



**2.5 Update of FROGS and adaptation  
to PEARL 4.4.4 and  
FOCUS groundwater II guidance**

**FROGS (French Refinement Of Groundwater Scenarios)  
UIPP Training**

**Paris, 22-23 January 2015**

**UIPP Environmental Methodology Working Group**



- I. Inclusion of PEARL 4.4.4 and its new hydrologic model version of SWAP 3.2.34**
- II. Adaptations to the FOCUS gw II guidance implemented in FROGS 3.3.3.3**
- III. Additional updates implemented in FROGS 3.3.3.3**
- IV. Impact of changes in comparison to results obtained with FROGS 2.2.2.2**



- FROGS 3.3.3.3 generates input files for Pearl 4.4.4.
- New bfo files have been generated due to the new version of the soil hydrologic model SWAP (v. 3234) employed in Pearl 4.4.4
- Splitting of rainfall due to problems with the earlier version of the hydrologic model SWAP integrated in PEARL 3.3.3 (SWAP 2.09e) and therefore also in FROGS 2.2.2.2 was withdrawn.
- Eleven 4-year crop rotations that had been reduced to 3-year rotations in earlier versions of FROGS due to simulation time restriction in the former SWAP version were reintegrated as the new SWAP 3234 is capable to run 86 years of simulation time.



Implementation of changes as recommended by FOCUS (2009):

- The calculation of the temporal 80<sup>th</sup> percentile and spatial 80<sup>th</sup> percentile were updated to reflect FOCUS (2009) methodology.
- FAO method to calculate reference evapotranspiration was included.
- Crop factors needed for the calculation of actual evapotranspiration were updated.
- Irrigation was not touched since the FROGS irrigation is based on agronomic evidence in France.



- The methodology to estimate scenarios surfaces (i.e., soil-AU-crop combination) has been revised.
- The crop statistics have been updated with the 2010 agricultural survey data. As a consequence, two new crop rotations were included.
- Update of Microsoft Excel® template *FROGS\_Template\_Mitigation\_v2.xls* to include top soil pH as a potential mitigation option

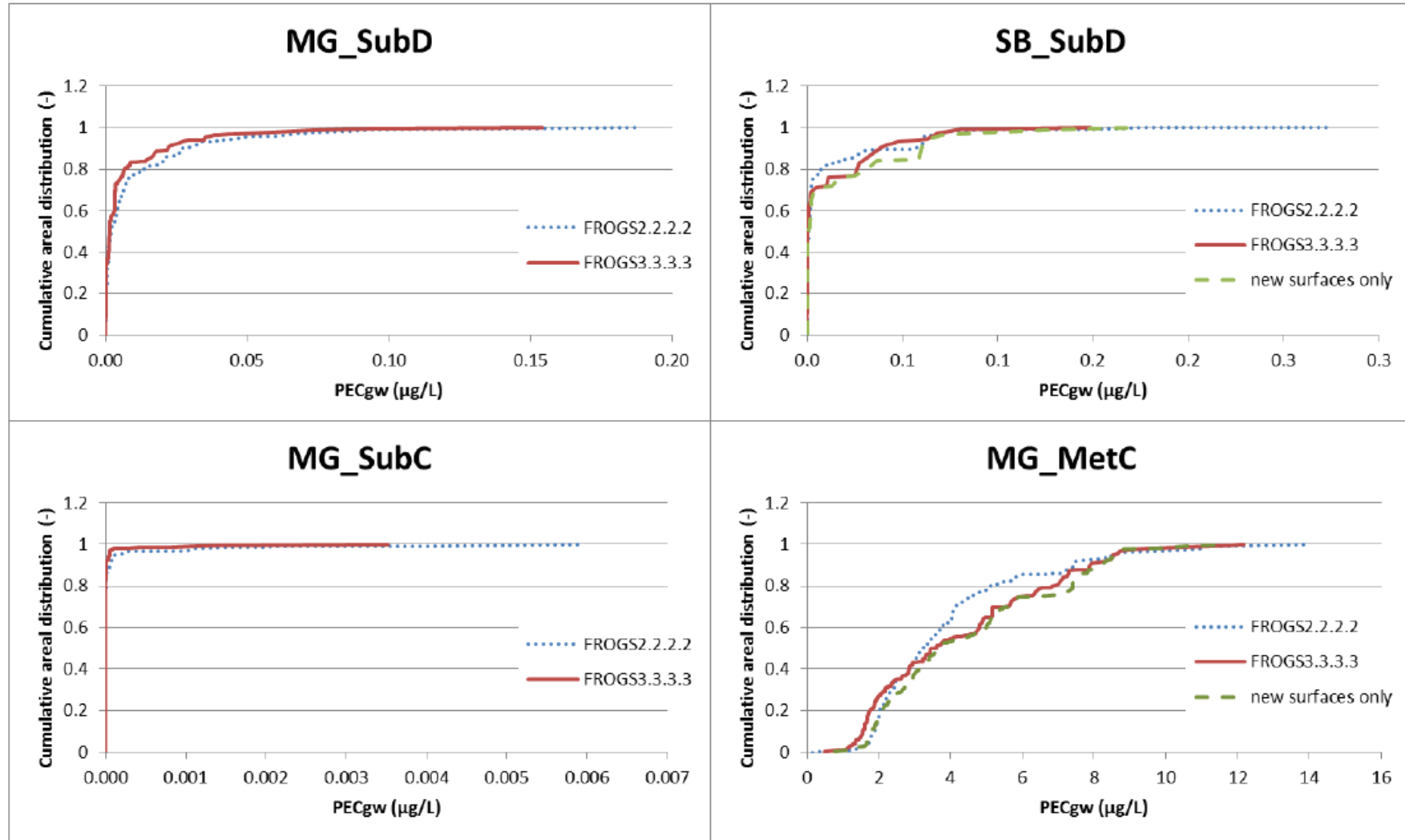


Figure 1: Cumulative areal distribution of PEC<sub>gw</sub> for some selected combinations of crops (MG, SB) and Compounds (FOCUS Dummy substances C, D, and Metabolite of C).

**Table 2: FROGS 3.3.3.3 vs FROGS 2.2.2.2 results**

		overall 90 <sup>th</sup> percentile PEC <sub>gw</sub> (µg/L)		
	FROGS	Dummy C	Dummy C met.	Dummy D
SB	2.2.2.2	1.444E-07	3.760	0.0077
	3.3.3.3	3.855E-05	5.006	0.0262
WW	2.2.2.2	1.452E-05	6.178	0.0825
	3.3.3.3	4.945E-05	7.312	0.1010
OSR	2.2.2.2	2.014E-05	4.234	0.0393
	3.3.3.3	1.826E-06	3.949	0.0278
MF	2.2.2.2	4.126E-07	4.452	0.0077
	3.3.3.3	6.614E-08	3.877	0.0033
MG	2.2.2.2	1.337E-06	5.129	0.0130
	3.3.3.3	1.544E-07	6.891	0.0068
WB	2.2.2.2	2.167E-05	7.432	0.1150
	3.3.3.3	3.367E-05	7.548	0.0861
PO	2.2.2.2	5.300E-06	3.326	0.0112
	3.3.3.3	3.668E-06	3.546	0.0143
SF	2.2.2.2	1.162E-06	3.921	0.0095
	3.3.3.3	3.900E-06	3.238	0.0079

**Legend:** SB: Sugar Beet; WW: Winter Wheat; OSR: Winter Oilseedrape; MF: Fodder Maize  
 MG: Grain Maize; WB: Winter Barley; PO: Potato; SF: Sunflower

higher overall 90<sup>th</sup> percentile in FROGS 3.3.3.3

lower overall 90<sup>th</sup> percentile in FROGS 3.3.3.3

SB – sugar beet  
 WW – winter wheat  
 OSR – oilseed rape  
 MF – fodder maize  
 MG – grain maize  
 WB – winter barley  
 PO – potato  
 SF – sunflower



Thank you very much for your kind attention.