Constraining uncertainties in the permafrost-climate feedback (COUP)

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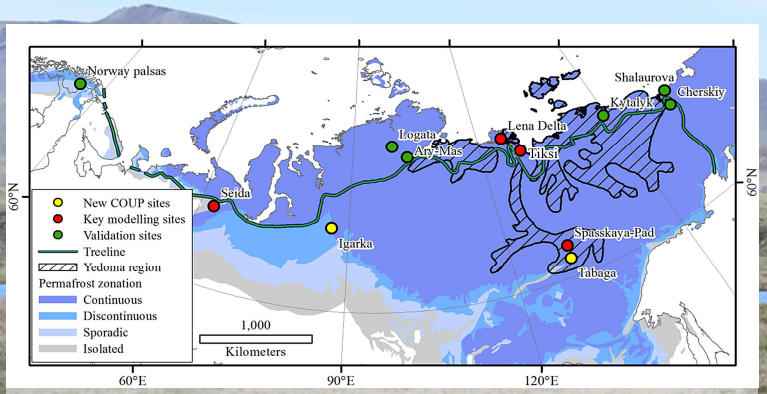
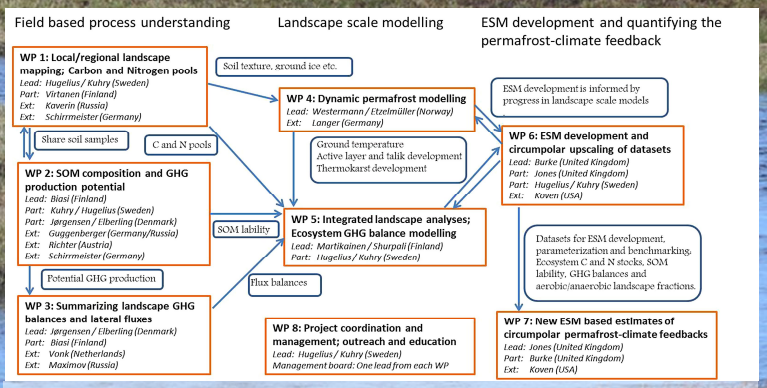
As the global climate warms, thawing permafrost may lead to increased greenhouse gas (GHG) release from Arctic and Boreal Ecosystems. The magnitude and timing of this important feedback are poorly understood. Detailed landscape level knowledge about land cover and soil properties is needed, when aim is to model permafrost thawing and its impact to GHG dynamics. The overall aim of COUP is to use detailed understanding of landscape-scale processes to improve global scale climate models.

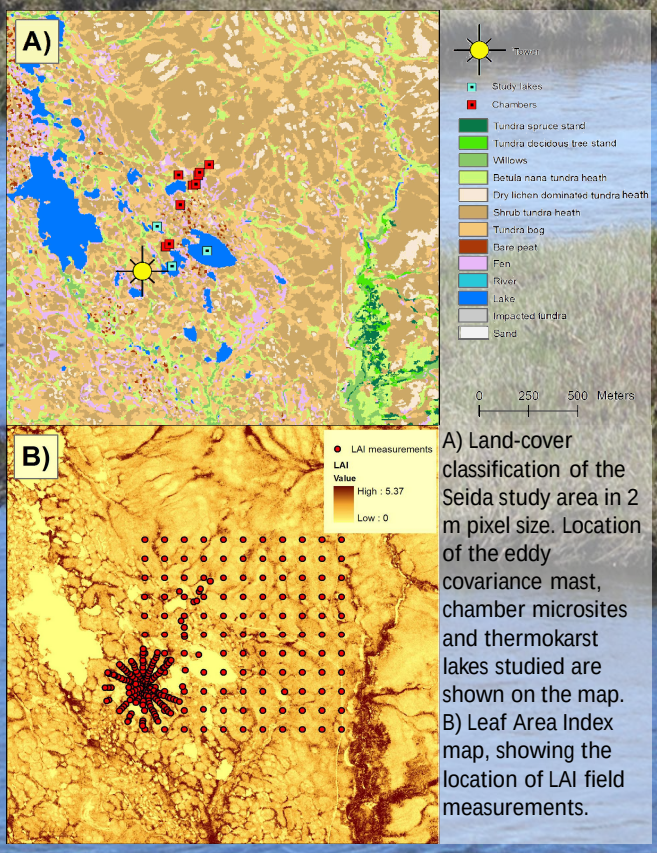
Better predictions of how permafrost areas will respond to a warming climate can help us understand and plan for future global change. Permafrost ecosystems are highly variable and studies show that very detailed field investigations are needed to understand complexities. Landscape properties vary in a very small spatial scale especially in Arctic environments. Because global scale models cannot work on such high-resolutions, we propose an approach where local landscape-scale field studies and modelling are used to identify those key variables that should be improved in global models. We will carry out careful field studies and high-resolution modelling at field sites covering all pan-Eurasian environmental conditions. The system understanding gained from this will then be used to (1) scale key variables so they are useful for global models and (2) improve a new global climate model. In the final step, the improved global climate models will be run to quantify the impact of thawing permafrost on the global climate. Datasets produced in COUP will be freely available online so that they can be used by other scientists and help improvement of all global climate models. COUP is designed to maximise synergies with ongoing projects.



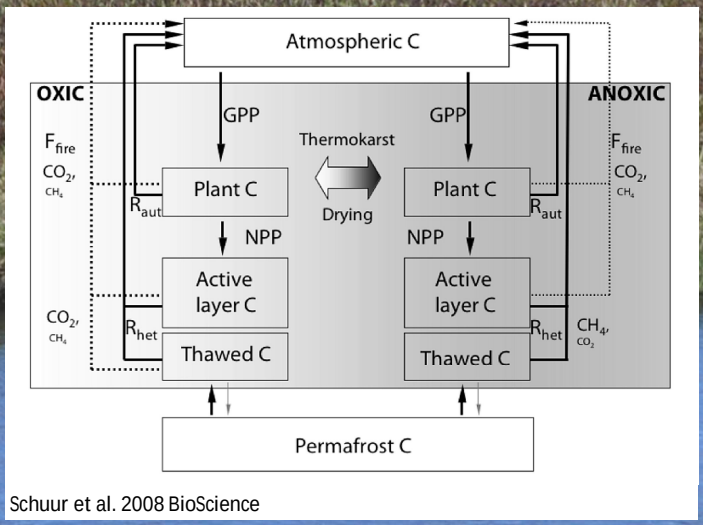
Location of proposed new sites, key modelling sites and validation sites in COUP. The sites span all relevant environmental gradients across the Eurasian permafrost domain. For all established sites, extensive field-based datasets for further analyses and model-support are already available.



A schematic overview of the proposed COUP work-package structure and workflow. COUP is a consortium under European JPI Climate Transnational Collaborative Research Projects call.



A) Land-cover classification of the Seida study area in 2 m pixel size. Location of the eddy covariance mast, chamber microsites and thermokarst lakes studied are shown on the map. B) Leaf Area Index map, showing the location of LAI field measurements.



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