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Discussions

Interactive comment on "Ice crystal c-axis orientation and mean grain size measurements from the Dome Summit South ice core, Law Dome, East Antarctica" *by* A. Treverrow et al.

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General comments:

The paper presents some data obtained along the Dome Summit South ice core, Antarctica, during the field seasons 1991-92 and 1992-93. These data consist of c-axis orientation measurements (textures) and mean grain size obtained on thin sections performed between 117 m depth and 1196 m depth. The measurements were performed in the field with the equipment available at that time, namely Rigsby stage for c-axis orientation data, and digitalised polaroid photographs for the grain size evaluation.

The DSS ice core site and its characteristics (mean temperature, accumulation, location...) are presented and the measurement techniques are detailed. Then the data are briefly shown on two figures and the data files that will be made available are detailed.

- Since the authors clearly explain the fact that there exist now modern tools to perform similar measurements (Automatic Ice Texture Analyser for instance) with a much higher spatial and angular resolution, we could expect more comments about the way to compare the presented data and the one that are nowadays measured. This could be important while willing to use the data in modern flow model that integrate the texture and its evolution within flow laws (Gagliardini et al. 2009, Bargmann, Seddik and Greeve 2011 for instance). In particular, the "old method" only enables to estimate 1 orientation per grain, and therefore does not account for the grain size effect on texture. It was shown by Gagliardini et al. 2004 (J. Glaciol. 50) that it can induce a noticeable effect on the texture evaluation. Such analysis of the limitation of the data set would greatly enhance the quality of this paper, and help people to know how they can use them. In particular, a comparison with some data measured with a modern analyser on a few characteristic sections (small grains, large grains areas) would help and enable to know if the DSS data obtained here can be used quantitatively or not.

- In the same idea, a large scattering of the c-axis orientation data is observed in figure 2. An evaluation of the error bar associated with the measurement would enable to see whether this scattering is due to the data itself (high accumulation zone, more impact of the layering of the snow mantle...), or to the limitation of the measurement technique and conditions. Durand et al. 2006 (J. Glaciol 52) techniques could probably be used to estimate a standard deviation of the second order tensor eigenvalues due to the limited number of grains. With modern AITA measurement, this limited number of grains effect was shown to be the main source of error by Montagnat et al. 2012 (EPSL).

- Concerning the grain size measurements, the authors could also comment on the fact that the technique they used can be considered, or not, close enough to modern techniques (based on the calculation of the number of pixels in each grain, via seg-

mentation) to enable direct comparison with recent measurements. Could the authors also comment on the impact of selecting 100 grains? Is there any bias, related to the fact that one will more easily chose the larger grains, is it operator dependant?

- Although we do not expect this paper to provide a deep scientific analysis, the authors could add in the figures 2 and 3 some climatic data, or at least locate the climatic transitions along the core, and give an idea of the dust content variation with depth? This could provide a first rough view of the interest a reader could have in using the data for further studies and comparison with other ice cores.

Specific comments:

- abstract line 5: "the" appears twice - p2 line 20: in most large scale ice sheet model, ice is considered as a viscoplastic material whose flow is modeled by the Glen flow law. And not a viscoelastic fluid! - p3 line 32: "orientationS" - p6 line 30: A1 and A2 are not defined - p6 line 7: maybe mention Russell-Head and Wilson 2001, J. Glaciol - p6 line 9: "the ability TO spatially map..." - p13 line 24: could you please show an example of the figure described?

Data files: the .mat matlab file is very easy to use and contains all the required information.

Since there exist only one DSS core, the data are unique and cannot be reproduced.

As a conclusion, I would recommend the publication of this paper since it provides data and the frame in which they where obtained, that could be of use for qualitative comparison between ice cores. It would nevertheless be important to answer the general comments mentioned before in order to enable a better understanding of the data, and therefore a clear idea of how they can be used, in particular in comparison with most recent data, or in the frame of ice flow modeling.