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Implementation of terrestrial carbon in Norwegian Earth System Model (NorESM).

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NorESM is the emerging Norwegian coupled global Earth system model including the atmosphere, the ocean, the sea-ice, and the land areas. NorESM is based on the development version CCSM4 alpha_38 from National Center for Atmospheric Research (NCAR) for atmosphere and land surface (including land carbon cycling) obtained through a separate co-operative agreement with NCAR scientists and developers, on the MICOM isopycninc physical ocean model (Bergen version), the HAMOCC ocean biogeochemical model (Hamburg, adopted for isopycnic coordinates at Bergen), and an atmospheric chemistry and aerosol model (Oslo). NorESM is a laboratory devoted to the investigation of the Earth climatic system: natural variability and predictability, anthropogenic contributions to changes, quantification of risk and uncertainty. The physical model components, the atmospheric chemistry, and ocean biogeochemistry models, of NorEsm work in coupled mode. A longer pre-industrial spin-up of the physical sub-system is currently under way (using the biogeochemistry modules in diagnostic mode only without feedback as yet).

The land surface model and terrestrial biosphere will be upgraded to the Community Land Model version 4.0 (CLM4.0, NCAR 2010) as soon as it is available in operational mode. CLM4.0 is a state-of-the-art Dynamic Global Vegetation Model (DGVM. The land surface component is a community-developed global climate system model for application to studies of inter-annual and inter-decadal variability, paleoclimate regimes, and projections of future climate change. This is the last piece of the puzzle that will allow us to study feedbacks related to vegetation dynamics.

Complementarily to the testing and validation efforts devoted to the construction of CLM4.0 and as a preparation to its implementation into NorESM, an independent strategy of model testing is set up at the Geophysical Institute in Bergen. Our work will focus on comparing CLM4.0 simulations with data of carbon allocation in the vegetation organs. Carbon allocation is a key component in DGVMs. The partitioning of the net primary productivity among the different organs determines the relative growth rate of the various plant organs. Carbon allocation is involved in long-term feedbacks including the assimilation capacity, the plant hydrologic balance and the plant waste turnover rates. Preliminary assessments will be presented during the talk.