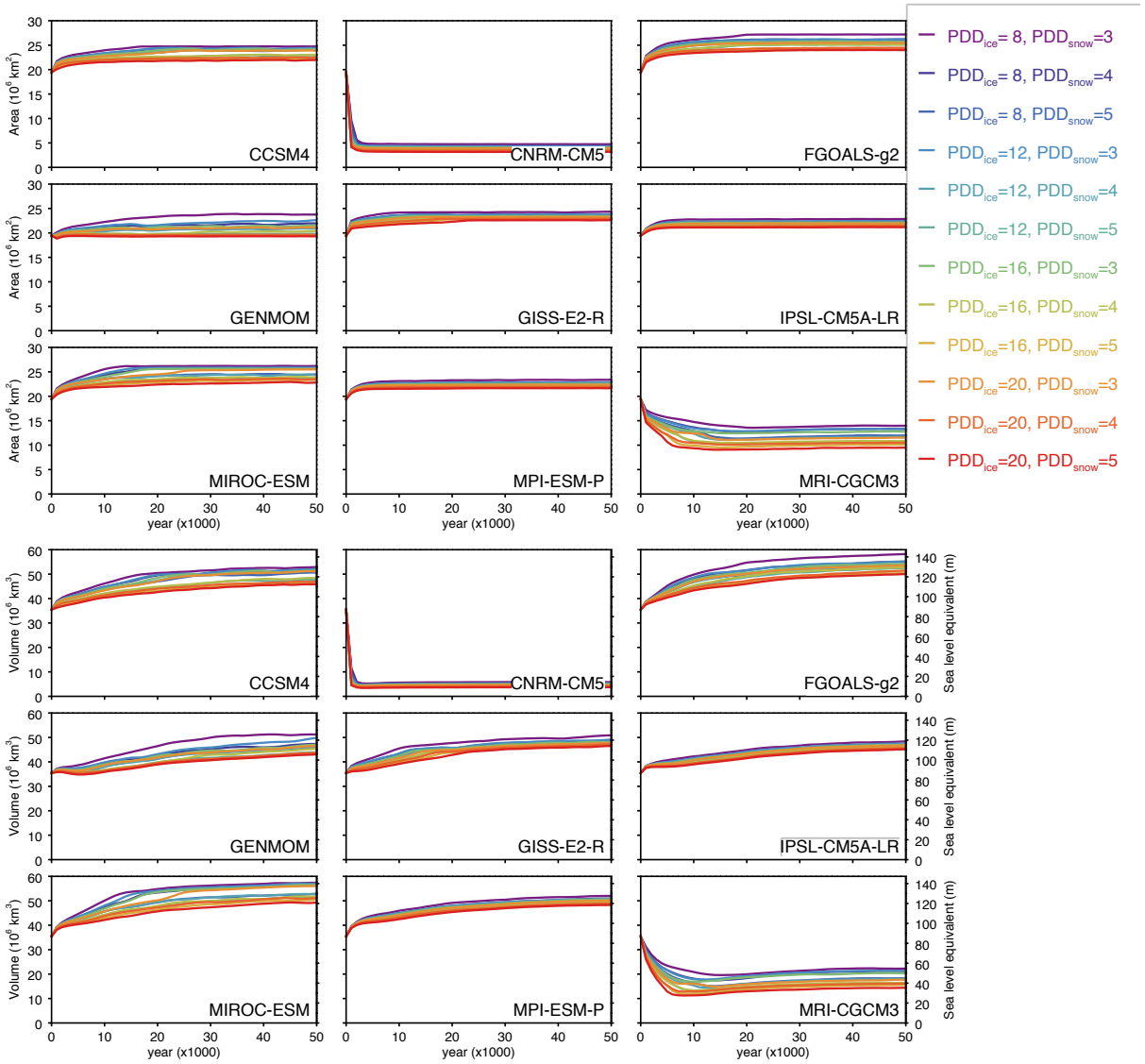

Figure R1. CISM2 time evolution of North American ice area and volume. Sea level equivalent is calculated as the eustatic change from converting land ice to water, using 910 and 1028 kg m^{-3} densities for ice and water respectively, assuming an ocean area of 360 768 576 km^2. This figure will be included in the revised manuscript SI.

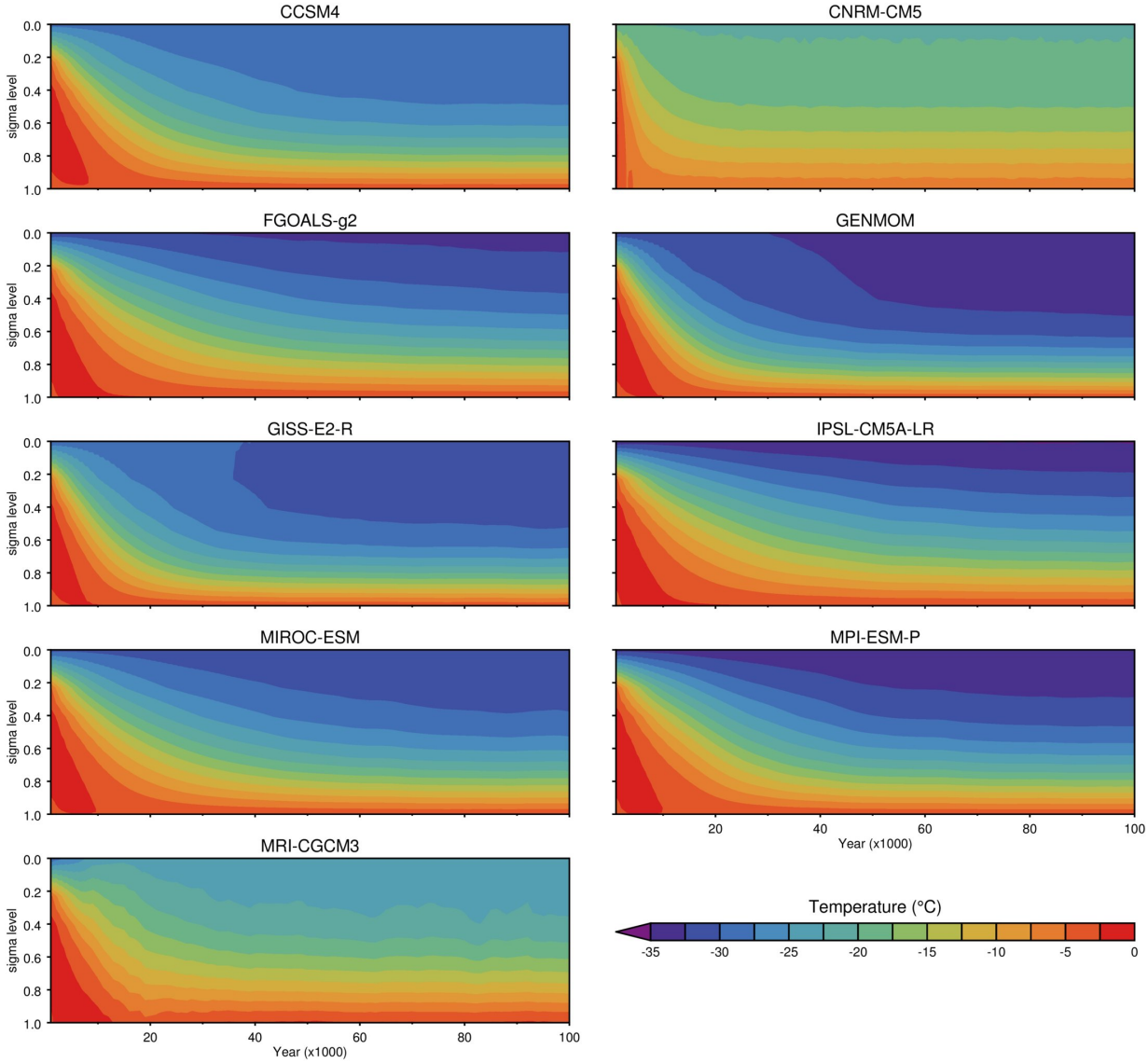

Figure R2. Time evolution of the temperature profile over 100,000 simulated years. Temperature is spatially averaged over a 20x20 grid cell box in the center of the Laurentide Ice Sheet [lower left 102.28°W, 56.68°N; lower right 89.93°W, 56.77°N; upper right 88.89°W, 63.64°N; upper left 103.91°W, 63.51°N]. Sigma level = 1 is the bottom of the ice sheet and sigma level = 0 is the top. This figure will be included in the revised manuscript SI.

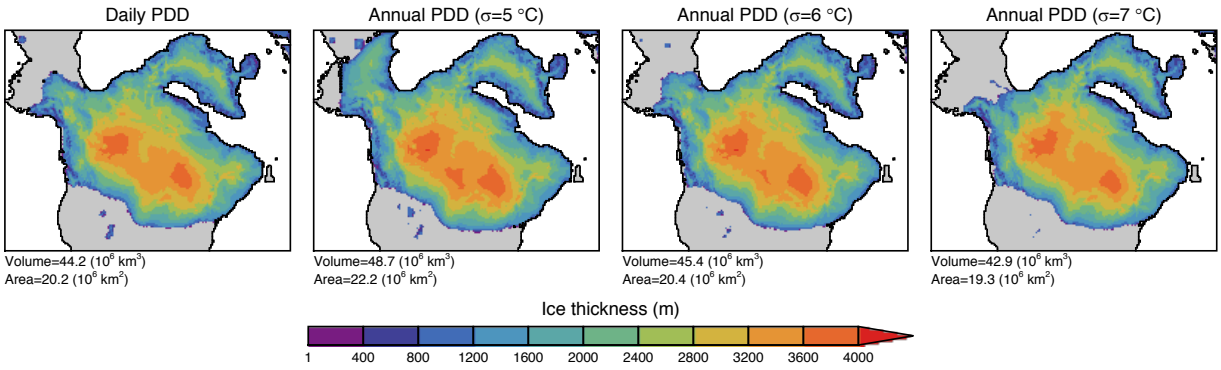

Figure R3. CISM2 sensitivity tests comparing 50 years of daily input from GENMOM using the daily PDD scheme to monthly climatology input from GENMOM using the annual PDD scheme with multiple parameterizations of daily temperature standard deviation (σ). PDD_{ice} = 16 mm d^{-1} °C, PDD_{snow} = 4 mm d^{-1} °C, 60% of snowmelt refreezes. Additional daily PDD parameters (e.g. snow density and fraction of rainfall to snowfall) are set to CISM2 defaults. All other parameters follow Table 1 in the main text. Ice thickness is sampled after 50,000 years of simulation. This figure will be included in the revised manuscript main text.

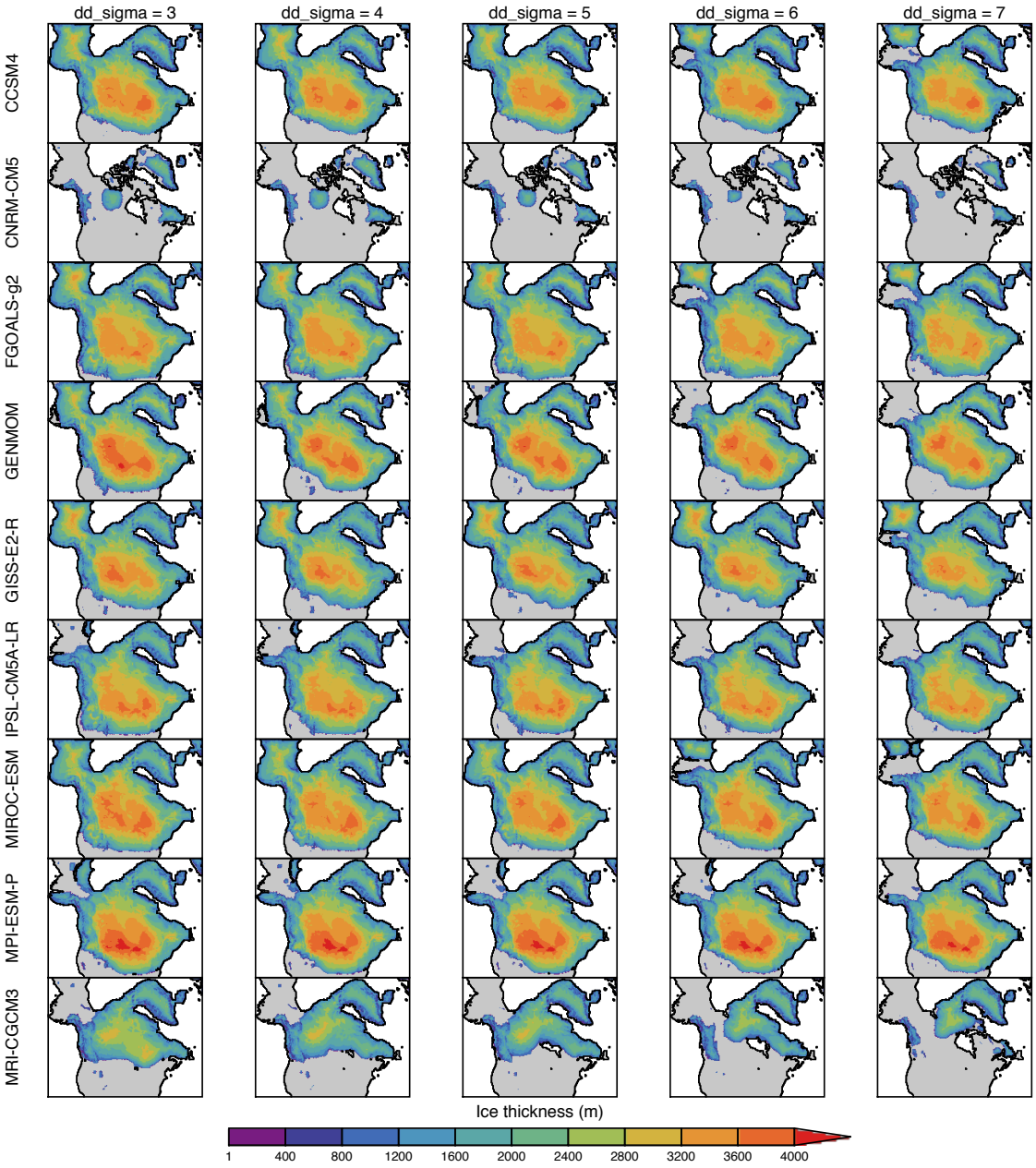

Figure R4. Sensitivity tests of ice sheet thickness using different parameterizations of daily temperature standard deviation (dd_sigma) after 50,000 years of simulation. The annual PDD scheme is used with PDD_{ice} = 16 mm d^{-1} °C, PDD_{snow} = 4 mm d^{-1} °C. Parameters follow Table 1 in the main text.

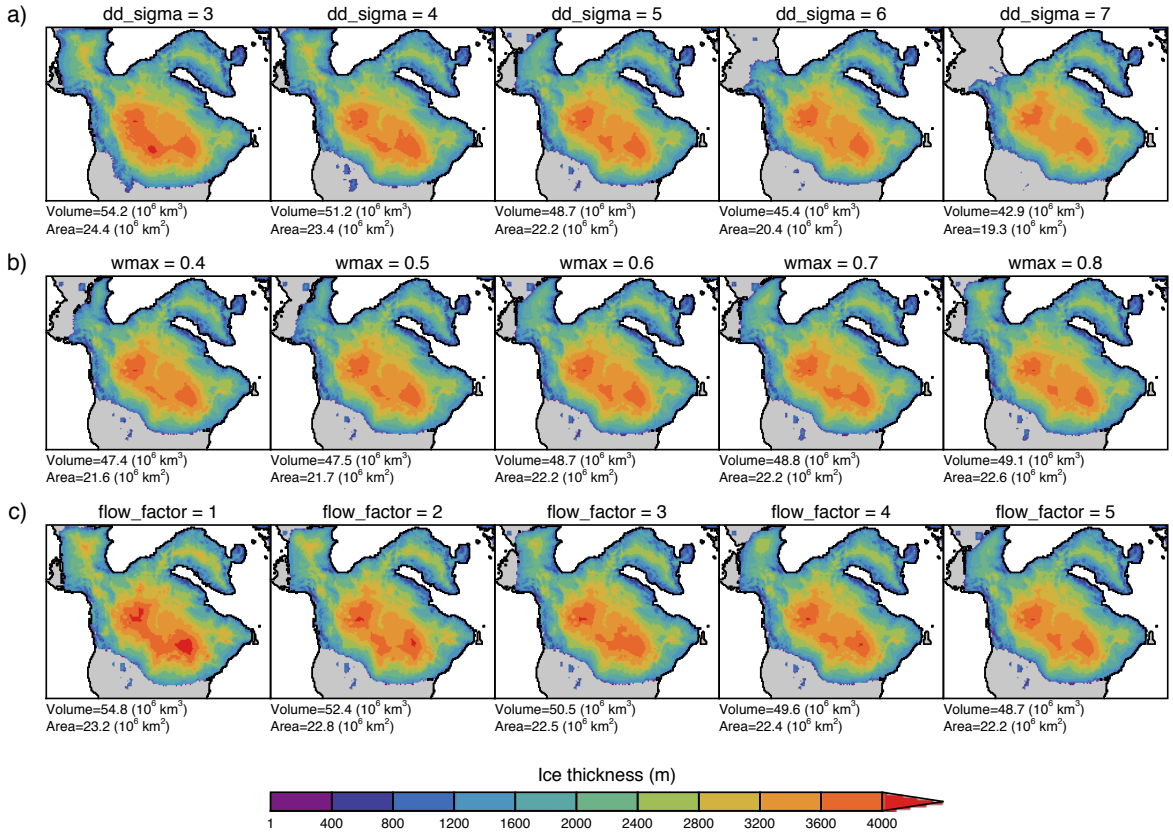

Figure R5. Sensitivity tests of ice sheet thickness using different parameterizations of a) daily temperature standard deviation (dd_sigma), b) the fraction of snow that refreezes (wmax) and the c) ice flow factor. GENMOM is used as input to all simulations and ice thickness is sampled after 50,000 years of simulation. The annual PDD scheme is used with PDD_{ice} = 16 mm d^{-1} °C, PDD_{snow} = 4 mm d^{-1} °C. Unless otherwise specified, parameters follow Table 1 in the main text. This figure will be included in the revised manuscript SI.