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Toward improving the representation of the water cycle at High Northern Latitudes

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The rapid warming at northern latitude regions in recent decades has resulted in a lengthening of the growing season, greater photosynthetic activity and enhanced carbon sequestration by the ecosystem. These changes are likely to intensify summer droughts, tree mortality and wildfires. A potential major climate change feedback is the release of carbon-bearing compounds from soil thawing.
These changes make it important to have information on the land surface (soil moisture and temperature) at high northern latitude regions. The availability of soil moisture measurements from several satellite platforms provides an opportunity to address issues associated with the effects of climate change, e.g., assessing multi-decadal links between increasing temperatures, snow cover, soil moisture variability and vegetation dynamics. The relatively poor information on water cycle parameters for biomes at northern high latitudes make it important that efforts are expended on improving the representation of the water cycle at these latitudes.
In a collaboration between NILU and Met Norway, we evaluate the soil moisture observations over Norway from the ESA satellite SMOS (Soil Moisture and Ocean Salinity) using in situ ground based soil moisture measurements, with reference to drought and flood episodes. We will use data assimilation of the quality-controlled SMOS soil moisture observations into a land surface model and a numerical weather prediction model to assess the added value from satellite observations of soil moisture for improving the representation of the water cycle at high northern latitudes.

This presentation provides first results from this work. We discuss the evaluation of SMOS soil moisture data (and from other satellites) against ground-based in situ data over Norway; the performance of the SMOS soil moisture data for selected drought and flood conditions over Norway; and the first results from data assimilation experiments with land surface models and numerical weather prediction models. Analyses include information on root zone soil moisture.

We provide evidence of the value of satellite soil measurements over Norway, including their fidelity, and their impact at improving the representation of the hydrological cycle over northern high latitudes. We indicate benefits from these results for multi-decadal soil moisture datasets such as that from the ESA CCI for soil moisture.