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Poster

One of the largest uncertainties in projected greenhouse gas concentrations and temperature trends is the impact from terrestrial and marine carbon-climate feedbacks, especially in the northern high latitudes (i.e., circumpolar Arctic and Boreal region North of approximately 50° latitude). While evidence is emerging about changes to various terrestrial and marine ecosystem processes, a comprehensive and integrated understanding of Arctic-Boreal carbon cycle dynamics and its interaction with the global carbon cycle remains elusive. In this presentation, I will show how we can use OCO-2's space-based vantage point to quantify Arctic-Boreal carbon fluxes, diagnose its current state (net source or net sink or approximately carbon neutral) & spatiotemporal patterns, and understand the relationship and dynamics among climate and disturbance drivers responsible for its current state. I will show recent results from improving the quantity and the quality of OCO-2 retrievals over the Arctic-Boreal region - these retrieval improvements relate to refining the filtering and bias correction approach, and modifying the core retrieval algorithm to better capture characteristics of retrievals over snow & ice-covered surfaces. I will use these results, along with findings from NASA’s ABoVE campaign and the international RECCAP-2 Permafrost effort, to put OCO-2 inferred regional fluxes from the pan-Arctic domain in context of global fluxes and the global carbon budget. Additional investigations using the SIF data from OCO-2 further illustrate the potential for space-based observations for providing new insights into Arctic-Boreal carbon cycle dynamics. This is of high interest to the community, especially as we prepare to look at data from ESA’s CO2M satellite constellation and JAXA’s GOSAT-GW mission. The presentation will finally conclude with a discussion on the need for integrating these atmospheric CO2 information with other environmental datasets in order to obtain a truly integrated picture of the Arctic-Boreal system and identify its most sensitive parts, i.e., parts of the system in which carbon cycle responses will lead to substantial positive, or modifications of negative feedbacks, to the climate system.

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