

***Interactive comment on “Spatial and temporal  
variability of snow accumulation in Dronning  
Maud Land, East Antarctica, including two deep  
ice coring sites at Dome Fuji and EPICA DML” by  
S. Fujita et al.***

**Anonymous Referee #1**

Received and published: 15 September 2011

General comments:

The paper deals with various accumulation measurements during the Japanese-Swedish IPY traverse in Dronning Maud Land, East Antarctica. The mass balance of Antarctica is an important factor in the discussion of sea level rise and has to be determined as exactly as possible, which is still a challenge due to the size and harsh conditions of the continent. The here presented study presents new surface mass balance data covering a large area in Dronning Maud Land, mainly based on snow pits, firn cores, and radar measurements. The mass balance is also related to wind con-

C943

ditions in the respective areas. The study yields interesting and valuable new results and is definitely worth and suitable to be published in TC. The applied methods are mostly sound and earlier work is discussed appropriately. My main concern is the discussion of the wind influence on surface mass balance; this part is not entirely clear and contains some ambiguities/errors. The figures and tables are clear (too small in the printer-friendly version, though). The presentation is generally clear, but not always concise and the structure might be slightly improved. The English language is ok most of the time, but some awkward expressions are found and sometimes it sounds a bit complicated, where easier and shorter expressions could be used. (I am not sure if all co-authors have read the manuscript carefully, but I recommend to have it read by a native speaker in any case.)

Specific comments:

Title: I would stress the traverse character of the data rather than the deep drilling sites, since that implies coverage of a large area, which is of more importance than that two ice core sites are included.

Abstract: “Glaciological data”: see below Counterclockwise windfield: see below

Intro: 2064/12-13: why these time periods? Please explain. 25: surface elevation, slope, and prevailing wind field are not glaciological conditions 2065/9-11: this is a result and should not be part of the introduction, better move it to the results section. 2066/1-2: which reasons? 2066/13: this is not true, they not ALWAYS represent upwind and leeward sides 17: in contrast to: find better expression 2067: 25: why two years lag for Pinatubo? That's not “similarly” to Agung. Please explain. 2068/2: divided by the age difference of the peaks 27: you did not describe the manner of error estimates for the pit studies. ?

Radar: Since my expertise in radar measurements is restricted I won't go into detail here, but leave that to the open discussion.

C944

Wind field: 2073: orientation of surface relief does not necessarily represent the average wind direction, but might just stem from the last storm. 2074: why are you so interested in the relationship between wind direction and wind speed? This does not yield any information about the corresponding precipitation/accumulation/SMB. 20: somewhat lower: give numbers, please. 2076: fig 7: why do you discuss the relationship wind direction- speed? This is not clear. There is no simple relationship between this and SMB. You might have a strong wind-event that erodes the surface to produce the observed sastrugi orientation with net ablation, as well as events with moderate winds that bring relatively high accumulation, but cannot be seen in your investigation of surface structure.

Discussion: I think it would be clearer to show the results from the various SMB data first and then try to explain them using the wind information. The whole paragraph is more confusing than helpful in its present form. Please try to rewrite it a bit more clearly.

2076/23: the wind field has no impact of the flow of maritime air masses over DML, it is a result of the local conditions and general atmospheric flow. 2077/5: this is not necessarily the case, it just shows the most recent wind history. Last paragraph: these results are not necessarily congruent. Define winter and spring! Investigated time periods are often too short for a general statement like yours. Cyclonic activity is usually largest in spring and fall. however, we don't know enough about their influence on the Antarctic plateau yet. 2078 first paragraph: this whole paragraph is not clear. Turned counterclockwise is a strange expression and why does it indicate cyclonic activity? The wind direction connected to a cyclone depends on the location of the cyclone center relative to the discussed site, and the direction of the katabatic winds depends on topography, so it is not possible to make a general statement like yours. Cyclonic activity can lead to wind directions similar to katabatic winds at EPICA DML as well as to an upslope wind. Cyclonic activity is not necessarily the same as strong large-scale forcing. You should differentiate between a cyclone directly affecting the investigation

C945

site and a cyclone causing a large-scale flow of moist air towards the interior of DML. The latter can have both NW or NE-direction. Second paragraph: see above

Spatial distribution of SMB: Again this is more complex than you describe it. The leeward-upslope effects of accumulation can be very different depending on the wind speed. For high wind speeds you can get more accumulation on the leeward side of the ridge, at least in the vicinity of the ridge. Again the question of deposition vs. erosion remains unsolved.

Passive microwave data: Should have mean mentioned earlier in the presentation of available data and methods

Increase in accumulation rate during the 20th century Please include references about precipitation studies of Antarctica in your discussion 2087/88: masks any increase in accumulation rate: the relative change should nevertheless be visible. The difference leeward - windward side is also only relative.

Conclusions: 1. ....counterclockwise to the katabatic wind. ...., see above, this does not make sense. 2. See above, lee-effects are more complex than you describe them 3. Counterclockwise prevailing wind field. See above, this does not mean anything. 4. This is not wrong, but I would not say the bedrock topography essentially determines the local-scale variations. It is the surface topography that determines the local-scale variations. 6. see above

The paper is relatively long. If you want to shorten it, I would suggest skipping the comparison with Huybrecht's modeling. ( no must) Last remark: some scientists criticize the mixed use of accumulation, net accumulation, and SMB. Everybody knows what is meant, but you might consider to be more precise here.

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Interactive comment on The Cryosphere Discuss., 5, 2061, 2011.

C946