

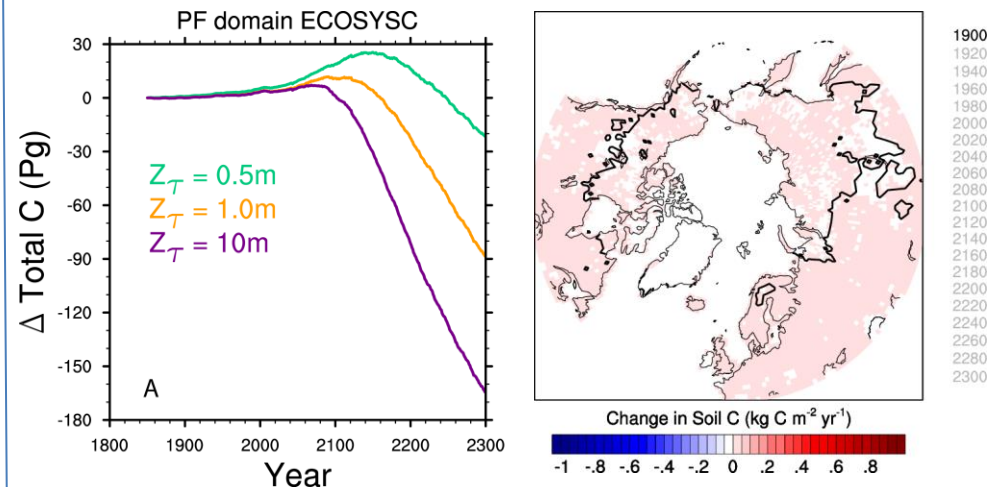
Understanding the Controls on the Magnitude of the Permafrost Carbon–Climate Feedback

Objective:

Quantify the carbon cycle dynamics of the permafrost region under a warming climate, and understand the roles of deep C lability and carbon–nitrogen interactions in determining the magnitude of the permafrost carbon–climate feedback.

Research:

Use CLM4.5-BGC, which allows for interactions between thawing permafrost, mineralization of C and N from decomposing permafrost soil and vegetation feedbacks, under a transient, offline, RCP 8.5 warming experiment to 2300. Identify N controls by comparing C–N and C-only versions of the model; and quantify role of deep C dynamics by varying a parameter that controls role of depth on



Impact:

Permafrost soils are a potentially large component of the terrestrial carbon cycle response to warming, which are only recently available for understanding their dynamics in ESMs. Including these processes allows CLM4.5-BGC to predict the magnitude of the permafrost carbon–climate feedback, which is a potentially large fraction of global feedbacks on long timescales.

Reference: Koven, C. D., D. M. Lawrence, and W. J. Riley (2014), Permafrost carbon–climate feedback is sensitive to deep soil carbon decomposability but not deep soil nitrogen dynamics, *Proc. Nat. Acad. Sci.*, 112(12):3752–3757, doi:10.1073/pnas.1415123112.