Figure S1. Decadal VIC SMB modeled by SEMIC with a fixed present-day ice mask from four ESMs identified by line style (legend). Colors indicate Historical (magenta), G4 (red), RCP4.5 (blue) and RCP8.5 (black) scenarios.
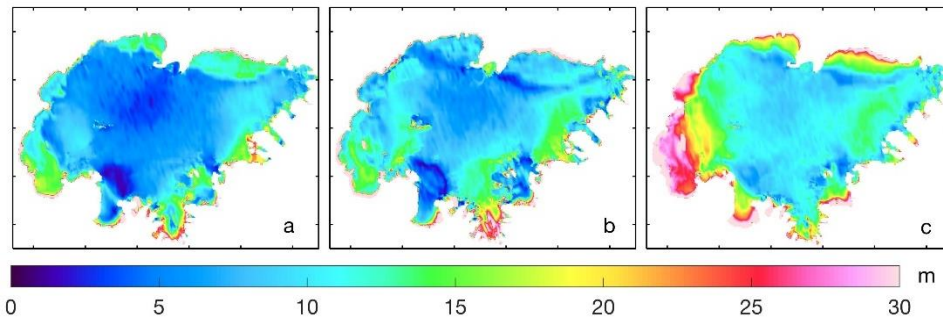

Figure S2 Standard deviation of ice thickness change by dynamics from four ESMs during 1982-2089 under G4 (a), RCP4.5 (b) and RCP8.5 (c) scenarios.
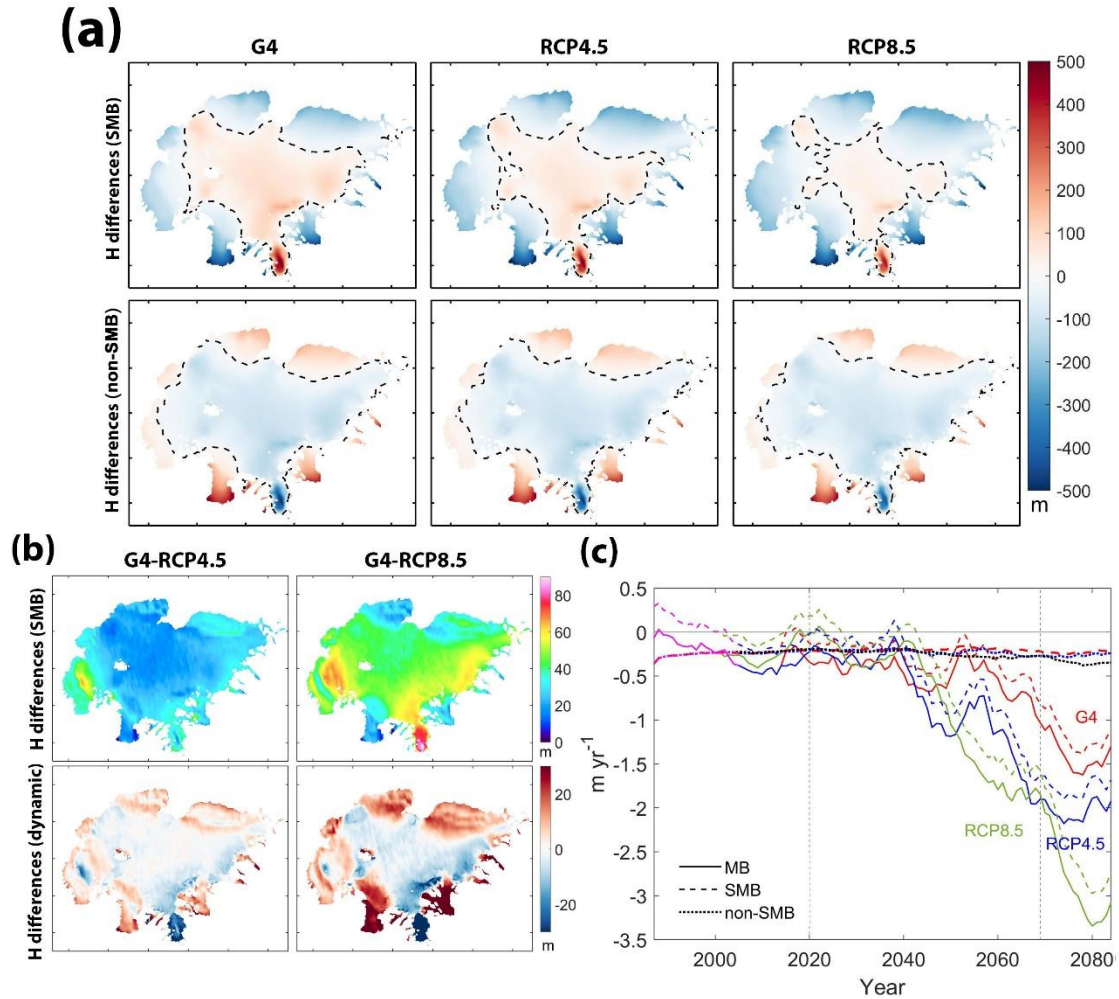
Figure S3. a) Ice cap height differences by BNU-ESM, 2089 minus 2020 caused by SMB (first row) and non-SMB (i.e., ice dynamics and basal melting, (second row)) calculated as the difference between MB and SMB, under the G4, RCP4.5 and RCP8.5 scenarios. No change is marked by the dashed black curves. b) Differences (G4-RCP4.5 and G4-RCP8.5) in ice cap thickness from BNU-ESM by 2089 due to SMB (first row) and ice dynamics (second row). c) Decadal ensemble means of modeled mass balance (solid curves), SMB (dashed curves) and non-SMB (dotted curves) by BNU-ESM under historical (magenta), G4 (red), RCP4.5 (blue) and RCP8.5 (green) scenarios. The vertical lines denote the beginning and the end of SAI geoengineering.
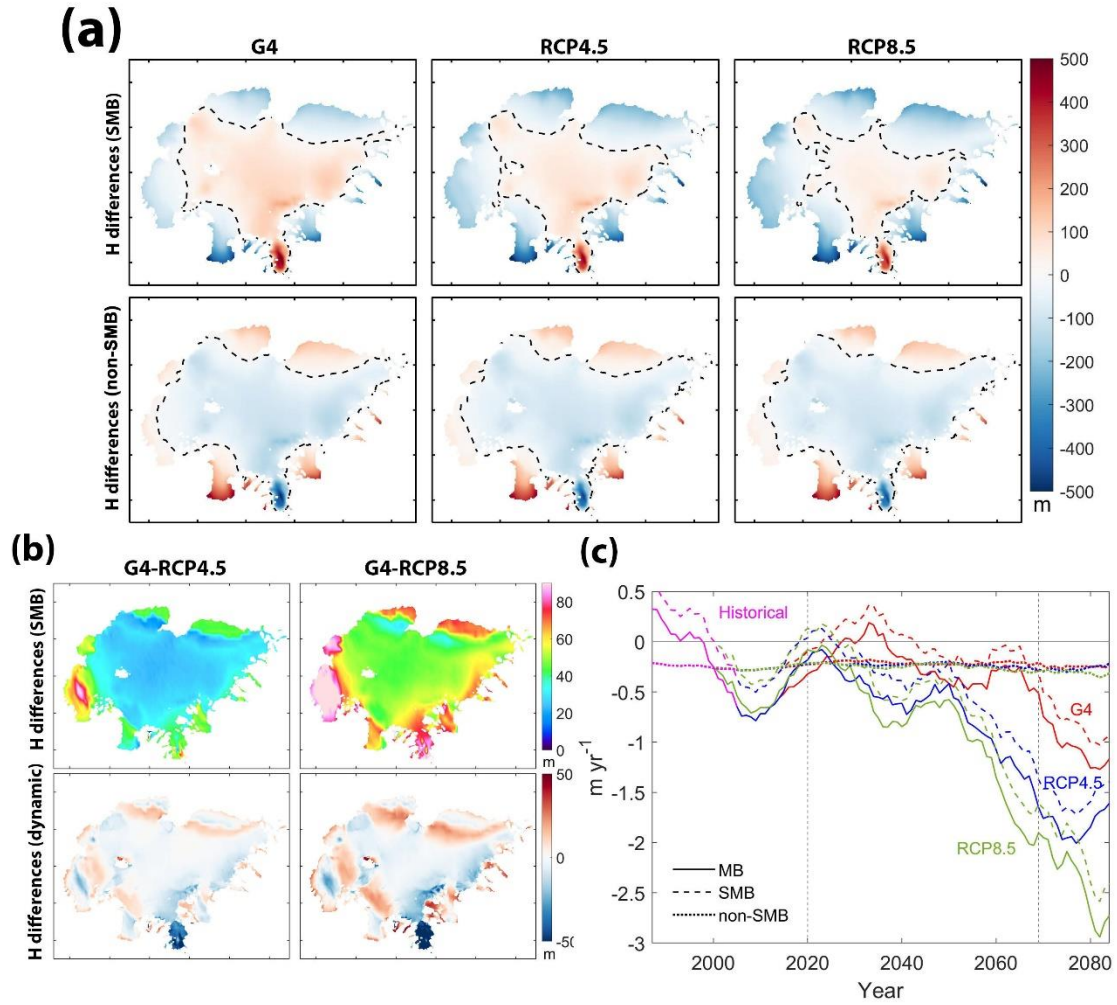
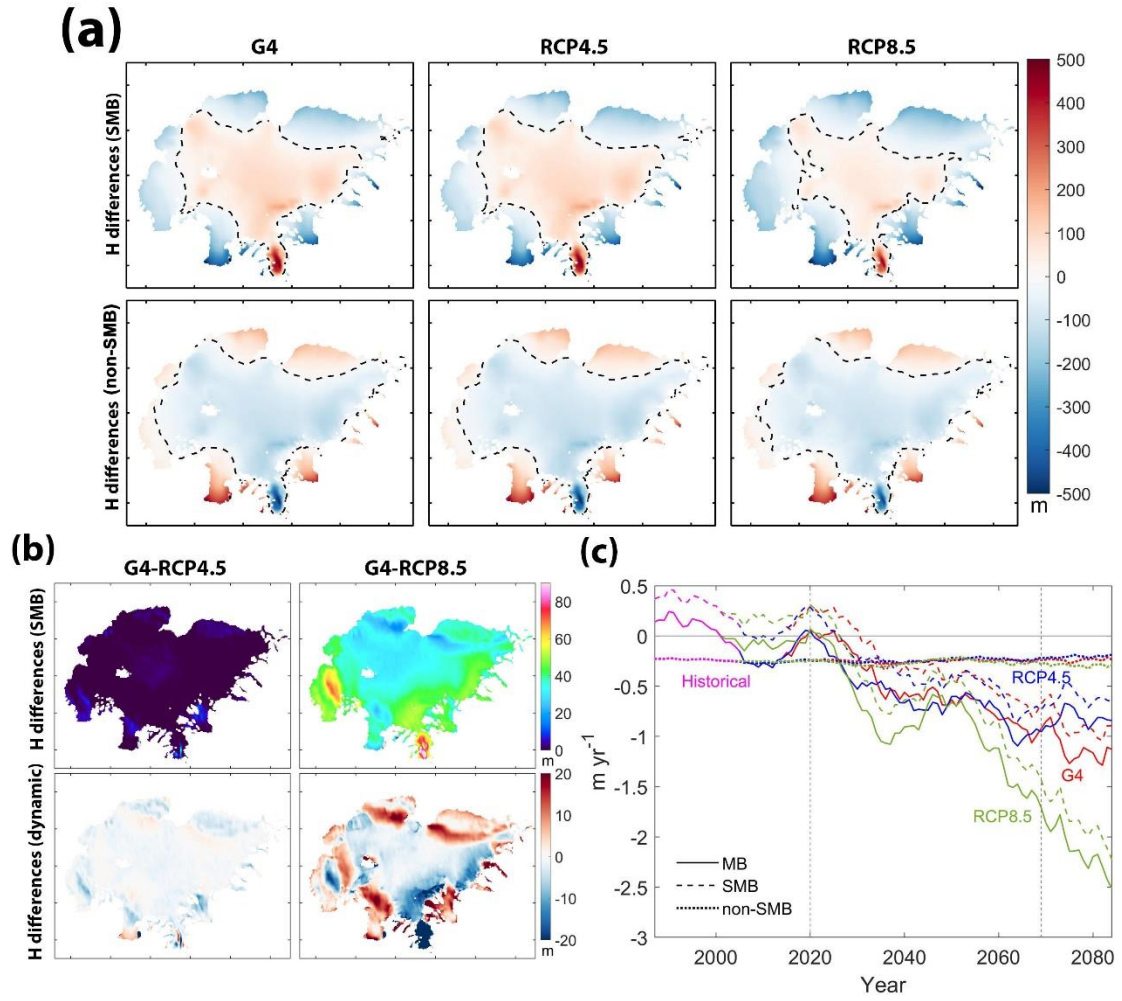**Figure S4.** Same as Figure S3, but for HadGEM2-ES.
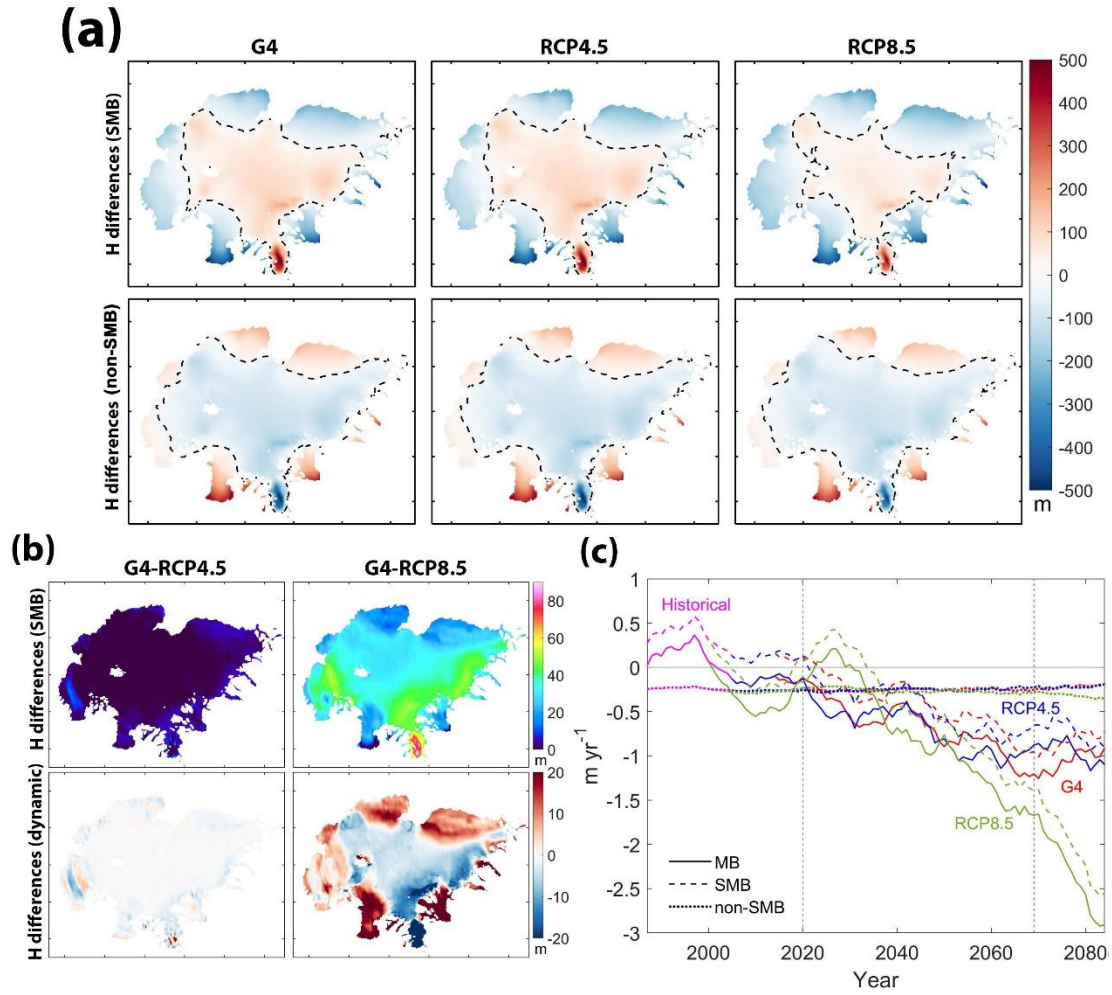
Figure S5. Same as Figure S3, but for MIROC-ESM.

Figure S6. Same as Figure S3, but for MIROC-ESM-CHEM.