

# **Dynamic Stick-Slip at the Base of Ice Sheets Generates Massive Internal Deformation**

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Large basal structures that disturb the normally flat ice sheet stratigraphy and rise as high as 50% of the ice thickness have been observed in both Antarctica and Greenland. We propose that these structures may be formed by dynamic contrasts in basal slip. We use a thermomechanical ice sheet model whose key features include water transport, freezing, and enhanced sliding when the basal temperature nears the melting point. Moving slip contrasts triggered by subglacial water produce large deformed stratigraphic structures, including synclines, anticlines, and overturned folds that resemble observations. Uplift caused by mobile slip contrasts can raise debris into the middle of the ice sheet, possibly delaying melt-out during Heinrich events. Dynamic changes in slip rate cause 100-1000 year long increases in model ice flux.