

General comment

Deriving climatological information from ice-cores is one of the most important issues in the present earth science field because the knowledge of the past climatic variation for the latest one million years recorded in ice-cores helps us know future trajectory of the climate of earth, especially, which is crucially important in global warming. This study develops an improved method of Bayesian model to apply to dating of ice-core data. The activity is worth because it let us have more objective discussion on climatic variation. The challenge and the results are interesting to both the statistical science and earth science while this journal is based upon the statistical science. Thus, I would like to recommend to publish this paper. Minor comments and some questions are given below.

Minor comments

(1) P. 940, lines 22-23

Before this sentence, please put a brief explanation why the age-depth relationship is created because statistical scientists may not follow the present description.

(2) P. 942, line 12

Units? Although I think the statistics does not need them, the authors put the physical image here.

For example, z [cm], $A(z)$ [cm/year], $\Theta(z)$ (no unit), ξ [year]

(3) P.944, line 17

The “denoted by by Az ” should be replaced with “denoted by Az ”.

(4) P.946, line 16

The “the $\delta^{18}\text{O}$ data $\delta^{18}\text{O}$ are” should be replaced with “the $\delta^{18}\text{O}$ data are”.

(5) P.954, lines 7-9

Is A_0 here estimated purely by this model without any observational information of accumulation such as Kameda et al. (2008)?

In this statistical model, do some conditions under the surface affect the estimation of the present surface accumulation, A_0 ?

While $A(z)$ is estimated by this model, is it right that $A_0=A(0)$?

(6) Figure 2

Each line is not distinguished in the figure because the difference between the 10th and

the 90th percentile is too small, which is found in Fig.3. But I think it is better this situation is explained here.

(7) P.955, lines 4-5

I think that the difference between 10th and 90th percentile should be zero at each tie point because the tie points indicate accurate date. But why do the differences not become zero?

(8) P.955, lines 6-10

As for Fig.4, what is the reason that the uncertainty gets smaller toward the bottom?

(9) P.956, line 15

The “pvovides” should be replaced with “provides”.