LIFE Project Number

LIFE12 ENV/FIN/000409

2nd progress report of Action B6:

Reporting Date

31/03/2016

LIFE+ PROJECT NAME or Acronym

Climate change indicators and vulnerability of boreal zone applying innovative observation and modelling techniques

Data Project

Project location	Helsinki
Project start date:	02/09/2013
Project end date:	01/09/2017
Total budget:	2755288 €
EC contribution:	1366952 €
(%) of eligible costs	49.61

Data Beneficiary

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1 Summary

This report describes the state of the art and further objectives of the uncertainty analysis of the climate change indicators in MONIMET. The climate change indicators will be retrieved for the current century and prescribed methods of uncertainty analysis will be conducted.

2 Introduction

The impact models of the project are land ecosystem models JSBACH (FMI) and PRELES, recently combined with growth model CROBAS and soil model Yasso (Luke and UHel), and described in connection with actions B4 and B5. This action analyses the uncertainties related to the model predictions and originating in (1) model inputs, i.e. the variables driving the model, (2) model structure, i.e, possible errors and deficiencies in the model in describing the processes included, and (3) parameters, including the physical and empirical constants needed to quantify model results. The target climate change indicators for which uncertainties are calculated are duration of vegetation active season (VAP), vegetation carbon uptake rate, forest and soil respiration rates, forest volume growth rate, methane emission rate, evapotranspiration (sum of surface evaporation and plant transpiration), soil moisture, length of soil frost period, snow cover and surface albedo.

3 Driving variables and parameters

We will use two emission scenarios each with one CO2 trajectory, and described using the set of models available to FMI (seven CMIP5 models). Three climate projections will be made for each scenario, including the multi-model mean, the mean of three upper extremes (with reference to temperature) and the mean of three lower extremes. As explained in relation to action B5, the production of the driving data for JSBACH model has been started after having a new data domain implemented at FMI. The driving variables of the scenarios have also been transferred to Luke system for running PRELES+CROBAS+Yasso and first simulations have been carried out.

Adding parameter uncertainty to the different scenario simulations is straight-forward in principle. For each case, we make Monte Carlo model runs with random parameter inputs drawn from the posterior distributions of the Bayesian analyses made for the models. This will provide us with uncertainty ranges of the results as related to the model parameters.

4 Results and their presentation

The raw results from the uncertainty analysis will include gridded data of multiple scenario runs with uncertainty ranges included in each grid point, combined with temporal trends over a century. In order to present the results in an informative manner, appropriate aggregation of the data must be carried out.

We will aggregate geographical data separately for the northern and southern part of the country. Most of the results will be presented for periods of changed climate rather than for transients. For some variables such as forest growth and NEE this may not be justified because they are essentially dynamic transient phenomena. The exact procedures for doing this are yet to be decided upon and will depend on results from Actions B4 and B5. A minimum outcome of Action B6 will be the uncertainty of the steady state carbon stocks, and predicted shifts in them. We will also investigate the possibility of providing information about the inertia and related uncertainty of the (soil) model to reach the steady state, and the percentage of the steady state reached by the period examined.

5 Time table

As explained in the report of action B5, because of the changes in the JSBACH modeling setup, starting the scenario production runs was delayed for half a year. From the point of view of the PRELES model, this delay time allowed us to expand the model to include the stand growth and soil models and provide more variable outputs from this model as well.

The delay means that starting the scenarios runs and their analysis in action B6 is similarly delayed, and the milestone termed “The climate indicator variation between models evaluated” has not been completed yet. This will be done by the end of 2016, and the deliverable due in September 2017 will be produced on time.