**Poster #53**

## A Peatland Biogeochemistry Model Development and Application to Quantify Peatland Methane Emissions and Carbon Accumulation

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A newly-developed biogeochemistry model that couples the dynamics of hydrology, soil thermal regime, and ecosystem carbon and nitrogen for peatlands and non-peatlands was applied to quantify the long-term peat carbon (C) accumulation in Alaska from the Holocene to present. Modeled hydrology, soil temperatures, carbon pools and fluxes and methane emissions are evaluated using observation data at several peatland sites in Minnesota (SPRUCE), Alaska, and Canada. The model was then applied to estimate C stocks in Alaska. Comparable with the previous estimates of 25-70 Pg C in peatlands and 13-22 Pg C in non-peatland soils within 1-m depth using peat core data, our model estimates a total of 36-63 Pg C at present, including 27-48 Pg C in peatland soils and 9-15 Pg C in non-peatland soils. Current vegetation stores 2.5-3.7 Pg C in Alaska with 0.3-0.6 Pg C in peatlands and 2.2-3.1 Pg C in non-peatlands. We find that the changes in vegetation and their distributions are the main factors to determine the spatial variations of C accumulation. Warmer summer temperature and stronger radiation seasonality, along with higher precipitation in the High Thermal Maximum and the 20th century might have resulted in the extensive peatland expansion and carbon accumulation. Currently we are applying the model to simulate the long-term C accumulation trajectory of the peatlands in Minnesota.