2.3 Meteo & irrigation

FROGS (French Refinement Of Groundwater Scenarios)
UIPP Training

Paris, 22-23 January 2015

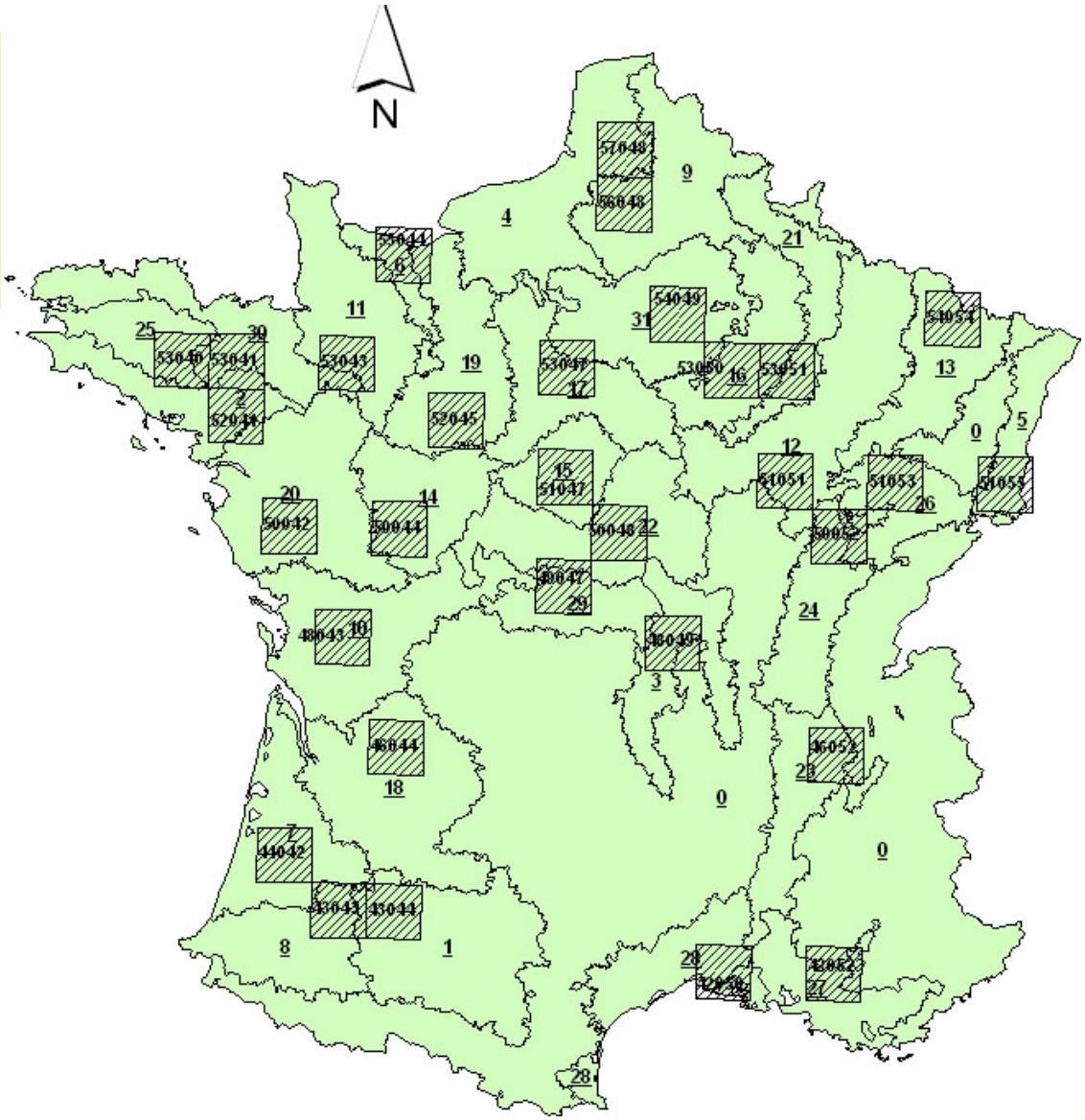
UIPP Environmental Methodology Working Group

Meteo data

Sélection of meteorological data

- Aim
  - For each AU, one MARS tile was selected to represent the meteorological conditions within the AU
  - MARS is commonly accepted in EU
  - Consists of tiles 50 x 50 km and covers most of Europe
- Methodology
  - The MARS tile with the largest agricultural occupation within the AU
  - Implementation of a checking process to verify if there were no obvious reasons to choose another tile

Selection of most representative tile for each AU



- **One data set per AU (representing max of target area)**

Implementation of weather data in Pearl

MARS database downloaded in 2008

- Parameters available for the period 1975-2006
- For the scenario: use of the years 1981-2006 (26 years)

Value	Description
MAXIMUM_TEMPERATURE	maximum temperature (°C)
MINIMUM_TEMPERATURE	minimum temperature (°C)
VAPOUR_PRESSURE	mean daily vapour pressure (hPa)
WINDSPEED	mean daily windspeed at 10m (m/s)
RAINFALL	mean daily rainfall (mm)
E0	Penman potential evaporation from a free water surface (mm/d)
ES0	Penman potential evaporation from a moist bare soil surface (mm/d)
ET0	Penman potential transpiration from a crop canopy (mm/d)
CALCULATED_RADIATION	daily global radiation (kJ/m^2/d)

Implementation of weather data in Pearl

- Correspondance between MARS available data and Pearl needed input
  - ETPref calculated outside Pearl according to FAO approach from MARS data (details in FOCUS GW 2, p 533)

Table 18 Required daily PEARL input data and the corresponding MARS data

PEARL Input	MARS Parameter
Daily global radiation (kJ/m^2/d), between 0 and 5 E6	CALCULATED_RADIATION
Minimum daily temperature (°C), between -50 and 35	MINIMUM_TEMPERATURE
Maximum daily temperature (°C), between -30 and 60	MAXIMUM_TEMPERATURE
Average vapor pressure (kPa), between 0 and 10	VAPOUR_PRESSURE / 10
Average windspeed (m/s), between 0 and 50	WINDSPEED
Daily precipitation (mm/d), between 0 and 1000	RAINFALL
Reference evapotranspiration (mm/d), between 0 and 100	calculated based on FAO approach (see text)

Adjustments of MARS data for SWAP

- SWAP (hydrology module in PEARL:
  - In earlier version of FROGS, SWAP failed in some situations characterised by high rainfall leading to 9 scenarios not included in the risk assessment
  - New SWAP version in FROGS 3.3.3.3, no failure

Irrigation

Stepwise approach

- The methodology to implement irrigation followed a stepwise approach

1 – Collection of irrigated surface for each crop included in FROGS from the “Recensement Agricole” (Agreste, 2001)

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2- Selection of the main irrigated crops

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3- For each selected crop, determination of the Agronomic Unit where irrigation is significant (irrigation > x% of the total crop in the AU and > y ha)

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4- Collection of irrigation practices for the selected crops and AU

1 – Collection of irrigated surface for each crop included in FROGS (Agreste, 2001)

- Total irrigated acreage of crops included in FROGS

Table 24 Irrigation acreage from Agreste (2001)

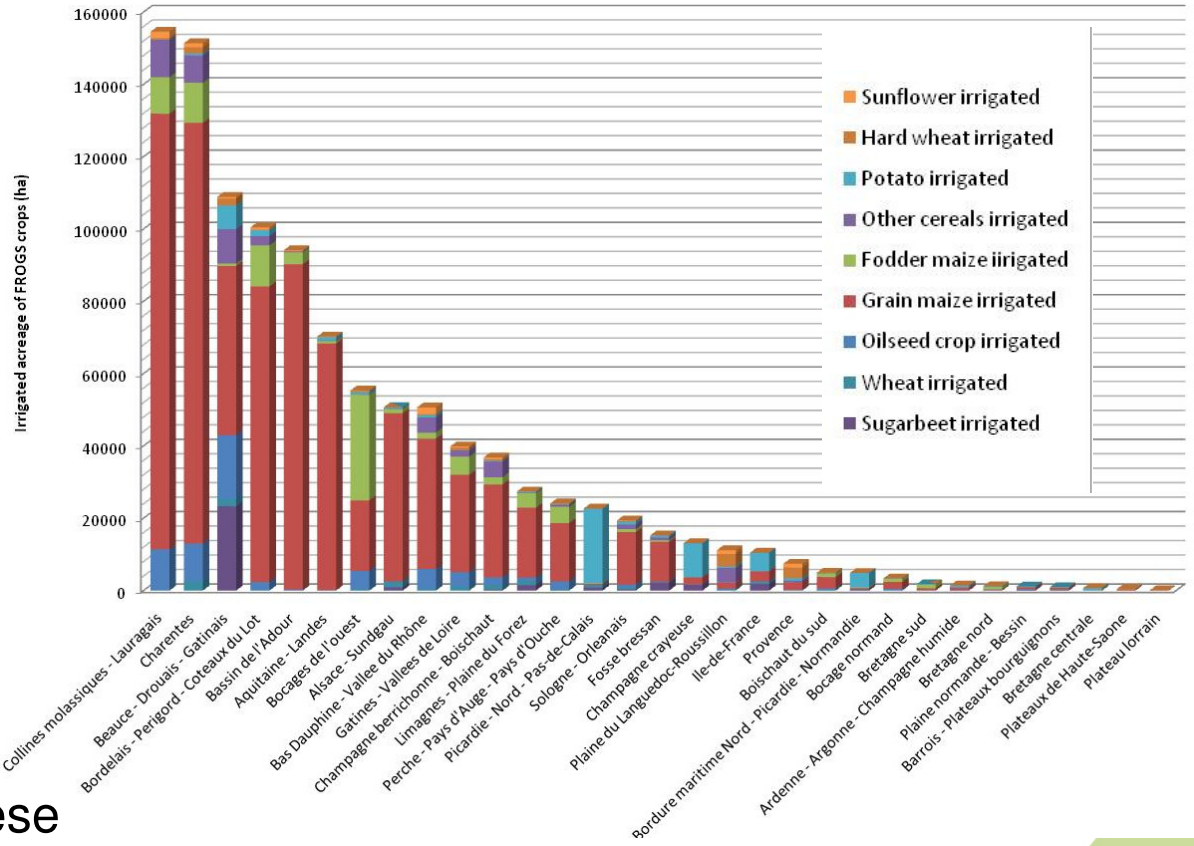
	Acreage (ha)	Acreage (% of FROGS crops irrigated)	Cumulative acreage (% of FROGS crops irrigated)
Total FROGS crop irrigated	1151375	-	
Irrigated Grain maize	780952	67.8	67.8
Irrigated Fodder maize	105085	9.1	77.0
Sum of oilseed crops irrigated (a)	66774	5.8	82.8
Sum of other irrigated cereals (b)	63831	5.5	88.3
Irrigated potato	56424	4.9	93.2
Irrigated sugarbeet	34257	3.0	96.2
Irrigated Hard wheat	17378	1.5	97.7
Irrigated wheat	15182	1.3	99.0
Irrigated Sunflower	11492	1.0	100.0

(a) including oilseed rape
(b) including barley

2- Selection of the main irrigated crops

- Maize is clearly the main irrigated crop for most of the AU
- Potatoes and Sugar Beet can also be important in some AU

- Grain maize + Fodder Maize + Sugar beet + Potatoes = 84.8% of irrigated crops included in FROGS



Implementation of irrigation on these crops only, applied directly to the soil surface

3- Determination of relevant AU to implement irrigation

- Irrigation varies among the AU
  - Pedo-climatic differences
  - Local water policies
- Implementation of irrigation in FROGS
  - Represents these differences
  - Avoid including irrigation where it is not a standard practice
- Selection of the relevant AU
  - Ratio of irrigated crop surface to the total acreage of the crops > 20%
  - Total irrigated crops covers more than 1000 ha within the AU
  - Presence of the crop in the crop rotation of the AU

4 - Irrigation practices

- Number of irrigation events and amount of water applied available in Agreste (2006) and Golaz (2006).
- First irrigation date set for each crop based on expert judgement and external documents (Arvalis et Chambre agriculture Somme).
- Interval between 2 irrigations calculated considering 8 weeks of irrigation for maize and 6 for potatoes, and the number of irrigation events
- Amount of water/event calculated based on total amount from Agreste and number of events

Implementation of irrigation in FROGS

- Irrigation schedules for the relevant crop/AU combination included in the FROGS database
- In FROGS, irrigation water is applied directly to the soil surface (as in standard FOCUS simulations)
- Relevant irrigation scheme considered in the generation of pre-run SWAP sol hydrology (*.bfo files)

Thank you very much for your kind attention.