DEVELOPING GROUNDWATER SCENARIOS FOR NORTHERN CHINA AND COMPARISON OF THEIR VULNERABILITY WITH FOCUS GROUNDWATER SCENARIOS

G Fait[1], M ter Horst[1], J Boesten[1], W Li[2], C Tao[3].

[1] Alterra, Wageningen UR; [2] CAAS; [3] ICAMA

ALTERRA
WAGENINGEN UR

Introduction

- Groundwater: important resource to be protected against pesticide contamination
- in Europe
  - leaching assessment based on the 0.1 µg/L criterion
  - environmental fate modelling → essential part of the risk assessment supporting pesticide registration
  - in 2000 FOCUS groundwater working group defined 9 standardised realistic worst-case scenarios (improved in 2009)
- in China
  - leaching assessment based on human toxicological criteria
  - PERAP project - cooperation with Chinese regulatory authority (ICAMA)
  - in 2010 standard scenarios developed within the PERAP project

Aim

compare the vulnerability of the Chinese and European scenarios

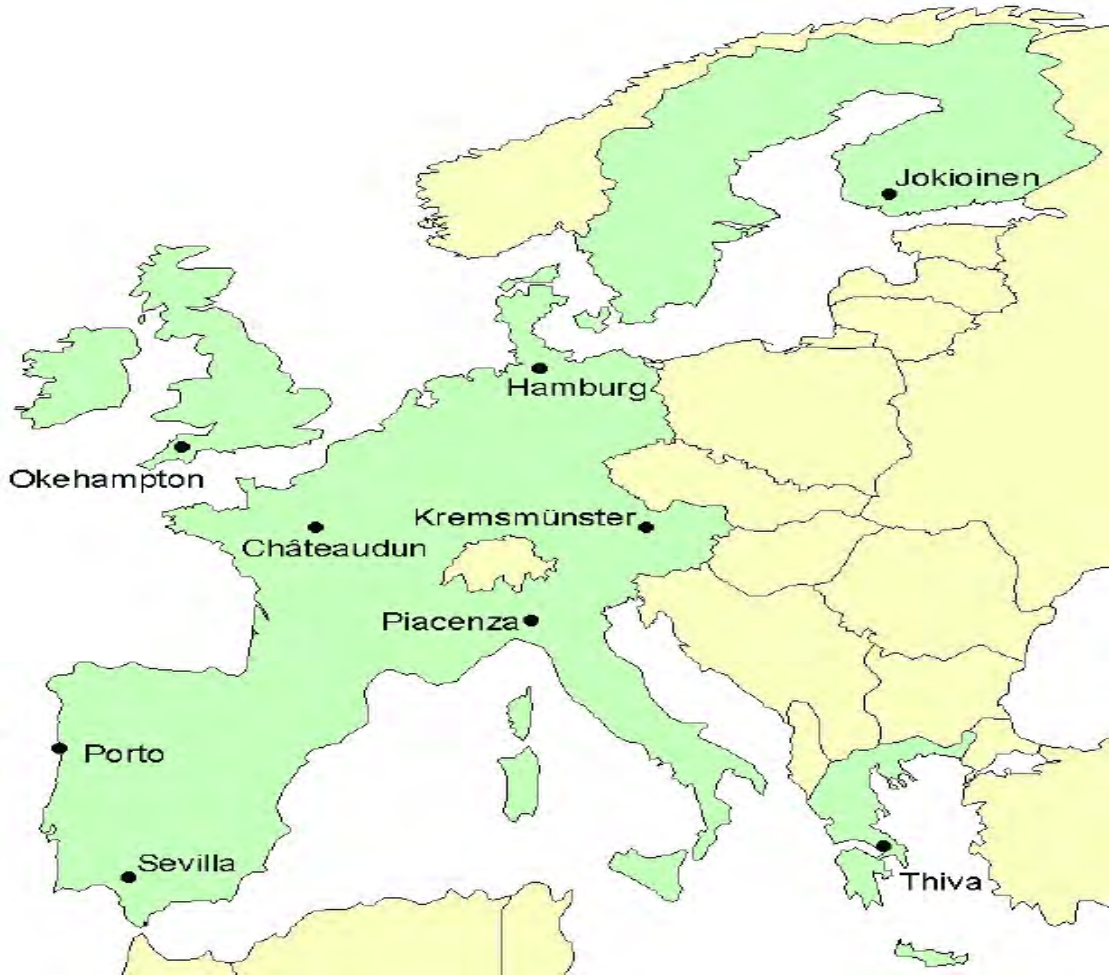
HOW

comparing leaching concentrations of Chinese and European scenarios calculated as a function of the half-life in soil at reference temperature (DegT50, d) and the coefficient of sorption on organic matter (K_{OM}, L/kg).

Scenario development - Europe

- 2000: FOCUS groundwater WG
  - information on temperature, rainfall, land use, etc… → 9 locations representing major European agricultural areas
  - Overall vulnerability of the 90th percentile of all possible situations → 80th percentile value for soil: selected by expert judgement
    → 80th percentile for weather: performing simulations using multi-year weather data
  - Definition of 9 standardised realistic worst-case scenarios

Scenario development - Europe



Scenario development - Europe

- 2009: improvements of the scenarios
  - new soil profiles for Porto and Piacenza
  - new irrigation schedule
  - harmonisation among models
  - same dispersion lenght for all models
  - runoff eliminated
  - new crop factors
  - new evapotranspiration factors
  - etc...

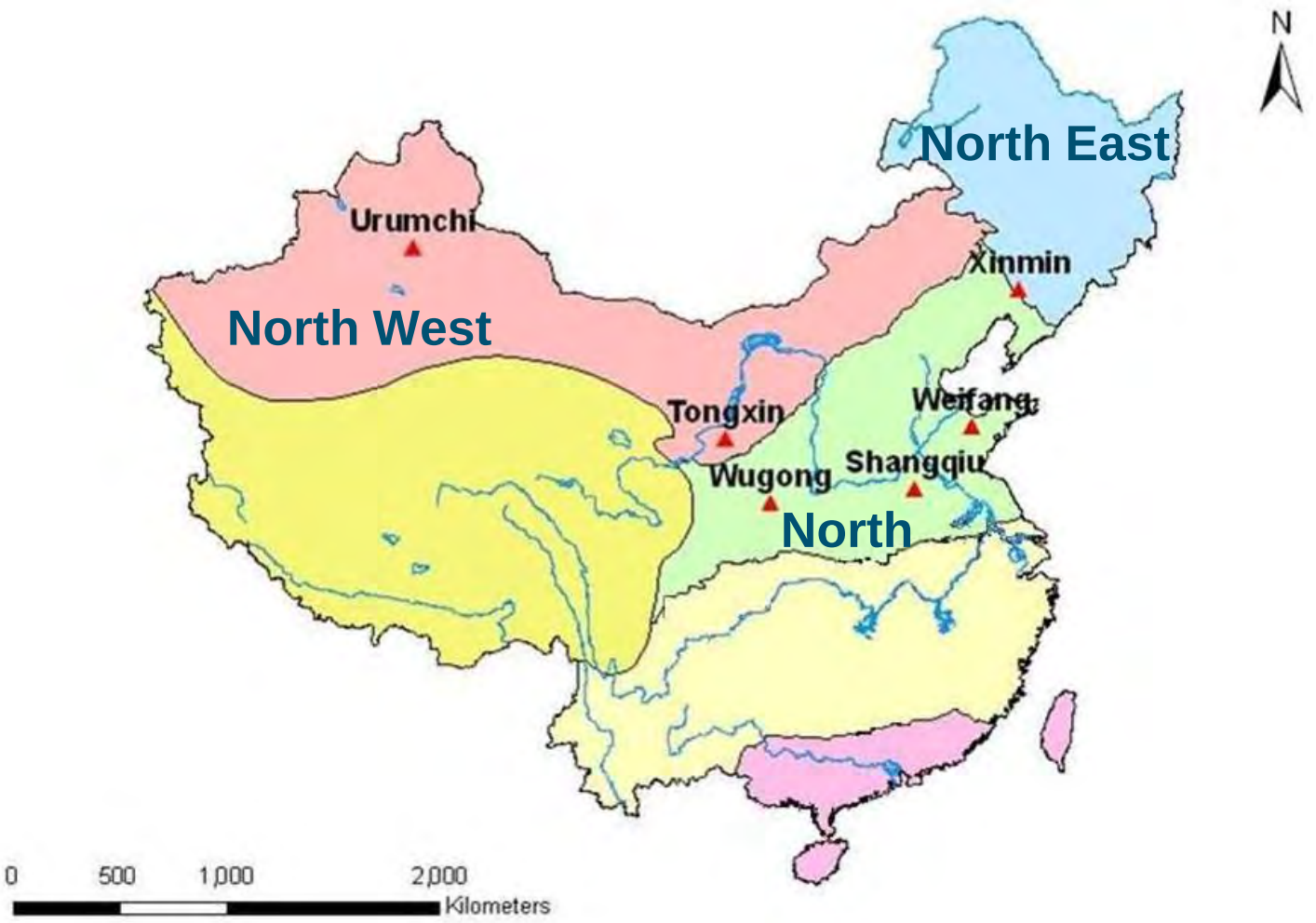
Scenario development - China

- PERAP (Pesticide Environmental Risk Assessment Project)

→ scenarios for dry land farming system

- Maps of annual average precipitation and temperature → 3 climatic zones: North, North East and North West
- Overall vulnerability of the 99th percentile of all possible situations → 90th percentile for soil: selected from organic matter map
  → 90th percentile for weather: performing simulations using multi-year weather data.
- 6 locations that represented the overall vulnerability were selected

Scenario development - China



Main risk management differences

	EUROPE	CHINA
Overall vulnerability	90th	99th
leaching assessment	PPPs concentration <0.1 µg/L	human toxicological criteria (2-30 µg/L)

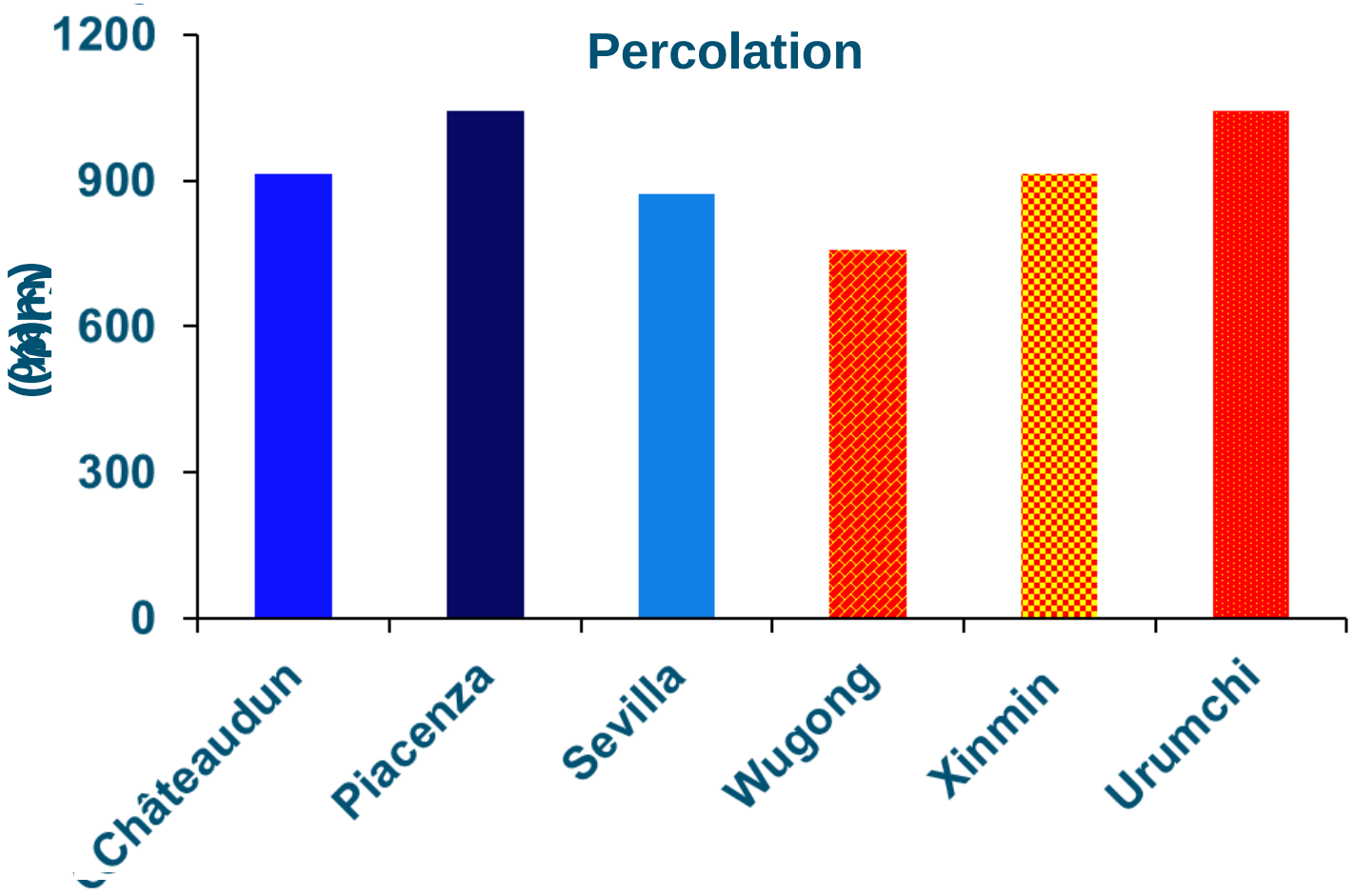
Set up of the calculations

- Application: annual, 1 kg/ha, the day before emergence
- Pesticide properties other than DegT50 K_{OM}: FOCUS substance A (non-volatile substance)
- Model: FOCUS_PEARL_4.4.4 for EU, ChinaPEARL_1.1.1 for China
- Crop: maize
- Irrigation: once a week on a fixed day, amount based on the soil water content in the root zone
- Select scenario covering full range
  - Europe: Châteaudun, Piacenza, and Sevilla
  - China: Urumchi (NW), Xinmin (NE) and Wugong (N)

Characteristics of the selected scenarios

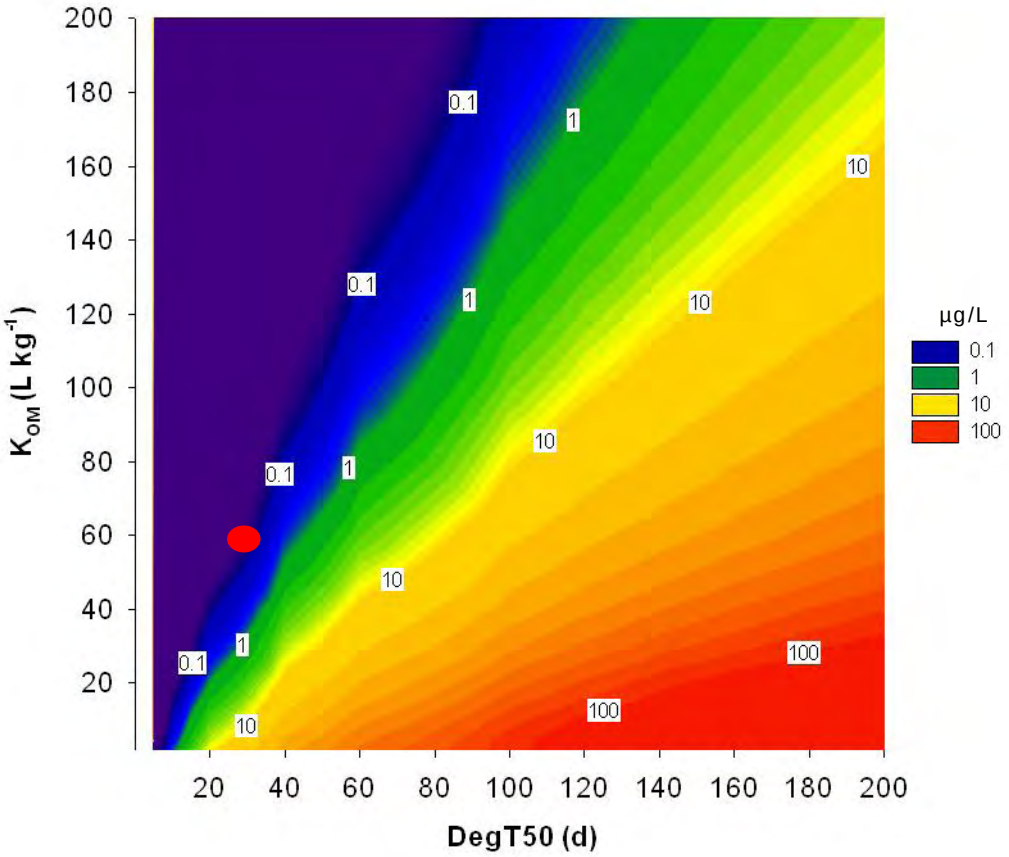
Location	Texture class (USDA) 0-25 cm	Clay (%) 0-25 cm	Organic matter (%) 0-25 cm	Annual average water input (mm) rain+irrigation	Annual average temperature (°C)
Châteaudun	Silty Clay loam	30	2.4	913	11
Piacenza	Loam	15	2.2	1044	13
Sevilla	Silt clay	14	1.6	872	18
Wugong	Silt loam	26	0.6	757	14
Xinmin	Loam	20	1.2	914	9
Urumchi	Silt loam	23	0.6	1043	8

Characteristics of the selected scenarios

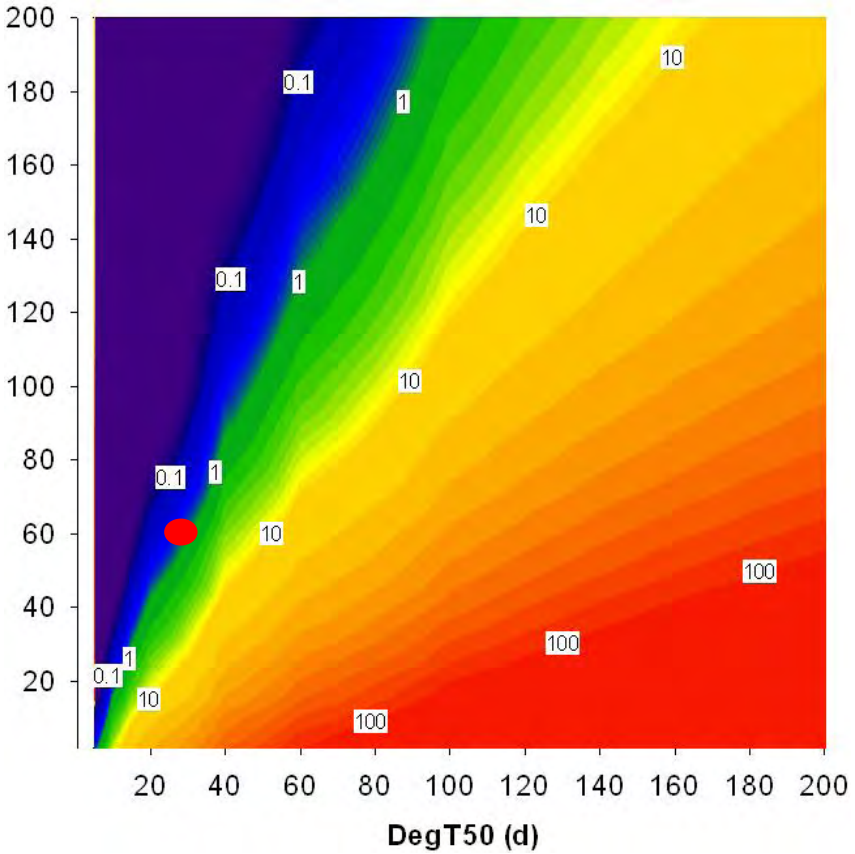


Results

Châteaudun



Xinmin

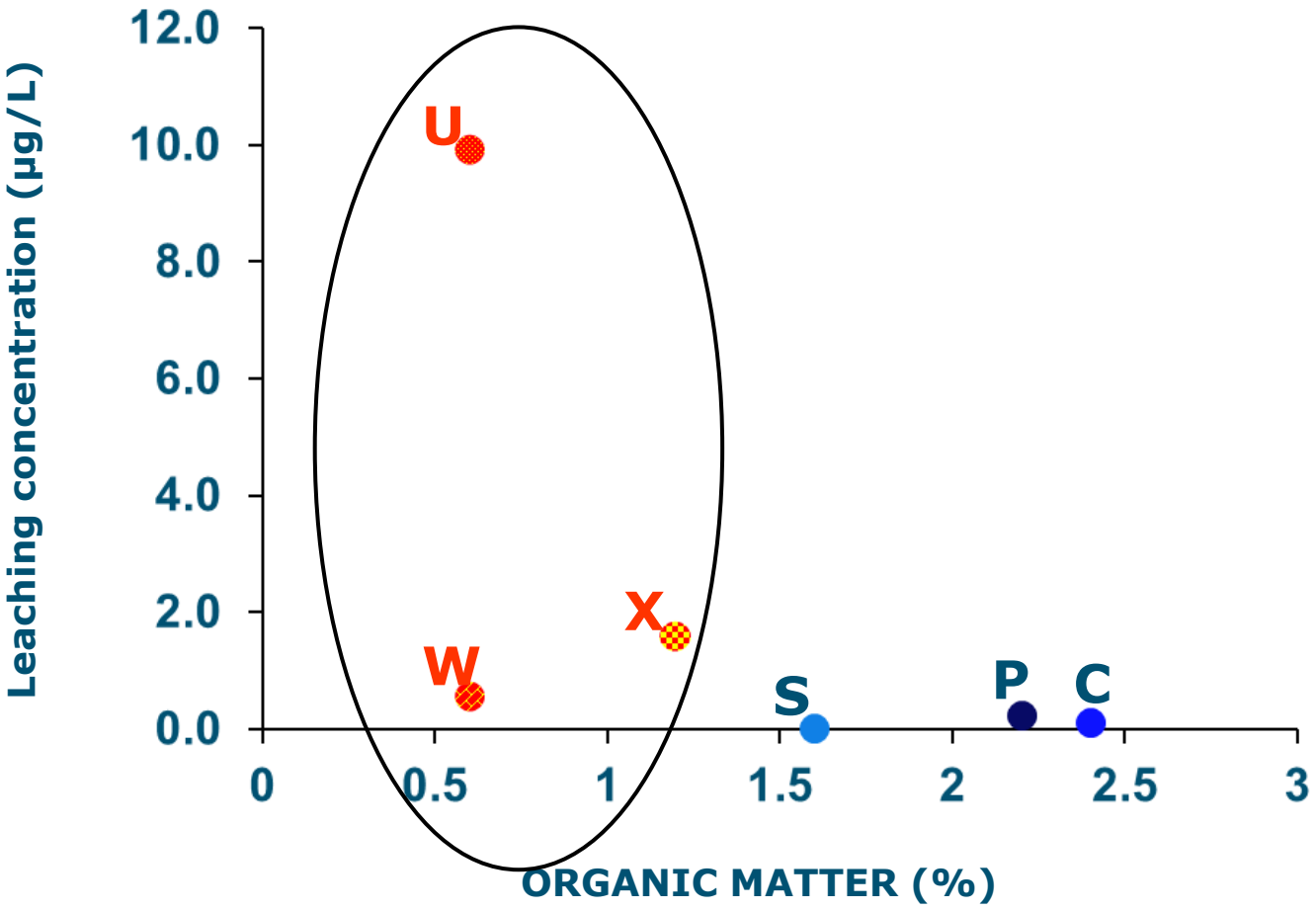


→ **Chinese scenarios more vulnerable to pesticide leaching than the European scenarios**

ALTERRA
WAGENINGEN UR

Results

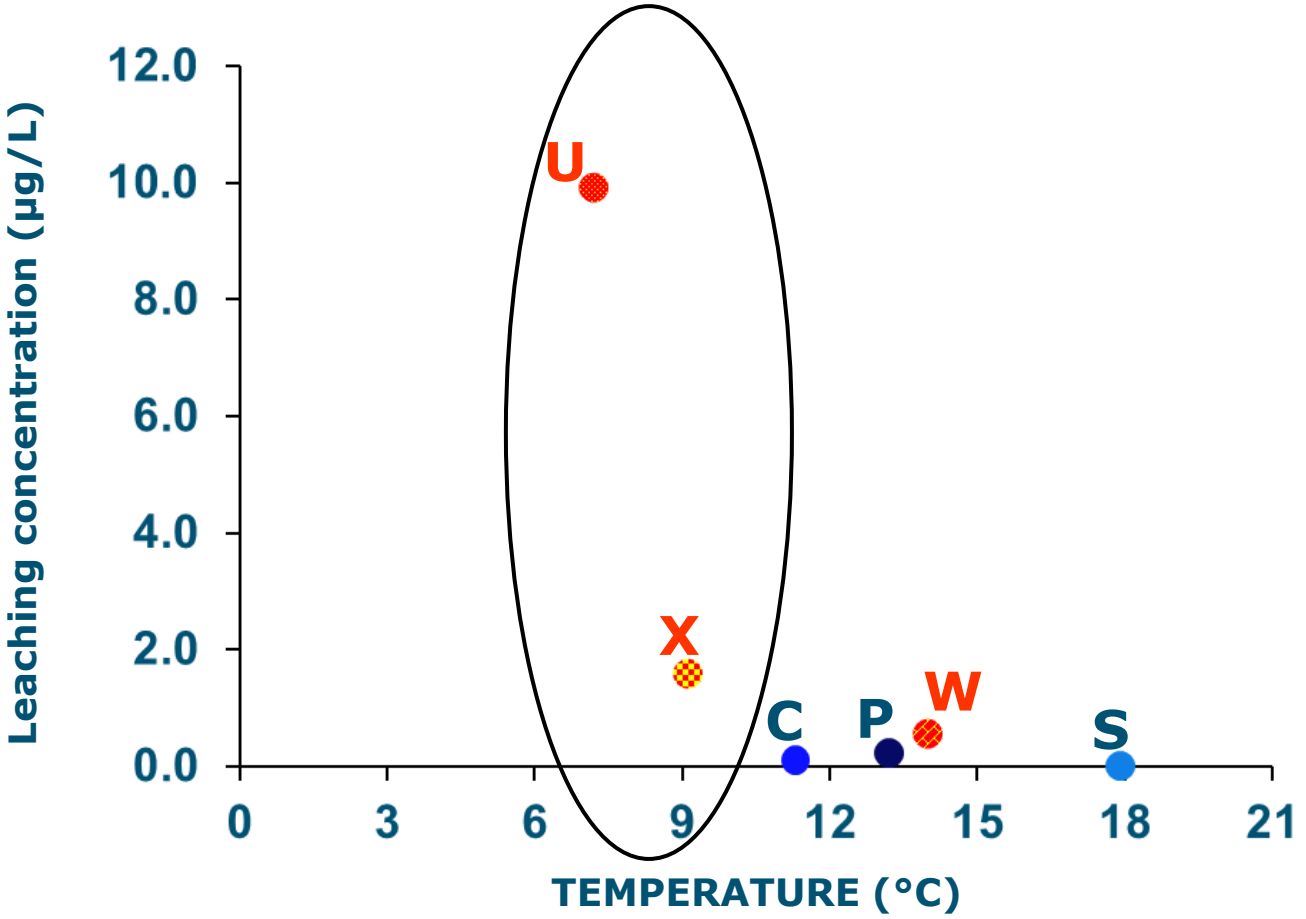
DegT50= 30; K_{OM} = 60



ALTERRA
WAGENINGEN UR

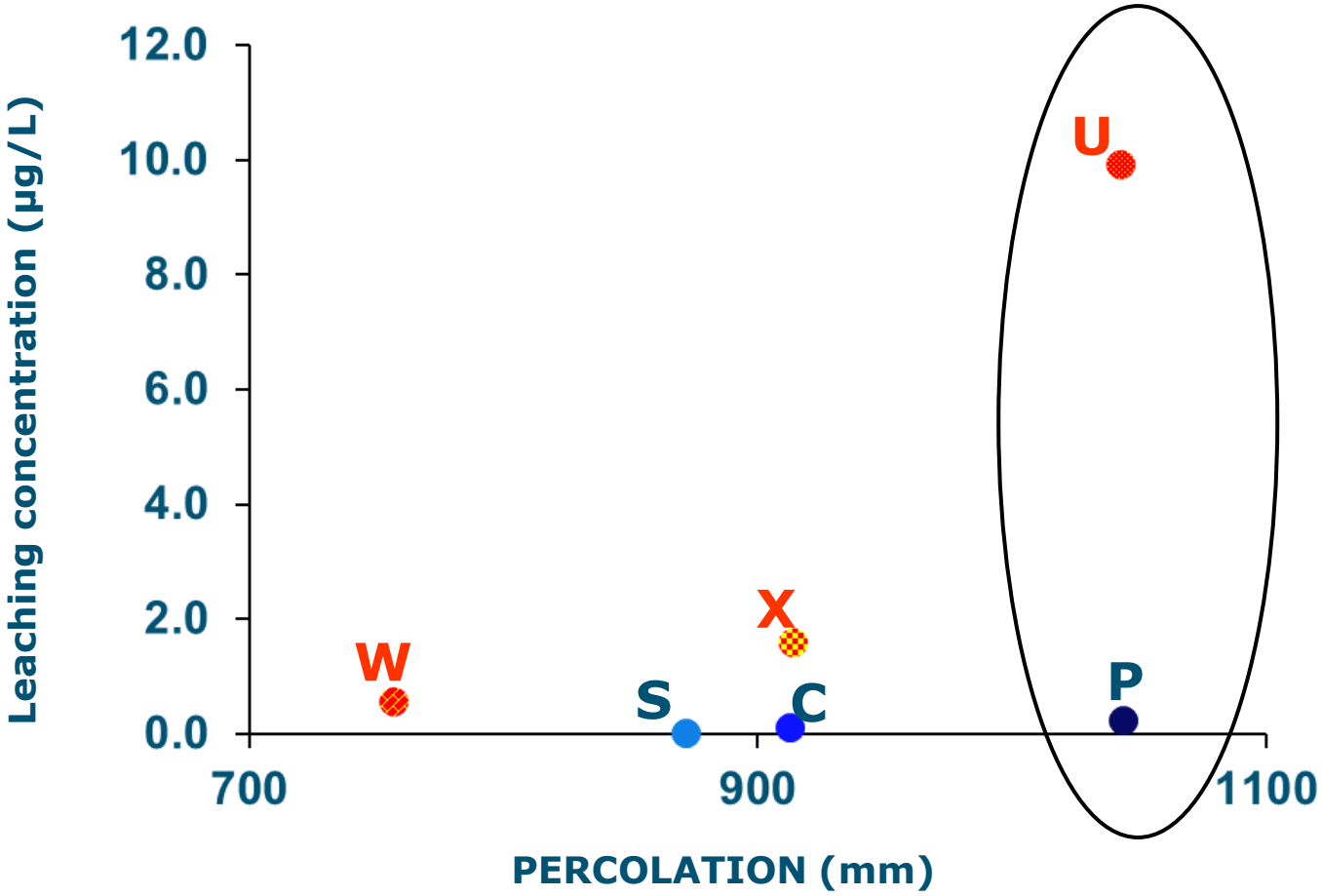
Results

DegT50= 30; K_{OM} = 60



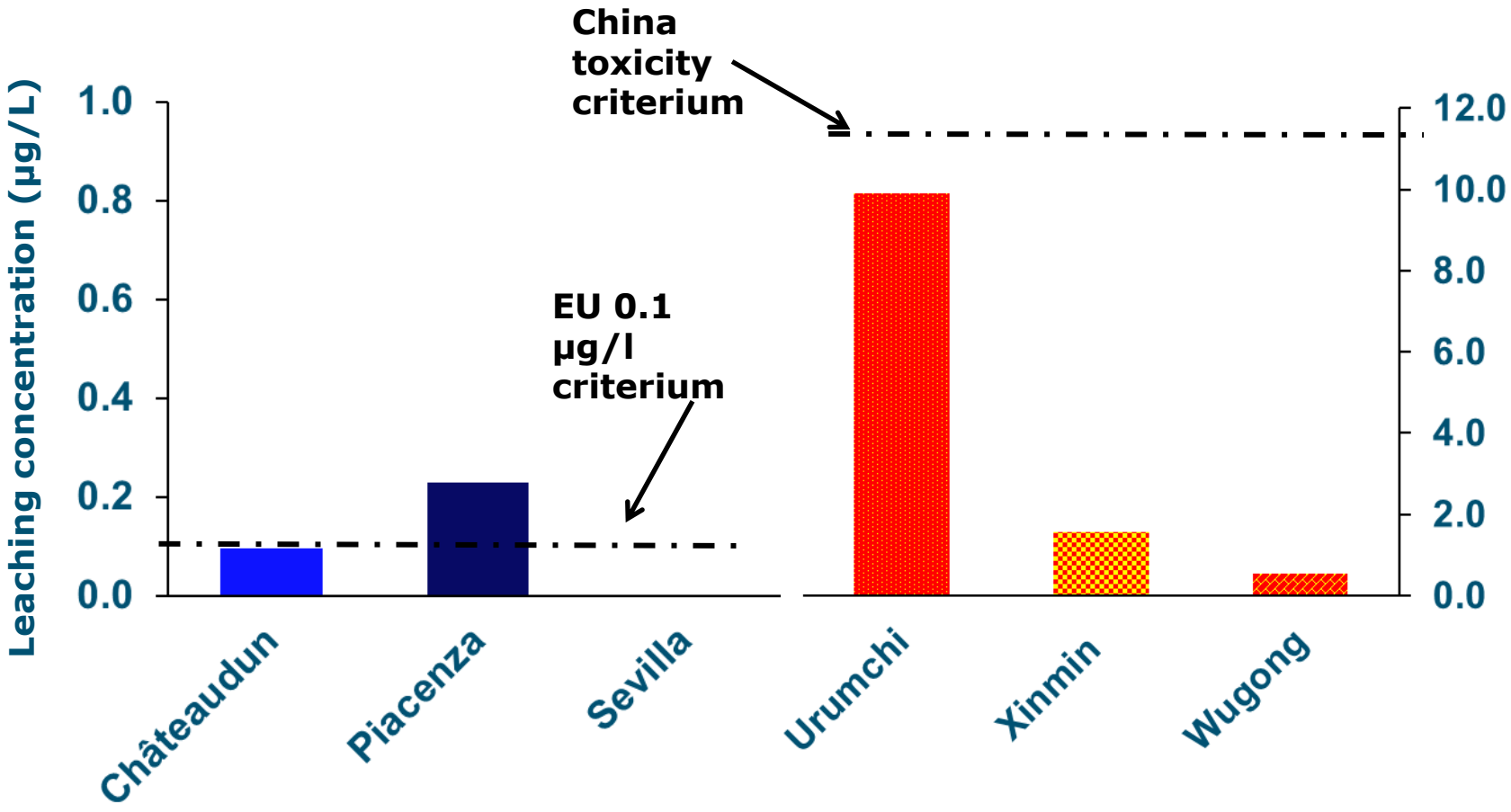
Results

DegT50= 30; K_{OM} = 60



Results

DegT50= 30; K_{OM} = 60



Conclusions

- Chinese scenarios more vulnerable to pesticide leaching than the European scenarios → lower organic matter, lower temperatures
- the higher vulnerability of the Chinese scenarios compensated by the use of human toxicological criteria for Chinese decision making
- usefulness of standard scenarios in order to evaluate the leaching potential of PPPs even among different countries

Thanks for your attention!

gabriella.fait@wur.nl

ALTERRA
WAGENINGEN UR