Status of NGEE-Arctic Track 2 Model Development: Incorporating Dynamic Topography in Fine-scale Models

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NGEE-Arctic is developing a process-rich hierarchical modeling framework to better estimate carbon releases from warming Arctic tundra. The scaling framework includes a climate-scale model and intermediate- and fine-scale models. Development of the fine-scale model is proceeding on two tracks characterized by static topography (Track 1) and dynamic topography induced by ice-wedge thawing (Track 2). Computational challenges associated with dynamic topography will be summarized. Dynamic unstructured mesh infrastructure, spatial discretization schemes that maintain accuracy on distorted grid cells, and careful attention to soil energy and water balances in the dynamic meshes have been identified as requirements (Painter et al. 2012). A numerically tractable representation of thaw-induced topographic changes based on calculated melt volumes of subsurface ice will be described. Prototype simulations using the Arctic Terrestrial Simulator (Coon et al. 2012) will also be presented.

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