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South Pole ice stream temporal and spatial evolution in the last glacial cycle

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While considered to be the most stable part of the Antarctic continent, recent studies show East Antarctic ice sheet as a high potential for rapid change and significant sea level contribution. Airborne radar sounding has shown that major ice stream tributaries have disrupted ice at the South Pole, portraying a complex evolution for the East Antarctic ice sheet. We confirm the temporal and spatial extent of these flow regime changes through the analysis of dated internal layers observed using airborne sounding data. Layering is time-registered to the local dust record from ICE CUBE boreholes and the SPRESSO core, which constrains ice stream transient penetration between 50 ka and about 10 ka, corresponding to the last glacial maximum. The ice stream margin position has migrated through time, initially at 10 km grid north of the South Pole, and migrated to the grid south by 40km before shutting off. The active portion of the ice sheet has undergone significant melting, bringing ice from the MIS 5e interglacial very close to the bedrock with respect to the inactive portion to the grid north. Shear heating from the ice stream margin migration is consistent with subglacial lakes previously observed in the area (Peters et al, 2008). This ice stream is further evidence for a substantial, rapid sea level contribution from the deep interior of the East Antarctic Ice Sheet.

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