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CHANGES IN ARCTIC AND BOREAL TERRESTRIAL ECOSYSTEMS FROM 1981-2010: COMPARISONS BETWEEN A GLOBAL EARTH SYSTEM MODEL AND OBSERVATIONS

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Currently, global Earth system models underestimate the decrease of Arctic sea-ice extent in the summer. A major goal of the FP7 project ICE-ARC is the development of an enhanced sea-ice parameterization to improve the prediction of future sea-ice trends, which in turn will then be used as externally prescribed fields for simulations with the Community Earth System Model (CESM) to predict future trends of the C budget of Arctic and boreal terrestrial ecosystems and to quantify the strength of the land-climate feedback in those regions.

As a first step towards this goal, we will evaluate version 1.2 of CESM with observations for the 30-year period 1981-2010. First, we will compare the seasonal and annual exchanges of CO₂ between northern ecosystems and the atmosphere with CO₂ ground fluxes based on top-down estimates from atmospheric CO₂ inversions, and also with ground measurements of surface fluxes from the FLUXNET network. In addition, model results will be compared with atmospheric CO₂ concentration measurements from the GLOBALVIEW-CO₂ product. Second, we will analyze current and recent changes of plant productivity and growing season parameters over boreal regions during the last three decades and evaluate these changes with the time series of global satellite-sensed Normalized Difference Vegetation Index (NDVI) and with the prediction of net primary productivity from the CMIP5 ensemble of Earth system models.