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C061-0010 - Sensitivity of modelled englacial and subglacial conditions depending on boundary conditions

Wednesday, 16 December 2020

21:00 - 13:59

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Abstract

Englacial and subglacial conditions have been observed through drilling borehole, however, a direct observation is expensive and provids limited information in a specific location. On the other hand, many researchers utilized indirect methods, such as satellite altimetry, air-borne radar, and simulating thermos-dynamic model, for estimating englacial and subglacial conditions, however, these results should be calibrated with direct observation. Geothermal heat is one of key factor controlling subglacial and englacial condition, however, velocity field also affects thermos-dynamic model. Here, we use state-of-a-art thermos-dynamic model for simulating englaical and subglacial conditions compared to 14 observed borehole temperatures. We design 6 experiments with three geothermal heat datasets, and two vertical velocity estimates from plugin flow and incompressible assumption, respectively. Results show that the vertical velocity from plug-in flow model dominating that from the diffusion effect at base infers warmer base compared to incompressible assumption. Although the increase in geothermal heat enhance the basal temperature in plug-in flow assumption in general, it is not enough to melt in cases of Siple Dome and Dome Fuji. As a result, total grounded melting area is much larger in plug-in flow model. All experiments show that grounded ice melting are concentrated at fast flow region, where frictional heat contributes larger heat source than geothermal heat.

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