## The contribution of Humboldt Glacier, North Greenland, to sea-level rise through 2100 constrained by recent observations of speedup and retreat: Supplemental Information

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**Figure S1:** Results of tuning runs for von Mises stress calving law for  $q=\frac{1}{5}$  (a) and  $q=\frac{1}{7}$  (b). RMS velocity misfits are normalized by the maximum misfit in each velocity band, for ease of visualization. Modeled velocities and margin positions are compared with observations from 2017–2018 (Joughin et al., 2018). Values of  $\sigma_{max}$  chosen for century-scale projections are listed in Table 1. Slight horizontal offsetting of colored dots is to ensure visibility when multiple velocity bands have the same normalized RMS misfit value.



**Figure S2:** Results of mesh convergence test with smoothed ice thickness and bed topography in terms of change from the initial condition. The 1-10km mesh gives similar results to the 0.5-10 km and 0.25-10 km meshes.



**Figure S3**: Snapshots of velocity and grounding line position at 2050 for 2017 calving front (a) and von Mises calving runs with low (b), medium (c), and high (d) threshold stresses. Top and bottom rows of each set of subpanels correspond to basal friction law exponents of  $q=\frac{1}{5}$  and  $q=\frac{1}{7}$ , respectively.



**Figure S4**: Snapshots of velocity and grounding line position at 2100 for 2017 calving front (a) and von Mises calving runs with low (b), medium (c), and high (d) threshold stresses. Top and bottom rows of each set of subpanels correspond to basal friction law exponents of  $q=\frac{1}{3}$  and  $q=\frac{1}{7}$ , respectively. Several small areas outlined in light cyan indicate ice flow speeds  $\geq 3$  km yr<sup>-1</sup> (i.e., faster than imposed maximum calving rate).



**Figure S5**: Comparison of simulations from 2007–2021 with undercutting active (blue) and undercutting inactive (pink) for the medium  $\sigma_{max}$  case (see Table 1 in main text). While undercutting is not a large direct contribution to the mass budget (Figure 6 in main text), its control on calving is significant.



Figure S6: Same as Figure 4 (a-c) in main text, but with upper bound mass loss scenarios (5 km yr<sup>-1</sup> calving rate limit) included in lavender.