

Interactive comment on “Ice thinning, upstream advection, and non-climatic biases for the upper 89% of the EDML ice core from a nested model of the Antarctic ice sheet” by P. Huybrechts et al.

P. Huybrechts et al.

Received and published: 31 August 2007

Our response to the comments in bold

This paper presents a chronology of the EDML ice core constructed from a nested ice flow model. This model consists of a higher-order ice flow model nested into a large scale model of the whole Antarctic ice-sheet. From the results, the non-climatic bias, introduced, firstly, by the change of the surface elevation and, secondly, by the difference between the actual surface elevation at the drilling place and the surface elevation at the place of deposition are evaluated. Based solely on a flow model with no constraint from any age markers, the proposed chronology is found to be very close to the official EDML1 chronology. This is a good paper, very well presented, and which

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contains an interesting modeling approach to date the EDML core. I think this paper can be published as it is, and I have only minor remarks/corrections for the authors.

Thank you

line 5 : annual accumulation rate should be given in cm yr^{-1} of ice equivalent as in line 22 and in Figure 2.

Done

paragraph 2.3: it is not really clear if the FSM is run diagnostically (only Stokes) or prognostically (Stokes and free surface)? Some complements relative to the value of the physical parameters adopted for the models should be given (may be in the form of supplement material), like the viscosity, enhancement factor depending or not of the period of deposition, the temperature dependency of the viscosity, the sliding parameter, the conductivity, . . . Are they identical in both models? Also, regarding the time step, is the FSM runs with the same time step than the LGM model?

On p. 697, line 18 we mention that FSM only computes the diagnostic velocity field; the free surface is calculated in LSM and applied under the form of differences onto the currently observed ice thickness and surface elevation in FSM. Temperature is also calculated in LSM as mentioned on p. 697 (line 17) and interpolated onto the FSM grid using cubic splines (as written on p. 699, line 26). The FSM and LSM models are described in full detail in Pattyn (2003), Huybrechts and De Wolde (1999) and Huybrechts (2002), and references therein, including all equations and model parameters. There is no need to repeat all those details again here. Here we only mention the few changes with respect to these papers. The most important change is that FSM uses the same laws for ice deformation and basal sliding with the same parameters than LSM, albeit with a slight adjustment of the 'enhancement factor' to a value of 1.2 from the earlier published value of 2. The time step of LSM was mentioned on p. 698, line 13 (1 year) and for FSM on p. 703, lines 13 and 25 (every 100 years). We have substantially revised

§2 to address this comment and those from referee 1 and the editor.

page 707, line 11: m/yr should be m yr-1

Done, but kyr was mentioned instead of yr.

Interactive comment on Clim. Past Discuss., 3, 693, 2007.

CPD

3, S558–S560, 2007

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