Progress and Opportunities in Measurement and Modeling of Arctic Carbon Cycling under a Changing Climate

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Tremendous progress has been made in the observation and quantification of Arctic carbon cycling with various approaches. A session organized during the 2019 European Geoscience Union meeting showcased this progress with highlights from 17 studies representing different regions of the Arctic. A number of studies investigated the effects of soil freezing on carbon dioxide and methane production, consumption and emissions and the carbon budget in Arctic ecosystems using chamber and eddy flux tower observation techniques. Some of those studies focused on the role of moss, snow and permafrost thawing in carbon fluxes. There were studies that reviewed the methodology of measuring carbon fluxes from Arctic lakes, while several studies examined methane evasions from sea shelves and oceanic environments. Satellite and isotopic data as well as atmospheric transport and inversion modeling have been used in various studies. Several studies used earth system and biogeochemistry models to quantify methane fluxes and wetland area dynamics. The challenges of scaling up carbon balances in fragmented Arctic landscapes were presented, including characterizing and modeling landscape dynamics (e.g., peatland expansion). Based on these EGU session contributions and our own research progress, we present here observations and modeling results on Arctic carbon cycling and identify the challenges and opportunities in this field.

Keywords: Arctic, Carbon dioxide and methane , permafrost, wetlands and lakes, oceanic environment, earth system and biogeochemistry modeling

