The impact of the ice-ocean interaction on the future projection of global sea level rise

미래 해수면변동에서 빙상-해양 상호작용의 효과

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The polar ice sheet continuously interacts with the atmosphere-ocean system and it can affect the sea level change and, in turn, climate change. Even though better future projection of global climate change requires the rigorous understanding on the interactions in cryosphere, the technology level of the ice sheet modelling is rather limited for this region. IPCC AR4 (2007) sea level rise projections excluded the future dynamical changes in ice sheet flow, because no ice sheet model could reproduce the recently observed changes occurring on the Greenland and Antarctic ice sheets. The largest uncertainty in projections of future sea level change comes from the errors in ice sheet model. Under these circumstances, new modeling activity in KOPRI is initiated to predict the tipping point for the irreversible Antarctic melting and unstoppable sea level rise. The main goal of our group is to reduce uncertainties and enhance predictability of future sea level rise by improving the ice sheet model by intensifying our understanding on the ice sheet processes and dynamics based on field observations. At first, we tested the idealized scenarios of the oceanic forcings including floating ice melting and ice front retreat for future projections 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. 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. Coupling the ice sheet model with the interactive ocean component is considered to improve the model performance.