



## **Simulating soil organic carbon in yedoma deposits during the last glacial maximum**

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Substantial quantities of organic carbon (OC) are stored in the thick, ice-rich and organic-rich silty sediments called yedoma deposits, distributed in Eastern Siberia and Alaska today. Yedoma deposits were accumulated during tens of thousands of years of the last ice age, under very dry and cold conditions favoring dust deposition and hill-slope erosion to build up thick deposits in unglaciated lowlands and hillslopes. Quantifying yedoma carbon stocks during the glacial period is important for understanding how much carbon was stored on land and, subsequently, how much could have been decomposed during the last deglaciation. Yet processes that yield to the formation of thick frozen carbon stocks in yedoma deposits are missing in land carbon cycle models. Here we incorporate sedimentation parameterizations into the ORCHIDEE global land surface model that was run across the Northern Hemisphere with Last Glacial Maximum (LGM) climate conditions. Sedimentation coupled to vertical mixing of soil carbon by cryoturbation and frozen soil hydrology led to reasonable modeled OC vertical distribution and regional budgets, compared with site-specific observations and inventories for today's non-degraded yedoma region. Simulated total soil OC stock over the full depth in the model (0-47.5m) for the northern permafrost region during the LGM is 1536~1592 PgC, including non-yedoma frozen carbon (1146 PgC) and yedoma OC within today's yedoma region only (390~446 PgC). This result is an underestimation since we did not account for the potentially much larger area of yedoma during the LGM than present-day.