Impact of bed geometry on the future projections of ice sheet melting and sea level rise

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The impact of improved bed geometry on the future projections of ice sheet melting and sea level rise is investigated. The high-resolution bed geometry BedMachine dataset based on the mass conservation method using newly measured bed elevation from the flight track airborne radar is compared with the Bedmap2 targeting the Drygalski Ice Tongue and David Glacier, East Antarctica. The 2-dimensional (2-D) shallow shelf approximation model (MacAyeal, 1989), which is implemented in the Ice Sheet System model (ISSM) (Larour et al., 2012) is used. At first, we conducted the idealized scenarios of the atmospheric and oceanic forcings including surface mass balance, floating ice melting and ice front retreat for future projections. Sensitivity experiments are conducted to verify the significant differences induced by changes in model. A series of projected simulations are compared to explore the role of forcing scenarios on the grounding line migration, surface mass balance and sea level contribution. Second, the future projections based on the IPCC RCP(Representative Concentration Pathway) scenarios from 17 CMIP5 CGCMs are carrried out. From 1950 to 2100, 39, 70, 31, and 43 ensemble experiments with RCP2.6, RCP4.5, RCP6.0 and RCP 8.5 scenarios are conducted, respectively. The changes in ice velocity and ice thickness are analyzed and global sea level changes from this region are projected. The global and regional implication of these changes are investigated.

Key words: Bed geometry, future projection, ice sheet model