Quantifying CO_2 fluxes of boreal forests in Northern Eurasia through integrated analyses of *in-situ* flux tower, remote sensing and biogeochemical modeling

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A number of global carbon balance studies suggested that there is very likely a large carbon sink in the northern Hemisphere, but its spatial patterns and temporal dynamics remain uncertain. International research communities have recently made great efforts establishing a network of CO_2 eddy flux towers across boreal forests in Northern Eurasia. The eddy flux tower network produced and will produce rich data sets of net ecosystem exchange of CO_2 (NEE) at the sites. The arisen challenge is how to interpret the rapidly accumulated data sets, and how to upscale the observations into regional scale to explain the global C imbalance. To answer the challenge, we propose a study with a predictive tool by integrating the eddy tower observation, remote sensing analysis, and biogeochemical modeling. The satellite-based Vegetation Photosynthesis Model (VPM) model and the process-based DNDC model will be employed for integration.
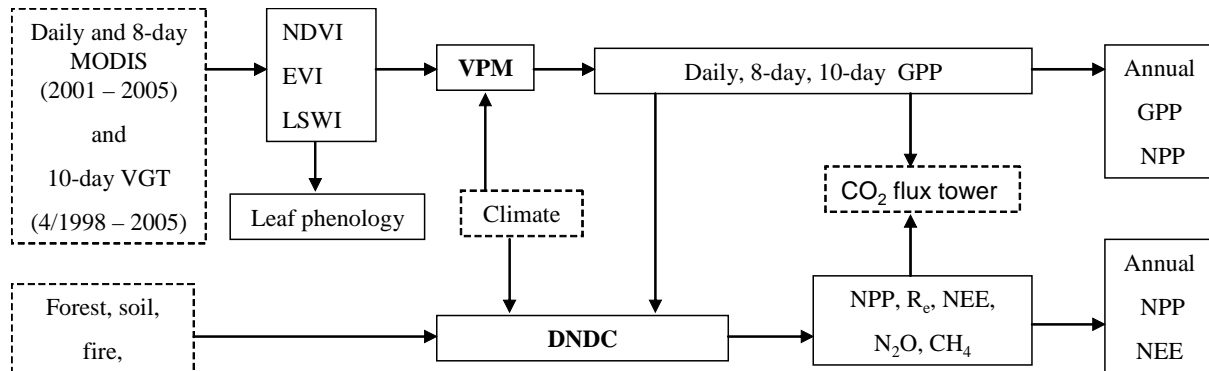
In the proposed study, VPM and DNDC will be first validated against the flux data observed across the eddy tower sites in Northern Eurasia, and then applied for predicting impacts of climate variation and disturbance on C dynamics at regional scale for Siberia. By modeling the spatial patterns and temporal variations of NEE fluxes at the large regional scale, we expect the results will answer if the boreal forests in Siberia could play a role in sinking the atmospheric CO_2. This project will further expand collaboration with researchers in Euroflux and Asiaflux.

Expected results from this proposed project are the following:
1) Validation of the satellite-based VPM model and process-based DNDC model, using CO_2 flux data from the flux tower sites of boreal forests in northern Eurasia
2) A multi-scale satellite image database for the flux tower sites in Russia
3) Regional datasets of GPP of boreal forests in Siberia for 1998-2005 from the VPM model
4) Regional datasets of NPP, NEE and R_e of boreal forests in Siberia for 1998-2005 from the coupled VPM-DNDC model.