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Geoscientific Model Development Discussions

# *Interactive comment on* "RIMBAY – a multi-physics 3-D ice-dynamics model for comprehensive applications: model-description and examples" *by* M. Thoma et al.

**M. Thoma et al.**

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Dear Helene Seroussi,

many thanks for your encouraging comment on our paper and your suggestions for improvement.

According to your suggestions we will add the Hutter (1983) and Morland (1987) citations for SIA and SSA, respectively, in the revised version of the manuscript (The MacAyeal (1989) reference was already given).

We also will add a new paragraph in the conclusion-section, where we shortly classify



RIMBAY with respect to the other state-of-the-art ice models you mentioned. We include the preliminary version of this paragraph below, so you might have the chance to comment on it if you like.

Sincerely, Malte Thoma (and Co-authors)

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Several numerical ice flow model codes have been developed over the past ten years. In particular, the more recent finite element (FE) approaches to solve the FS equations, as implemented in the Ice Sheet System Model (ISSM, Larour et al., 2012) and ELMER/ICE (e.g., Zwinger et al., 2007; Gillet-Chaulet et al., 2012), are very promising. There ability to adjust the spacial grid resolution with respect to the area under investigation is very useful. Their main drawbacks are currently the computational resources needed, which prohibit long term projections on millennial time scales, and that (at least to the author's knowledge) there is no general concept of moving grids, which could adjust along a migrating area of investigation.

Well-known thermomechanical finite difference (FD) ice models are the Community Ice Sheet Model (CISM, based on the GLIMMER; Payne, 1999; Rutt et al., 2009; Bougamont et al., 2011; Lemieux et al., 2011), the Parallel Ice Sheet Model (PISM; Martin et al., 2011; Winkelmann et al., 2011), the PennState3D ice-sheet/shelf model (PennState3D, Pollard and DeConto, 2012) and the SImulation COde for POLythermal Ice Sheets (SICOPOLIS; Greve, 1995; Sato and Greve, 2012). A recent overview about the most uptodate ice sheet models is given by Bindschadler et al. (2013). All these models have shown their flexibility in several applications. However none of these coupled SIA/SSA models has the potential to simulate selected domains (e.g. the vicinity of grounding lines or ice streams) within a larger (e.g., continental scale) area with a (potentially migrating) FS approach. Therefore RIMBAY can fill a gap between several demands of the ice-sheet modelling community.