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Ecosystem Science for Policy & Practice

Modelling of Ecosystem Services at global scale and for Scotland

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KIT-Campus Alpin
IMK-IFU: Atmospheric Environmental Research

Model-based quantification of ES

Dynamic vegetation models

simulate the development of land vegetation using mathematical representations of major ecosystem and plant processes

Because …

- Analysis of different biogeochemical cycles and their feedbacks (C, H_2O, N)
- Large scale: regional to global
- Changes over time: historical to future

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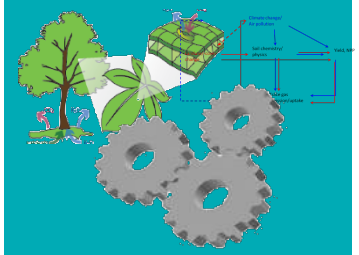
Workflow

Environmental Drivers → **Modeling** → **Ecosystem functioning** → **Ecosystem Services** → **Further analysis**

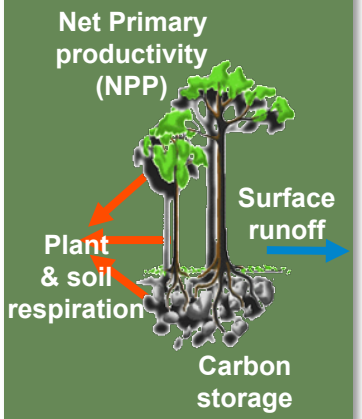
- Climate
- Land-use
- Atmospheric CO_2
- Soil texture

Modelling of ecosystem processes



- Photosynthesis
- Plant phenology
- Plant + soil hydrology
- …

Ecosystem state variables



Quantification of ES

- Carbon sequestration
- Water supply
- Food production
- Transpiration
- Soil fertility
- …

- Temporal development of ES
- Trade offs
- Which driver steers a change in ES?
- …

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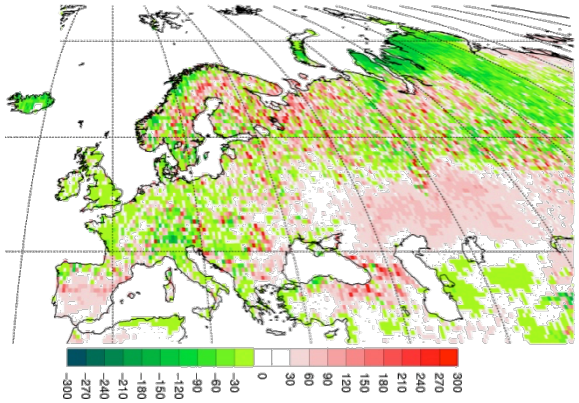
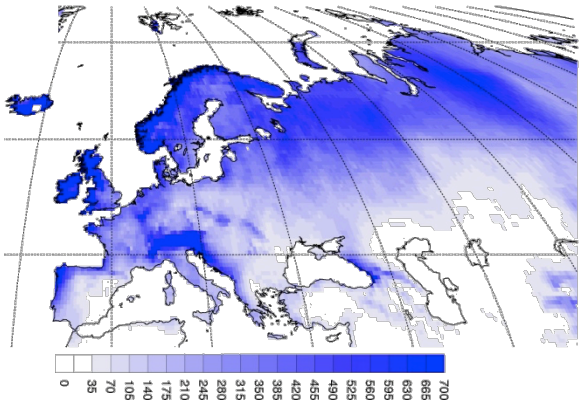
ES for Europe

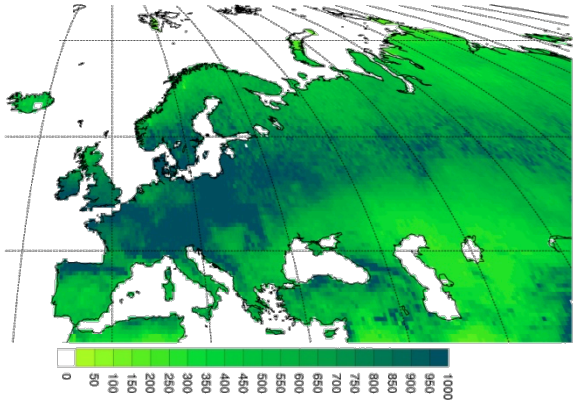
Carbon sequestration [gC/m2yr]



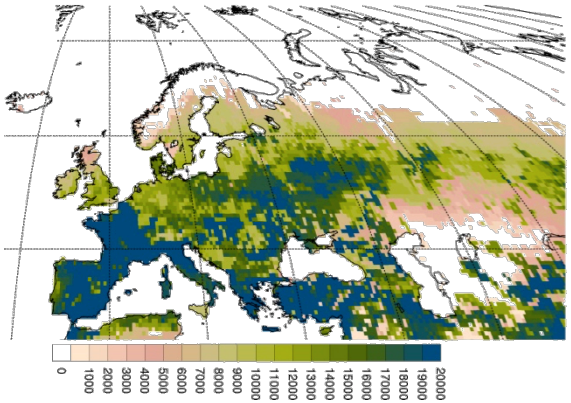
Water supply [mm/yr]



*** Biodiversity [no. species/10000km2] ***

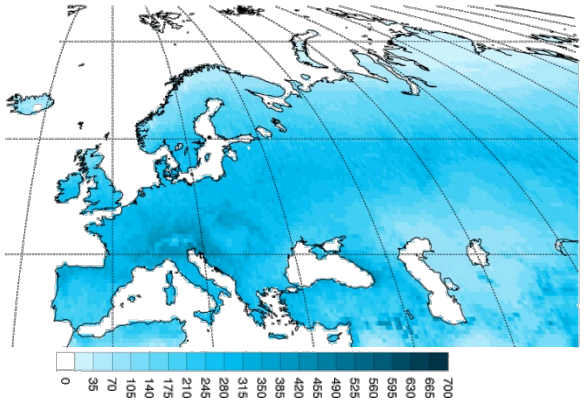


Food production [kcal/m2yr]



Other ES under development:
Fodder production, timber,
energy crops, soil fertility, ...

Actual Evapotranspiration [mm/yr]



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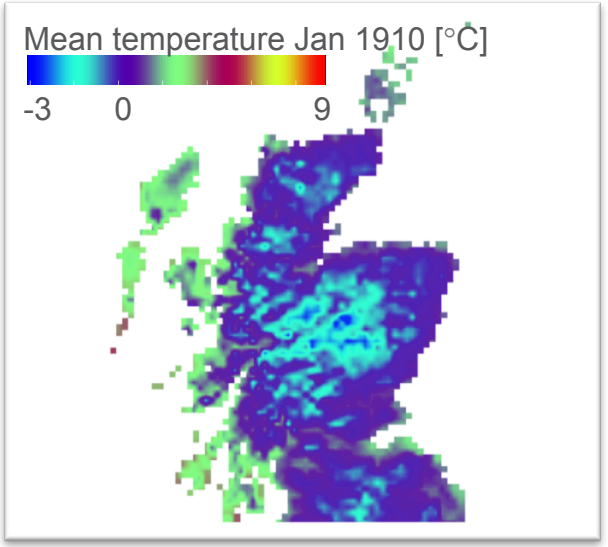
Modelling of ES in Scotland

- Maps of ES at Scottish national scale
- Spatial resolution of ~ 6 km
- 1910 - 2040



- Comparison to results of regional methods
- How do Scottish ES change for …
  different climate scenarios?
  different land use scenarios?
- How far is the current provision of ES in Scotland from the „optimum“?
  What do we loose and where are losses highest?
- Combination with other ES perspectives:
  economic valuation, socio-cultural ES assessments

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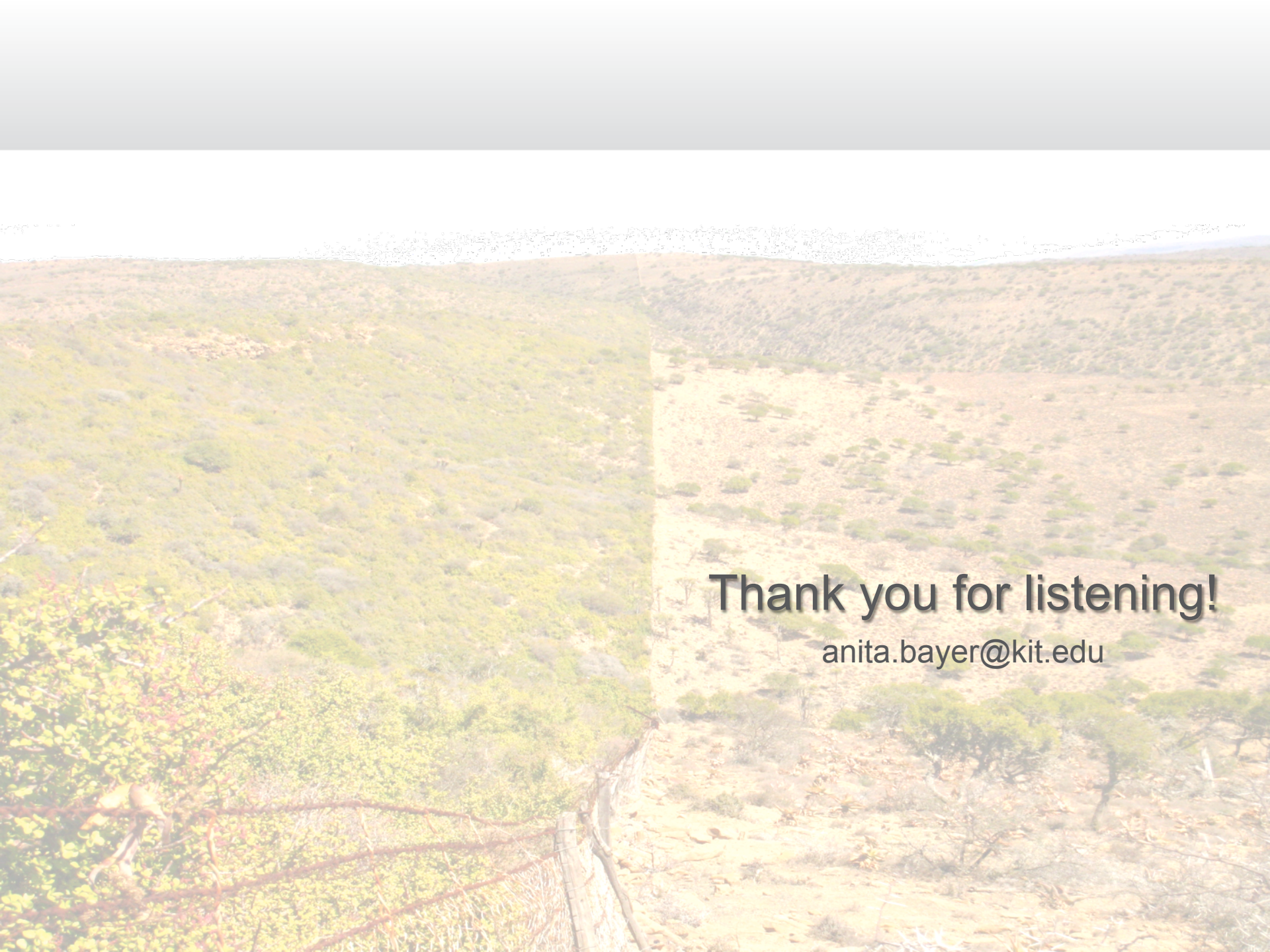
Thank you for listening!
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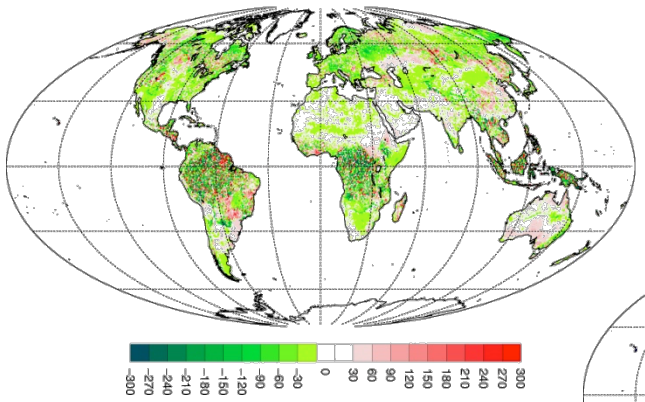
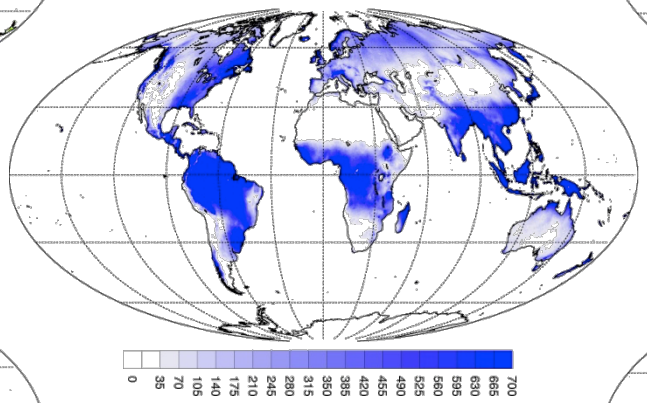
ES globally

Carbon sequestration [gC/m2yr]



Water supply [mm/yr]



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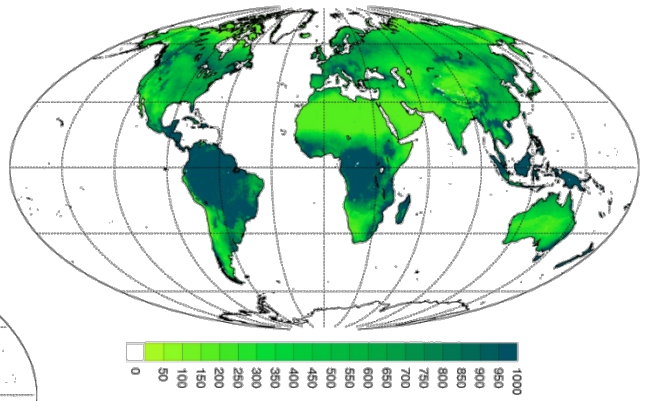
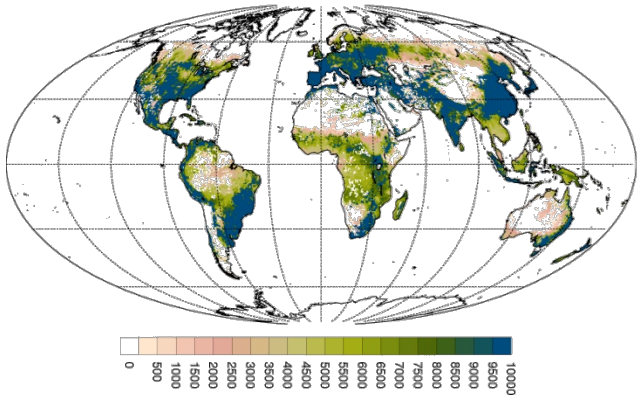
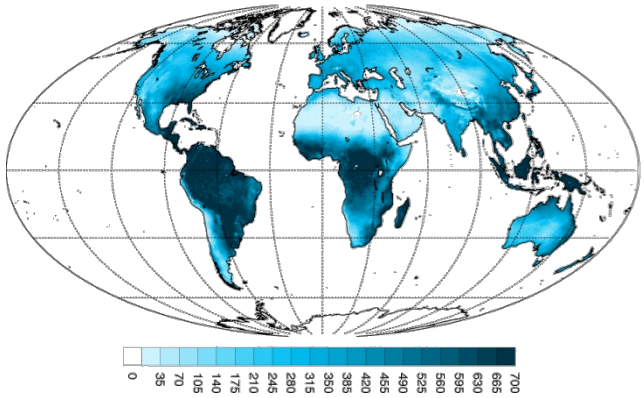


Food production [kcal/m2yr]



Actual Evapotranspiration [mm/yr]



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