roots can explore

We improve the model by replacing the soil module by 10-layers soils module

In the real life



Use AZODYN-model to identify and quantify to the main abiotic stresses occurring in a multi-environment trials

We combine data from AZODYN outputs and climate data

Climate data
Temperature
Rainfall,
Radiation

AZODYN-rapeseed outputs

Nitrogen Nutrition Index

Mean computed by each phenological stage

Statistical methods (Partial Least Square)
Observed Yield = function of selected variables

If you want more details I invite you to my poster 421

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Conclusion and perspectives

Conclusions

- The model performance is quite similar for the simulations with irregular climate than others situations. It is possible to study the impact of climate climate change on abiotic stress with this model
- The model AZODYN-rapeseed cannot be used where the soil is calcareous (>10%)

Perspectives

- to better characterise the irregular climate events with a projet with climate scientists
- to replace the soil module by 10-layers soil module
- to assimilate data (biomass or plant N content) in the model at the end of winter to improve the model

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