Geophysical Research Abstracts
Vol. 19, EGU2017-17564, 2017
EGU General Assembly 2017

Coupling a distributed hydrological model with detailed forest structural information for large-scale global change impact assessment

Stephanie Eisner (1), Shaochun Huang (2), Titta Majasalmi (1), Ryan Bright (1,3), Rasmus Astrup (1), and Stein Beldring (2)

(1) Norwegian Institute of Bioeconomy Research (NIBIO), Ås, Norway (stephanie.eisner@nibio.no), (2) Norwegian Water Resources and Energy Directorate (NVE), Oslo, Norway, (3) Norwegian University of Science and Technology (NTNU), Trondheim, Norway

Forests are recognized for their decisive effect on landscape water balance with structural forest characteristics as stand density or species composition determining energy partitioning and dominant flow paths. However, spatial and temporal variability in forest structure is often poorly represented in hydrological modeling frameworks, in particular in regional to large scale hydrological modeling and impact analysis. As a common practice, prescribed land cover classes (including different generic forest types) are linked to parameter values derived from literature, or parameters are determined by calibration. While national forest inventory (NFI) data provide comprehensive, detailed information on hydrologically relevant forest characteristics, their potential to inform hydrological simulation over larger spatial domains is rarely exploited.

In this study we present a modeling framework that couples the distributed hydrological model HBV with forest structural information derived from the Norwegian NFI and multi-source remote sensing data. The modeling framework, set up for the entire of continental Norway at 1 km spatial resolution, is explicitly designed to study the combined and isolated impacts of climate change, forest management and land use change on hydrological fluxes. We use a forest classification system based on forest structure rather than biomes which allows to implicitly account for impacts of forest management on forest structural attributes. In the hydrological model, different forest classes are represented by three parameters: leaf area index (LAI), mean tree height and surface albedo. Seasonal cycles of LAI and surface albedo are dynamically simulated to make the framework applicable under climate change conditions. Based on a hindcast for the pilot regions Nord-Trøndelag and Sør-Trøndelag, we show how forest management has affected regional hydrological fluxes during the second half of the 20th century as contrasted to climate variability.