Enabling intelligent copernicus services for carbon and water balance modeling of boreal forest ecosystems – North State

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The objective of project North State, funded by Framework Program 7 of the European Union, is to develop innovative data fusion methods that exploit the new generation of multi-source data from Sentinels and other satellites in an intelligent, self-learning framework. The remote sensing outputs are interfaced with state-of-the-art carbon and water flux models for monitoring the fluxes over boreal Europe to reduce current large uncertainties. This will provide a paradigm for the development of products for future Copernicus services. The models to be interfaced are a dynamic vegetation model and a light use efficiency model.

We have identified four groups of variables that will be estimated with remote sensed data: land cover variables, forest characteristics, vegetation activity, and hydrological variables. The estimates will be used as model inputs and to validate the model outputs. The earth observation variables are computed as automatically as possible, with an objective to completely automatic estimation.

North State has two sites for intensive studies in southern and northern Finland, respectively, one in Iceland and one in state Komi of Russia. Additionally, the model input variables will be estimated and models applied over European boreal and sub-arctic region from Ural Mountains to Iceland. The accuracy assessment of the earth observation variables will follow statistical sampling design. Model output predictions are compared to earth observation variables. Also flux tower measurements are applied in the model assessment.
In the paper, results of hyperspectral, Sentinel-1, and Landsat data and their use in the models is presented. Also an example of a completely automatic land cover class prediction is reported.