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Focus on the base - Sensitivity study of Totten glacier to basal topography, sliding law and resulting friction using BISICLES

Konstanze Haubner, Sainan Sun, Lars Zipf, and Frank Pattyn
Université libre de Bruxelles, Laboratoire de Glaciologie, Bruxelles, Belgium (khaubner@ulb.ac.be)

Over the last decade, studies investigating ice loss of the Antarctic ice sheet primarily focused on West Antarctica where most changes are currently observed (Shepherd et al., 2018, DeConto and Pollard, 2016). While ice flow in East Antarctica has been reported to be stable over the last decade (Gardner et al., 2018), recent studies (Miles et al., 2013; Rintoul et al., 2016) point to significant ice flow acceleration and thinning across Wilkes basin and Totten Glacier areas.

Short-term (decadal) simulations of changes in ice flow and mass are highly dependent on model initialisation and the datasets employed, as recently exemplified by InitMIP Greenland and Antarctica (Goelzer et al., 2018; Seroussi et al., submitted). Furthermore, changes in initial conditions are expected to be different for different velocity/topography datasets and initial response of the ice-sheet system to forcing on short time scales can be highly varying according to the sliding law employed (Gillet-Chaulet et al., 2016). However, initialisations can greatly benefit from improved time series in surface topography and velocity, decreasing uncertainties in forced response on decadal time scales.

This study focuses on the present-day initialisation of the Totten glacier catchment using the BISICLES model (Cornford et al., 2013). We employ three different data sets of bed topography (Bedmap2, Bedmachine, unpublished data) and varying sliding laws and compare the misfit of simulated velocity to observed velocity fields.
The aim of the study is to find an initialisation providing least noise for future simulations. Further, we discuss the possible variation in simulated ice thickness and velocity given the same ice flow model.