Flow and Thickness History of Siple Dome, West Antarctica

S.F. Price, H. Conway, E.D. Waddington

University of Washington, Seattle Washington

We use a high-order, transient, thermo-mechanical flowband model to explore possible flow and thickness histories for Siple Dome, West Antarctica. Changes to the model velocity and temperature fields are forced using specified accumulation-rate and surface-temperature histories. Changes are also forced by varying several unknown parameters, including the timing and magnitude of dome thinning, the timing of divide-flow onset, flow enhancement, and accumulation-rate scouring at the divide. Model output is constrained by the depth-age and depth-temperature profiles from the summit core site, the dome surface shape, and internal layer shapes derived from RES. Based on the model fit to these observations, we present a sensitivity analysis of the unknown parameters and a set of favored parameter values. Favored values indicate overall dome thinning of ~350m from 16-2 ka b.p., divide flow initiated at 3 ka b.p. followed by immediate northward migration, flow enhancement, consistent with current observations of crystal fabric, starting at ~7 ka b.p., and minor accumulation-rate scouring at the divide since 3 ka b.p.