SOPHIE: Common desires & actions

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ISMC
International Soil Modeling Consortium

What is ISMC?

A recently formed and growing international group of soil process modelers is focused on improving the soil process description and overall parameterization of earth system models:

Global- and regional-scale climate models

Ecological models that include ecosystem services, soil carbon, etc.

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Current Status of Soil Model Development

Modeling soil processes is fragmented and dispersed, lacking exchange between different soil disciplines and across other disciplines

An improved visibility of soil research and modeling in the Earth Sciences Community is needed.

The scientific community lacks easy-to-access and available standardized and high quality data and protocols for calibrating and validating soil models

A better exchange of ideas, expertise and need for development of joint activities through cross-cutting topical areas

The International Soil Modeling Consortium (ISMC) aims to address these issues

Challenge: A Need to Focus…

Substantial
Soil influence

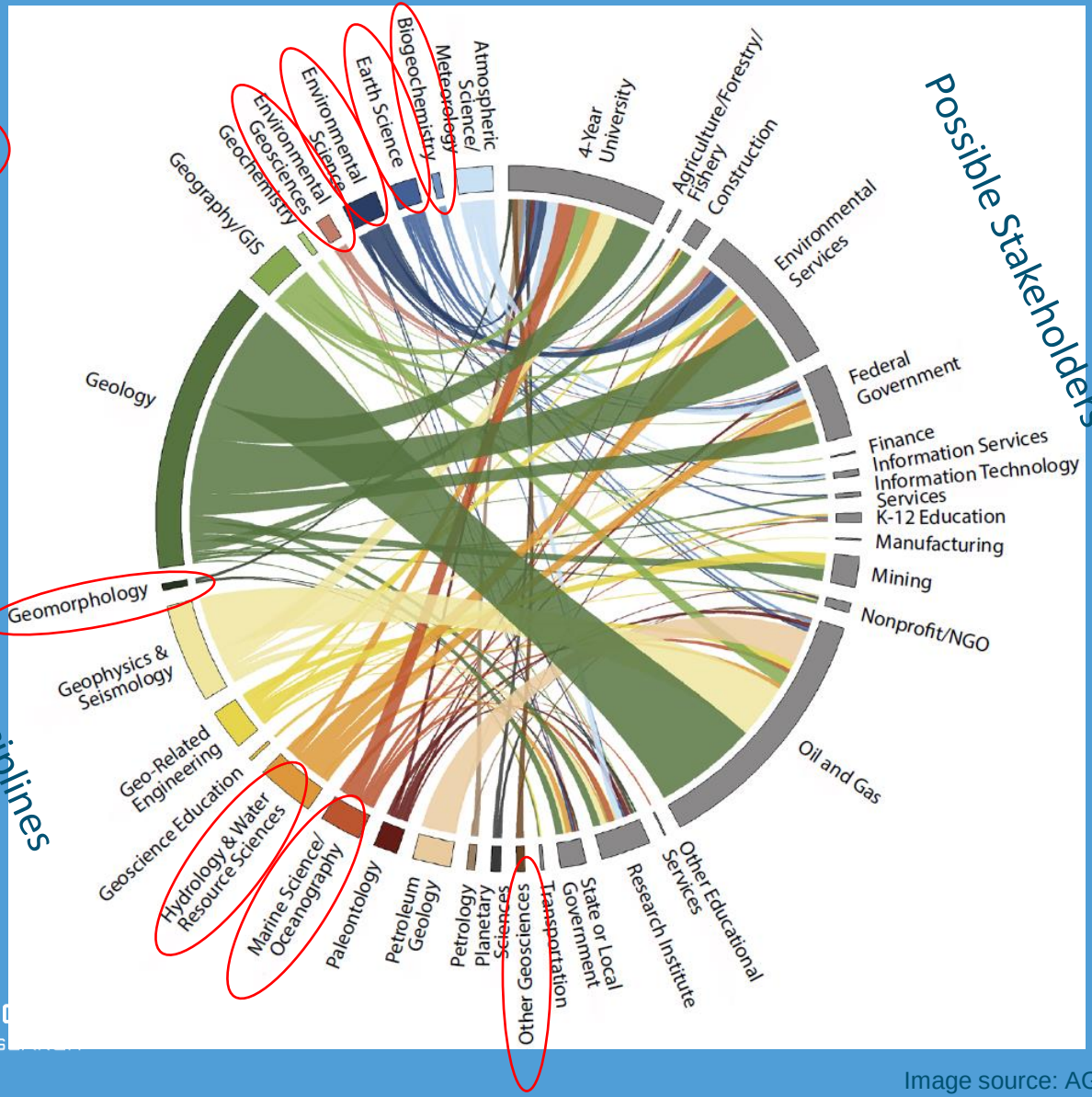
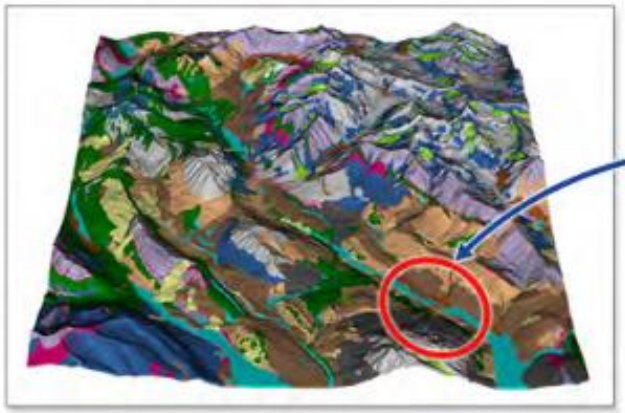
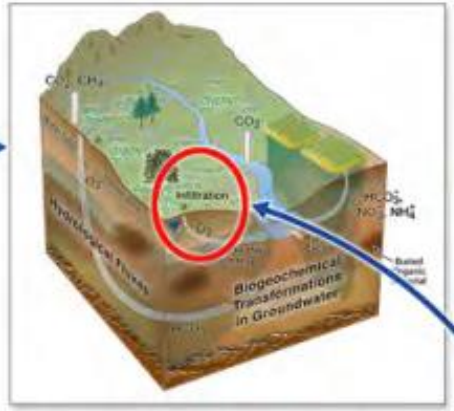


Image source: AGI, 2017

Better Soil Models: A Way to Integrate…

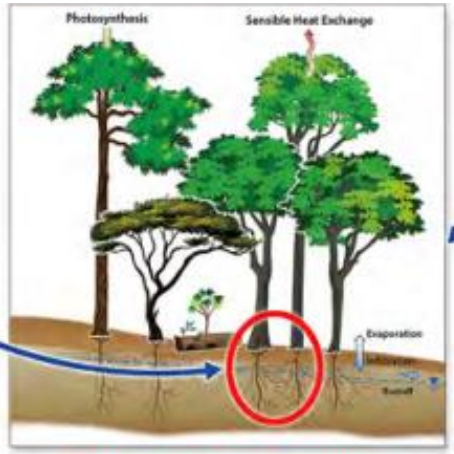


Watershed-scale processes



Catchment-scale hydro/biogeochem

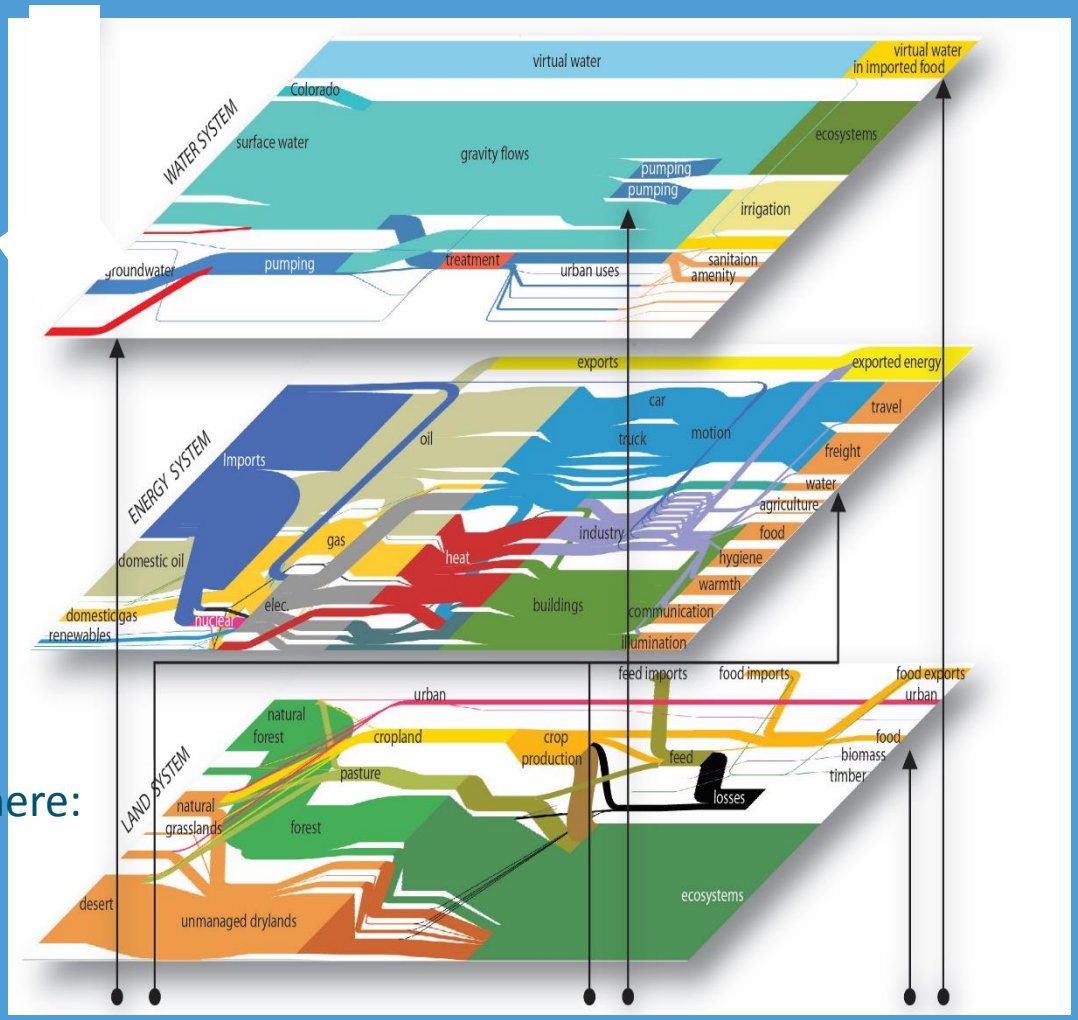
Root-scale and microbiomes



Plot-scale hydrology and vegetation

Image source: USDOE 2015

…Soil Processes into Integrated Assessments



Soil goes here:

Source: Forseer tool, Julian Allwood, Univ of Cambridge, 2012, http://forseer.org

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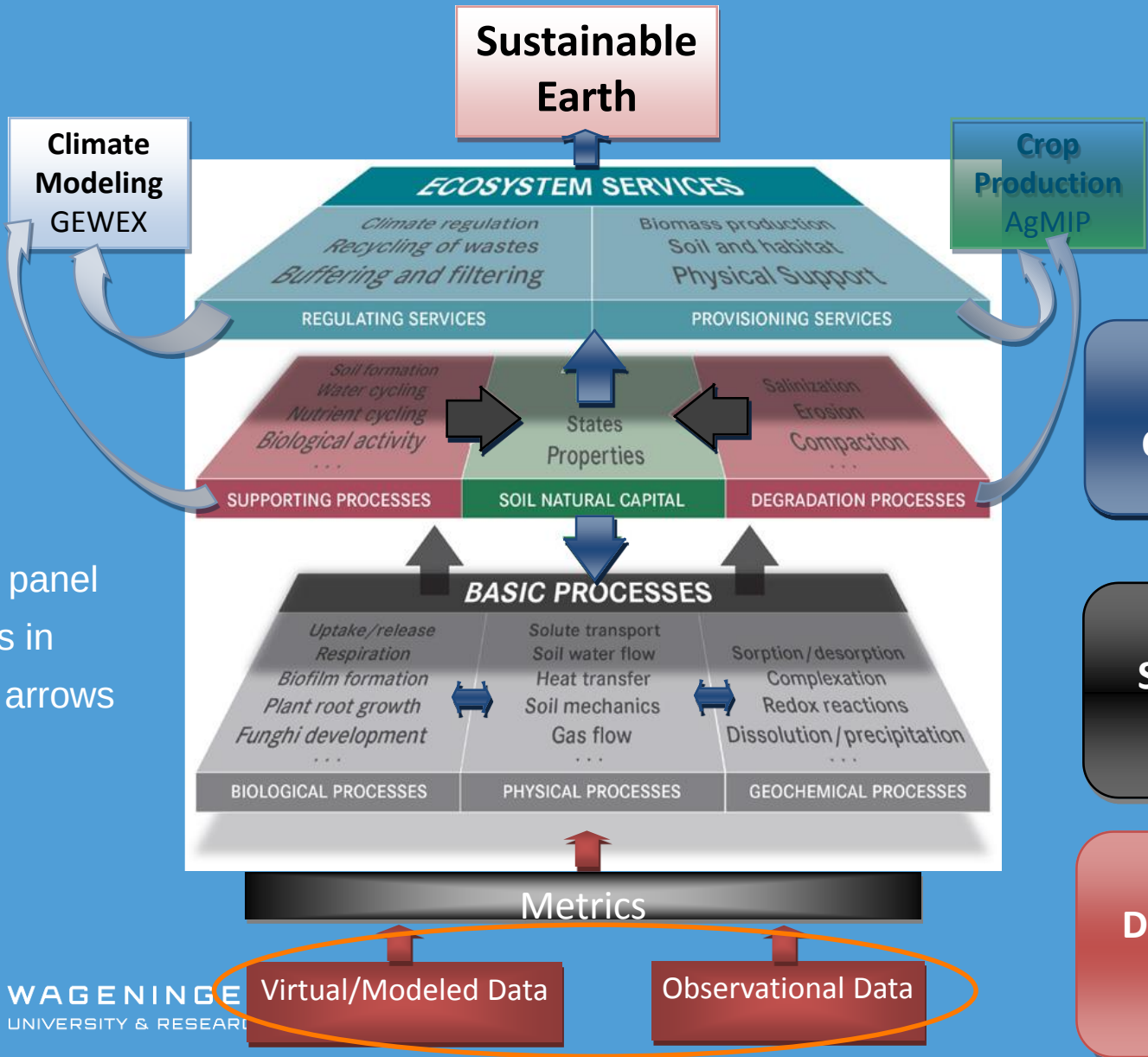
ISMC Schematic*

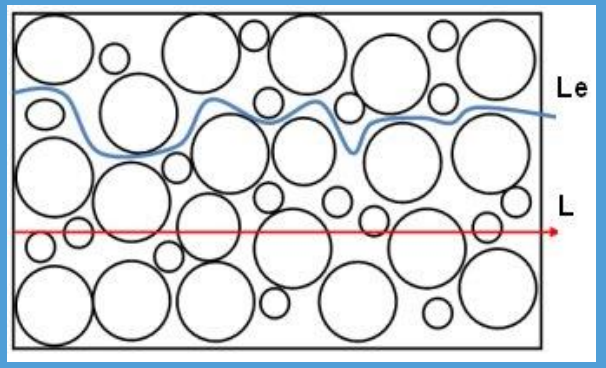


* Science panel activities in colored arrows

Soil process questions

Soil grain scale

- How does microbial diversity depend on variability in soil composition?
- To what extent does small scale heterogeneity matter at larger scales, for example for soil carbon or nutrients?



Top: Schematic soil structure. Bottom: Iron oxidizing Leptothrix bacteria (Credit: Bertram Schmidt, CC, distributed via imaggeo.egu.eu).

Soil process questions

Profile scale

- How much does local variability in the soil impact carbon and nutrient cycling in soils?

Top: Cracks in clay soil (Credit: with kind permission from Bram te Brake). Bottom: Preferential flow patterns through soil (Credit: with kind permission from Esther Bloem)

Soil process questions

Local/Farm scale

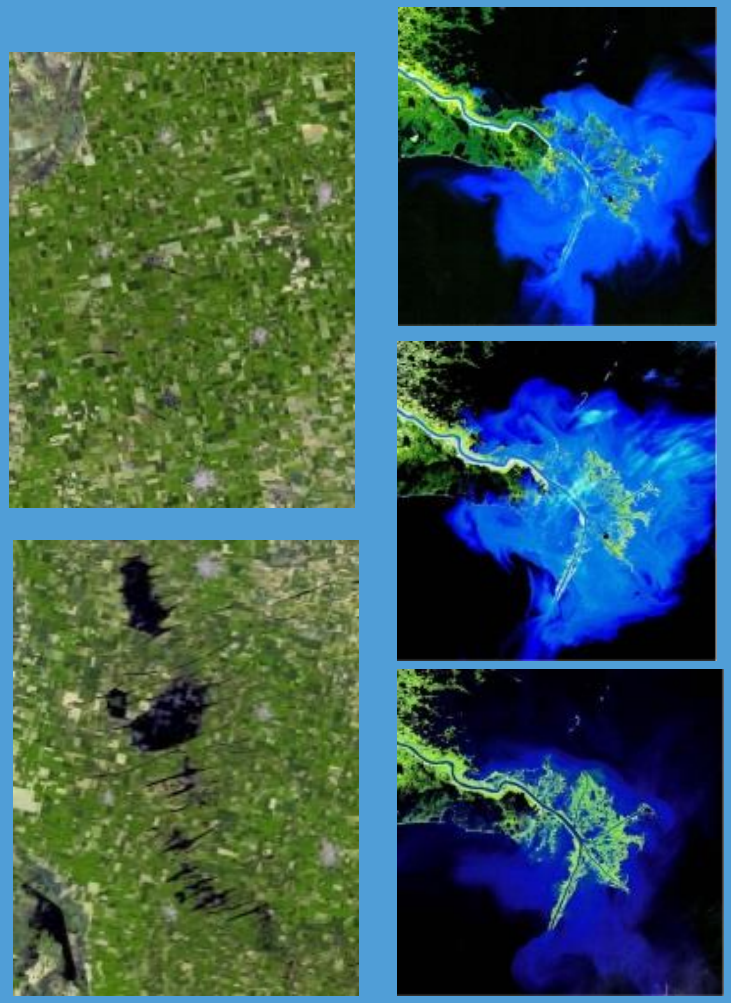
- How do small scale interventions on the landscape alter hydrological flow paths and sediment transport?

Top: Farm fields in Exmoore, UK (Credit: María Burguet, CC, distributed via imaggeo.egu.eu). Bottom: Pivot irrigation (Credit: Photo by John A. Kelley, USDA Natural Resources Conservation Service via Flickr under Creative Commons licence).

Soil process questions

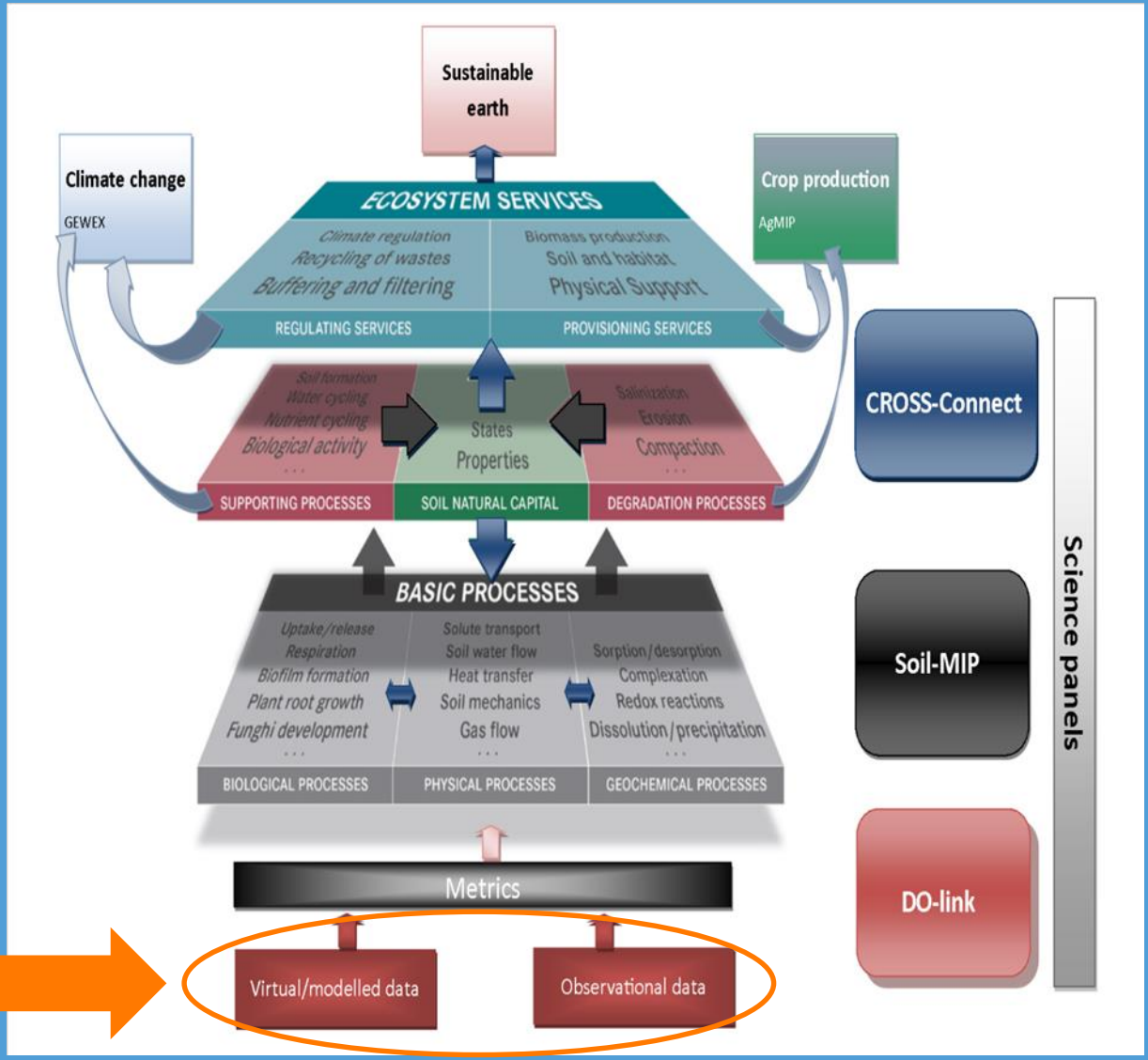
Basin scale

- How are hydrological, sediment and habitat function altered by major infrastructure?
- How do vegetation patterns combined at river basin scale influence water and sediment transport?



Left: Landsat 8 imagery before (top) and after (bottom) flooding in Argentina. Right: Landsat 1, 5, 7 imagery of three decades of change in the birdsfoot delta of the Mississippi River (Data available from the U.S. Geological Survey.)

Need for well defined data



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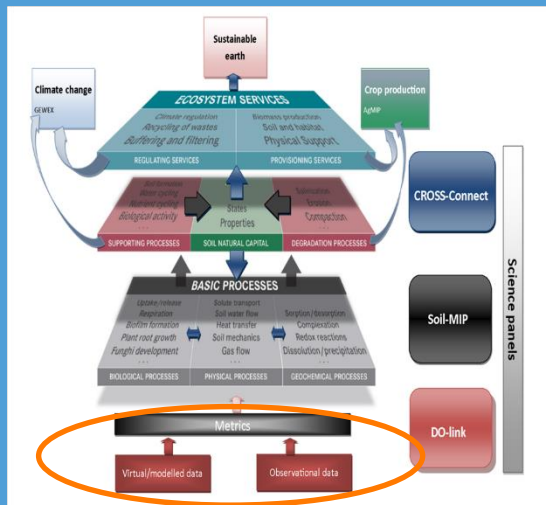
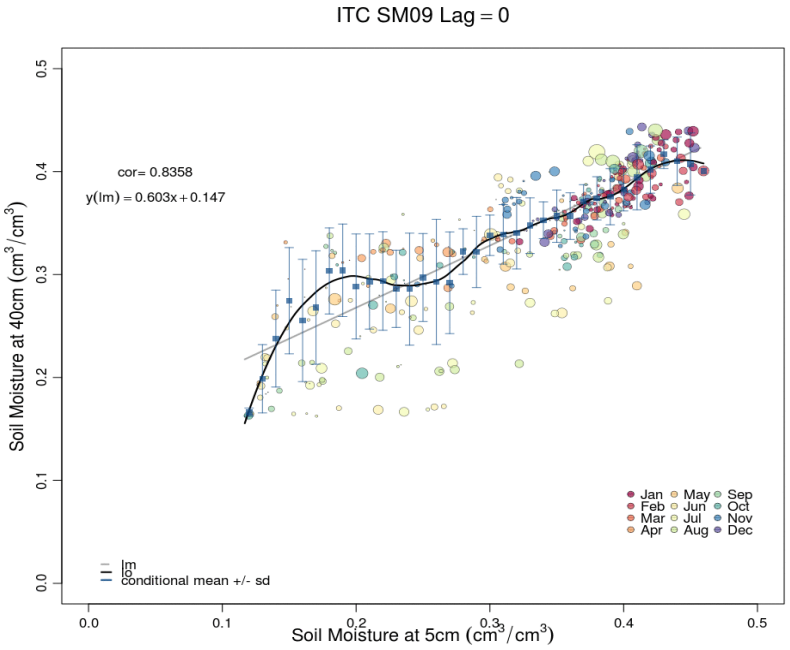
Relevant Data Questions in ISMC and SOPHIE?

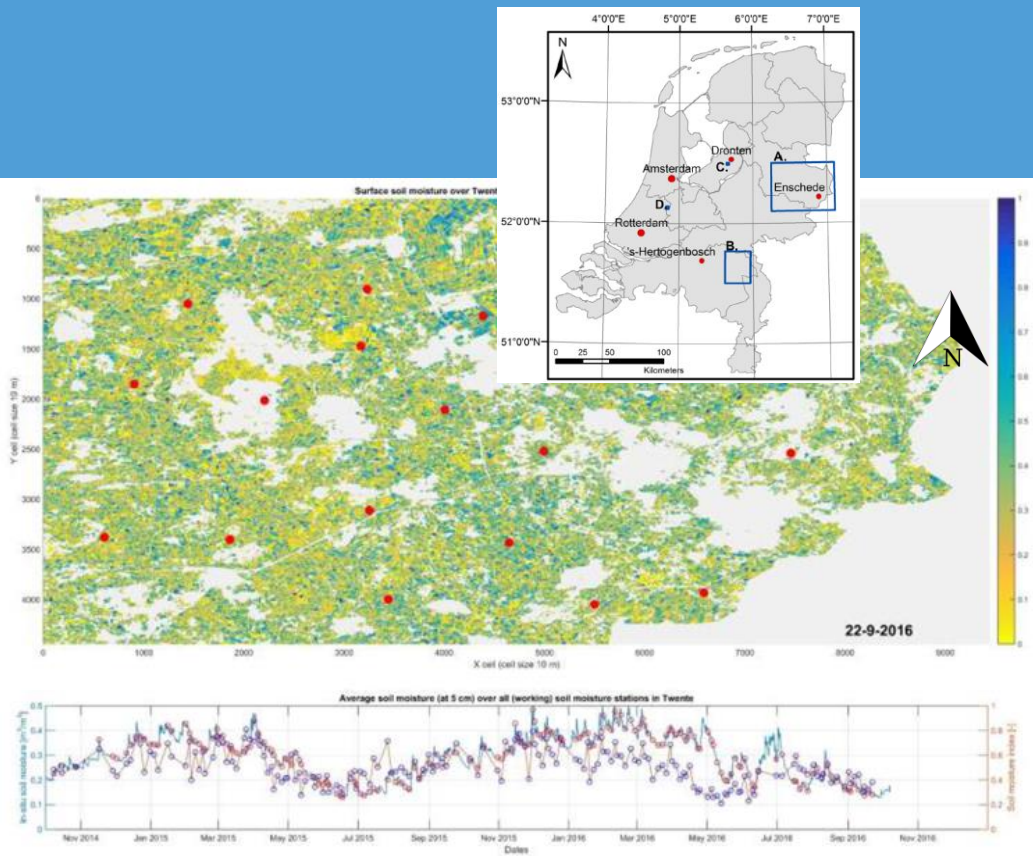
- Stakeholders have unique requirements
- Comparison laboratory data/field/regional/global data?
- Innovation in different sensors (remote sensing, big data)
- Are different sensors comparable (harmonisation)
- Which data sets can be used to calibrate models?
- Different labs, same results?



Emergent properties: Big data observations

- For example, soil moisture product from Sentinel-1
- For dynamic water management insight in subsurface response is needed.





Common Action

- Cost Action Application Global Soil Footprint
- Derived from the idea that (costs for) global exports depend on local soils. Soil threats are expressions of the global demand for resources.
- Connects part of ISMC & SOPHIE data questions
- ISMC modelling efforts with various stakeholders

ZERO NET LAND DEGRADATION

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Thank you for your interest

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Have a look at soil-modeling.org

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