



# Current Challenges and Future Perspectives for the Soil Erosion Community

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EU SOIL OBSERVATORY  
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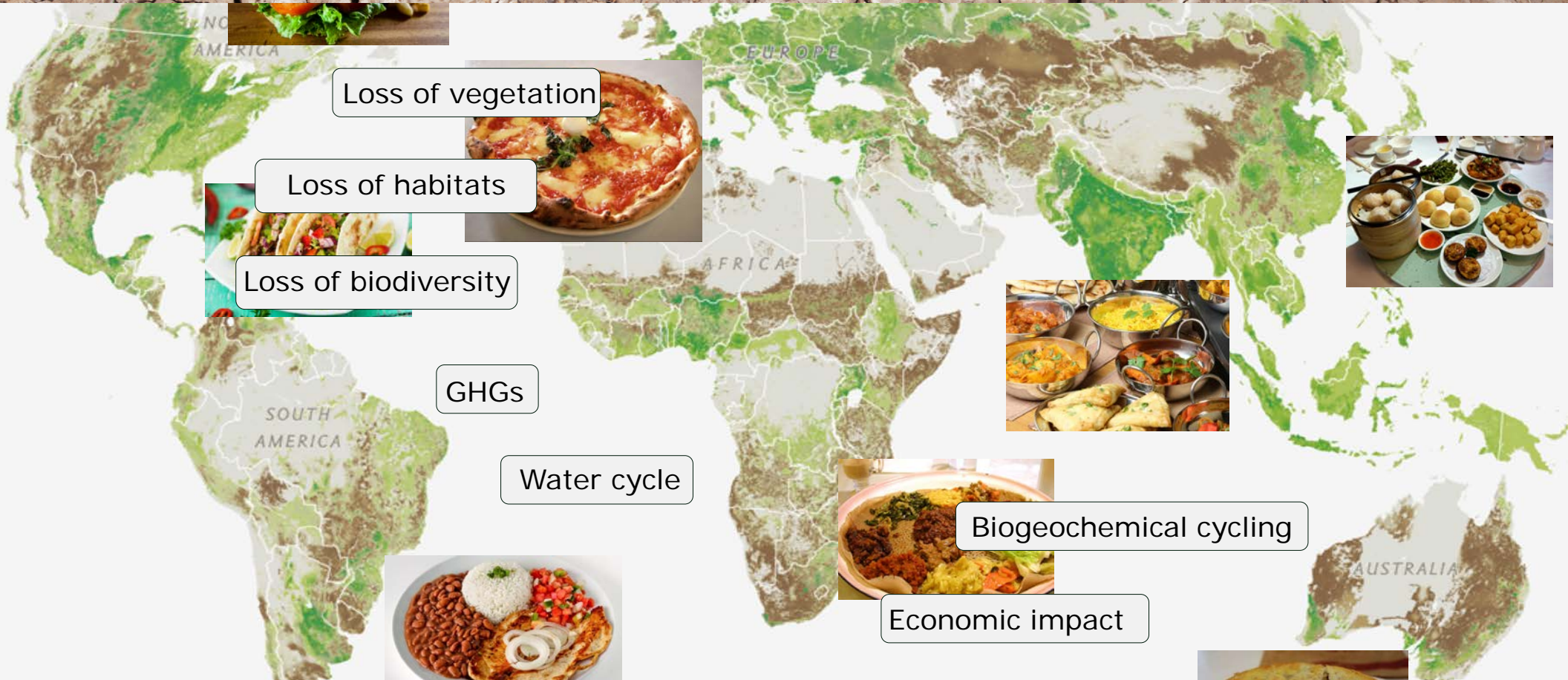




We leave footprints...







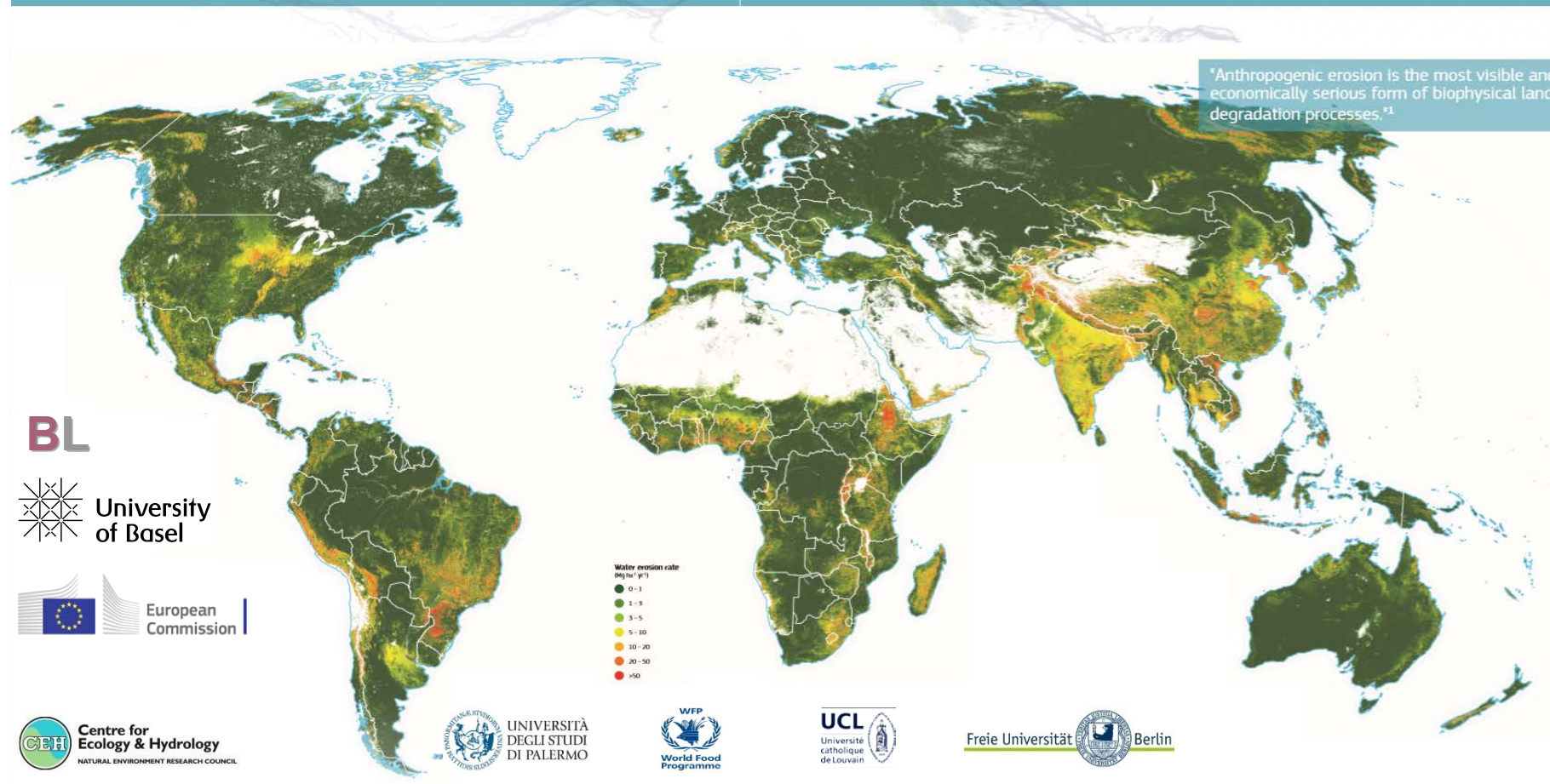
# Soil and land degradation







Global estimates of soil loss due to water erosion



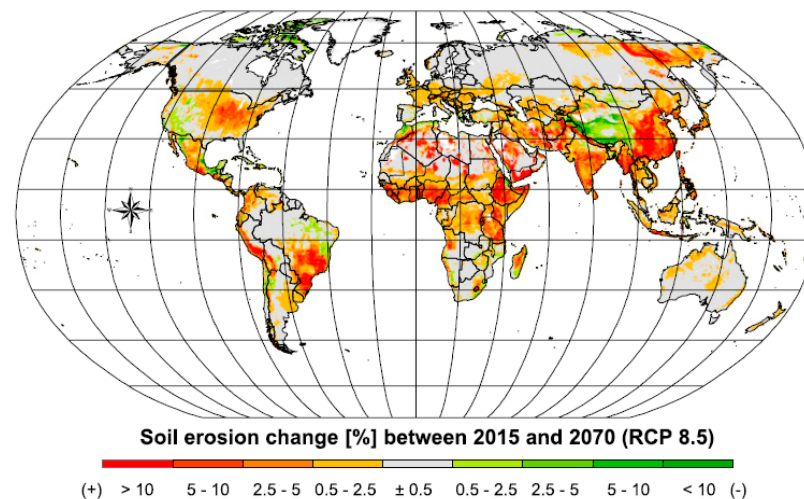
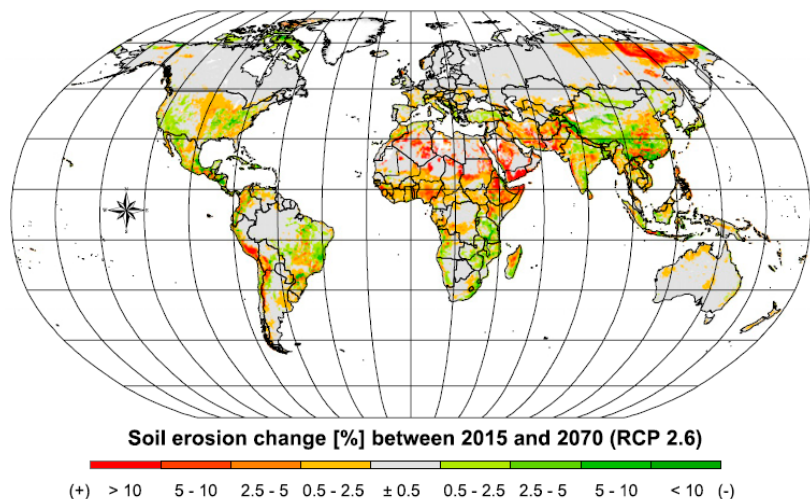
Benchmark for International Reports & Environmental Indicators



# Land use and climate change impacts on global soil erosion by water (2015-2070)

Pasquale Borrelli<sup>a,b,1</sup>, David A. Robinson<sup>c</sup>, Panos Panagos<sup>d</sup>, Emanuele Lugato<sup>d</sup>, Jae E. Yang<sup>b</sup>,  
Christine Alewell<sup>a</sup>, David Wuepper<sup>e</sup>, Luca Montanarella<sup>d</sup>, and Cristiano Ballabio<sup>d</sup>

## 3 Representative Concentration Pathways (2.6, 4.5, 8.5) and 14 General Climate Models



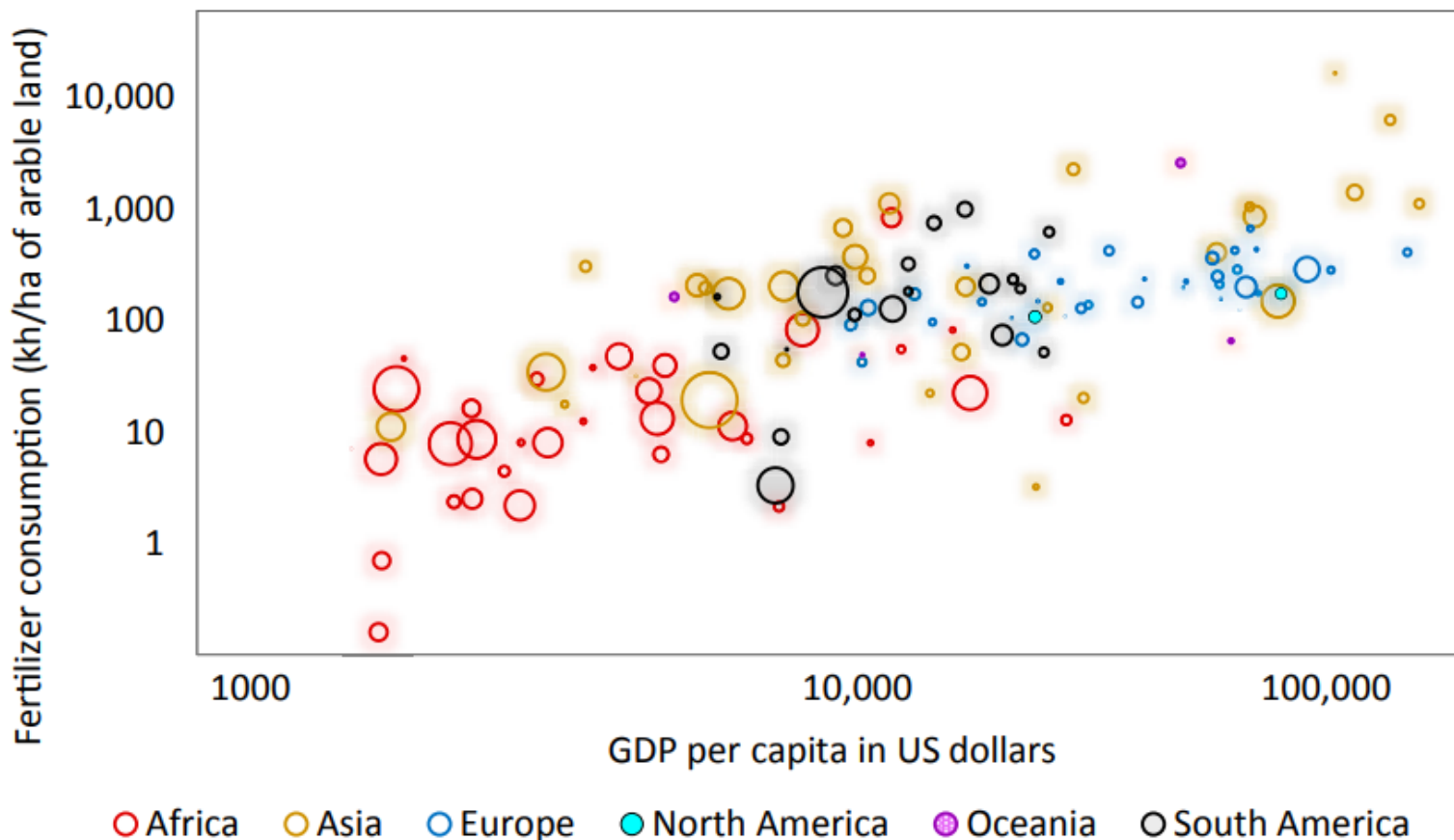
*“Climate projections, for all global dynamics scenarios, indicate a trend, moving toward a more vigorous hydrological cycle, which could increase global water erosion (+30 to +66%)”*

- Sediment fluxes
- Carbon fluxes
- Phosphorus fluxes
- Link to macroeconomic models



# Land use and climate change impacts on global soil erosion by water (2015-2070)

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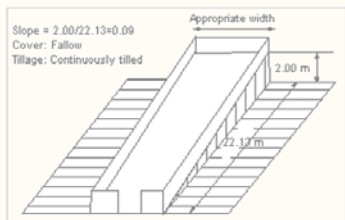


**How can large-scale  
models contribute  
to solve local  
problems?**



# From Field to Large-Scale Modelling and Back

## Object-oriented FARM modelling



(unit plot)



**Field Information:**

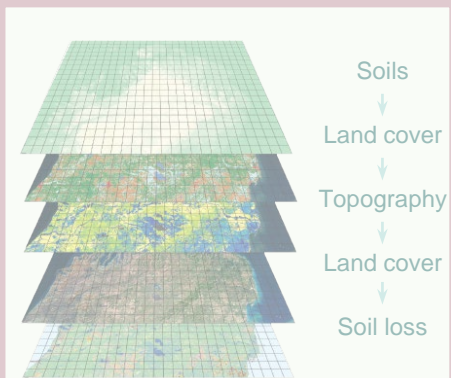
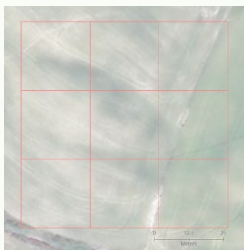
Farmer: My Farm  
Field ID: 001  
Slope: 5%  
Slope Length: 12 ft  
Soil: ADAMS (11B) K=0.17 (T=5)  
Acreage: 1.0 acre(s)

| Crop Rotations: |                 | Tillage Practices: |  |
|-----------------|-----------------|--------------------|--|
| Year 0:         | Corn for grains |                    |  |
| Year 1:         | Corn for grains | Fall Plow          |  |
| Year 2:         | Select a crop   | Tillage Practice   |  |
| Year 3:         | Select a crop   | Tillage Practice   |  |
| Year 4:         | Select a crop   | Tillage Practice   |  |
| Year 5:         | Select a crop   | Tillage Practice   |  |

Continuo >>

Traditional field-based prediction

At a large spatial scale, the area has to be discretized using, for example, a square **grid subdivision** (raster scheme), choosing a mesh size consistent with the scale of the original model deduction. Using a raster scheme applied to the (R)USLE model corresponds to **hypothesize that each cell is independent of the others with respect to soil loss.**



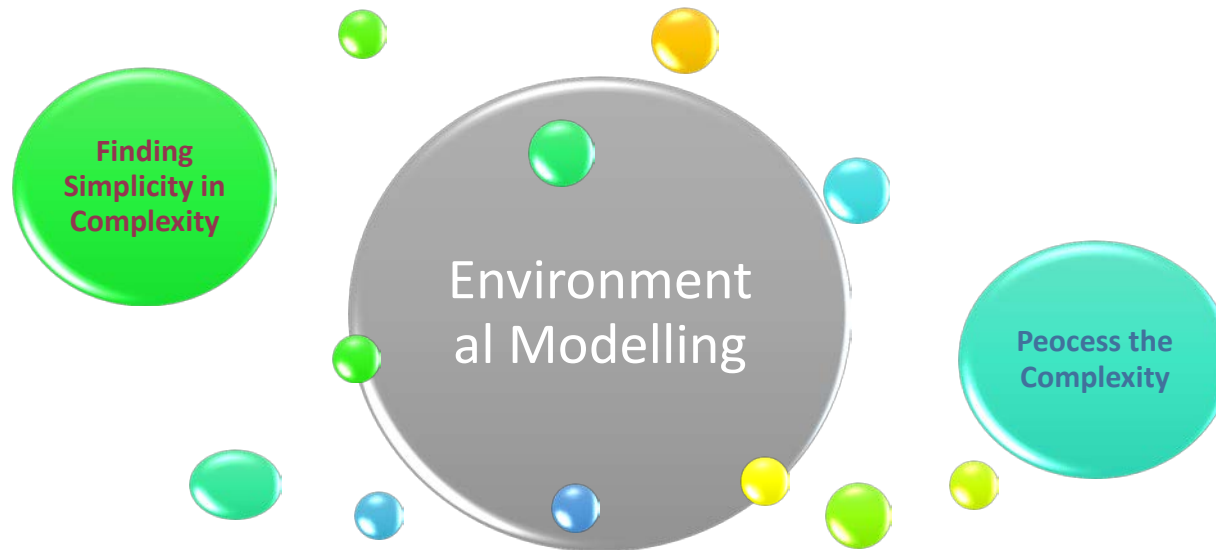
GIS pixel based prediction





## Soil Erosion Assessment: Simplicity vs Complexity

Large-scale modelling...

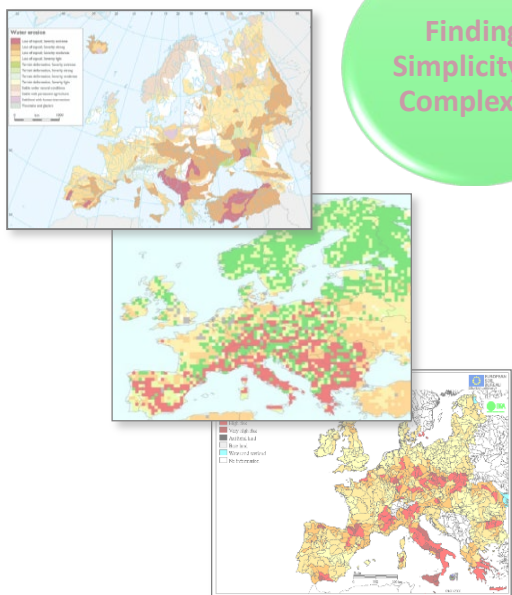




# Soil Erosion Assessment: Simplicity vs Complexity

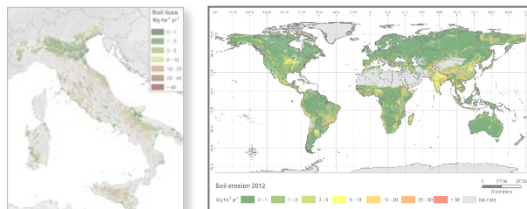
## Top-down approach

- Geographical distribution
- Gain the big picture
- Understanding of the process
- Building knowledge



Finding  
Simplicity in  
Complexity

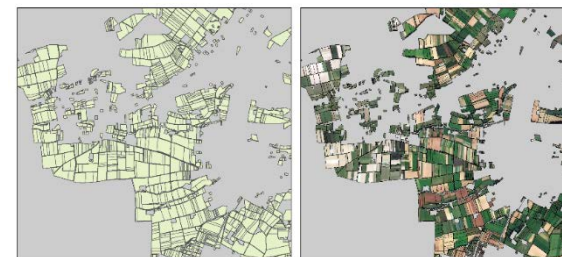
## Hybrid approaches



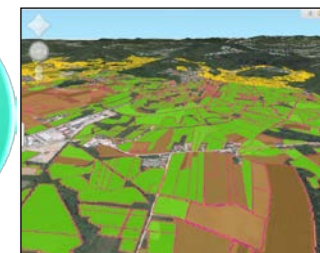
- Harmonized modelling
- Trans-national comparisons
- Policy evaluation
- Impact on biogeochemical cycling

## Bottom-up approach

Object-oriented  
FARM modelling



Process the  
Complexity



- From potential to actual risk
- Ex-ante and ex-post policy scenario
- Trans-national comparisons





## Object-oriented FARM Soil Erosion Modelling

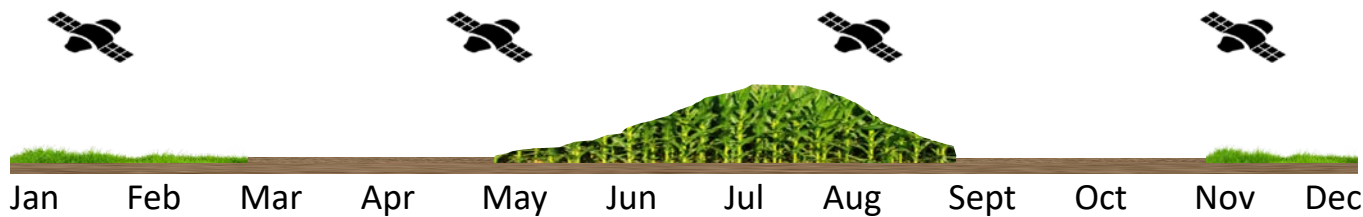
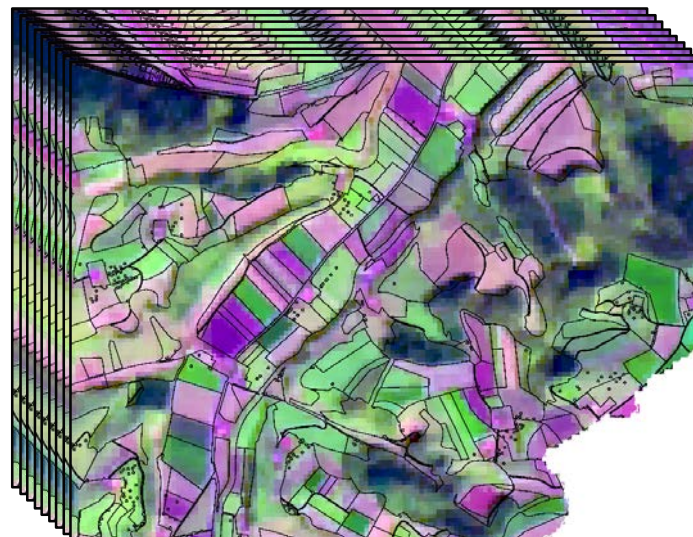
Land use map



LPIS processing



Landsat + Sentinel imagery



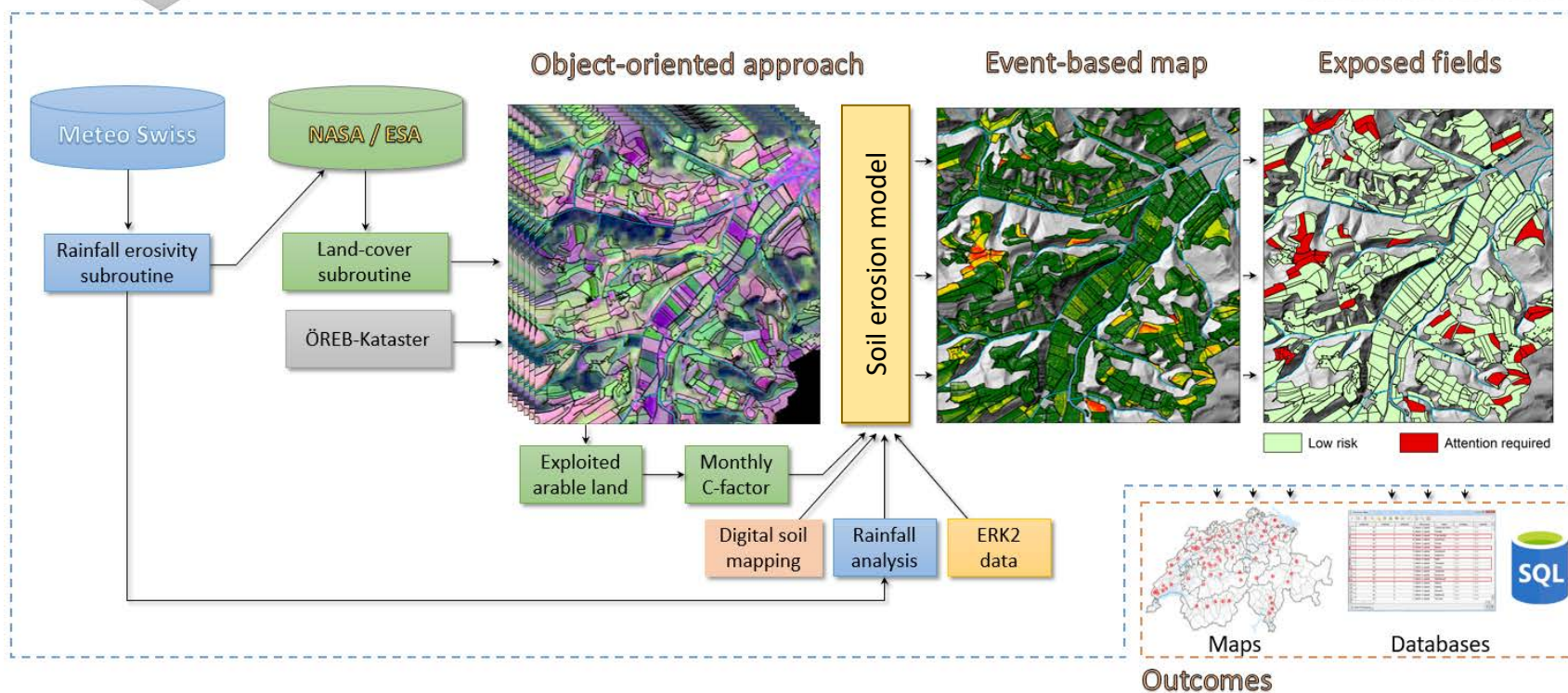


# Object-oriented FARM Soil Erosion Modelling

User-friendly interface



Automatic subroutine





- × **Improve** our capacity to predict erosive events
- × **Improve** our capacity to monitor the effectiveness of land management
- × **Provide** ex-ante and ex-post policy support
- × **Create** through the observatory a scientific monitoring network
- × **Active dialogue** with adjacent disciplines





## It is not all about water...



**THANKS FOR  
YOUR ATTENTION  
AND  
PLEASE DON'T ASK  
TOO MUCH**

