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The Land surface Carbon Constellation (LCC) project: Overview and first results

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In the context of climate change it is of paramount importance to quantify CO_2 sources and sinks, estimate their spatio-temporal distribution, and advance our understanding of the underlying processes. This information is needed to improve the projections of future trends in carbon sinks and sources, and thus the potential magnitude of climate change. However, there are large uncertainties in the quantification of the terrestrial carbon sinks arising mainly from uncertainties in the underlying models used for the quantification of these sinks. A major source for these model uncertainties are uncertainties in their parameterisations and parameter values. Reducing these uncertainties is critical for reducing the spread in simulations of the global carbon cycle, and hence in climate change projections.

The Land surface Carbon Constellation project, as part of ESA's Carbon Science Cluster, is designed to achieve such understanding and reduce these uncertainties in an integrated approach exploiting both observations (satellite and in situ) and modelling. The project demonstrates the synergistic exploitation of satellite observations from active and passive microwave sensors together with optical data for an improved understanding of the terrestrial carbon and water cycles. As such, the community terrestrial ecosystem model D&B based on the well-established DALEC (Williams et al.2004) and BETHY (Knorr, 2000) models together with appropriate observation operators is applied in a data assimilation framework at two contrasting field sites (Sodankylä, Finland, representing a boreal forest biome, and Majadas de Tietar, Spain, representing a temperate savanna biome) and their surrounding regions. The model development as well as the satellite data interpretation is supported by dedicated field campaigns at the two sites plus an additional agricultural field site (Reusel, The Netherlands).

In this contribution, we will report on the overall project design and lay out a roadmap for the synergistic use of remotely sensed observations of solar induced fluorescence and high resolution above-ground biomass and illustrate their use in combination with the assembled campaign data base including data from on ground radiometers as well as FloX Boxes.

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