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Relating inverse-derived basal sliding coefficients beneath ice sheets to basal water supply and other large-scale variables

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Variations in basal conditions that determine basal sliding are important boundary conditions for large-scale ice-sheet models, but remain largely uncertain below modern ice sheets. Previous modeling studies have used relatively sophisticated inverse control methods to deduce patterns of basal stress or roughness, fitting to observed velocities. Here a much simpler method is used, running the model forward in time and periodically increasing or decreasing the basal sliding coefficient locally depending on whether the model ice elevation is higher or lower than observed. In contrast to our earlier application, the method is applied to Antarctica without any constraints of basal temperature or water availability. Then the deduced pattern of sliding coefficients is related to distributions of basal temperature, water supply, sub-grid-scale topography and other variables, with the goal of deriving an empirical parameterization of sliding coefficients for continental-scale models.
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