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Interactive comment on "Hoar crystal development and disappearance at Dome C, Antarctica: observation by near-infrared photography and passive microwave satellite" *by* N. Champollion et al.

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We thank the referee #2 for his questions and comments. All his questions and comments were considered and are addressed in the following of the document.

1/ A map showing Dome C's location would certainly be useful.

A map of Antarctica is added between figure 1 and 2, with the following legend: " Location of Dome C on an Antarctic geographic map. "

2/ How far is the camera network from the actual station ?

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The camera is installed about 1 km from the Concordia Base.

This precision is added in the paper at line 14 on page 179: " PAuto was set up about 1 km far from Concordia Base on 23 November 2009 in an undisturbed area."

3/ Larger hoar crystals and hoar crystals aggregates should at least theoretically be more effective scatterers of passive microwave radiation ?

Indeed, scattering of the electromagnetic waves in the microwave domain is mainly due to the snow grain size. Hence, large hoar crystals or hoar crystals aggregates are more effective scatterers of passive microwave radiations. However, the influence of snow grain size on the polarization of microwave waves is low. Because in this paper we investigated polarization ratios, which essentially depend on snow density near the surface, the size of hoar crystals is not examined.

4/ Page 178, line 9. Reference to A.T. Chang's work is needed here and perhaps elsewhere ?

It is not clear which reference(s) would be useful here. To our knowledge, A.T. Chang mainly worked on seasonal snow depth retrieval which is quite different from the microwave penetration depth and ice sheet. We will consider to include reference to A.T. Chang in addition to Surdyk, 2002 for the penetration depth if a precise reference is suggested by the reviewer.

The reference to Macelloni, G., 2007, Multifrequency microwave emission from the Dome-C Area on the East Antarctic Plateau: Temporal and Spatial Variability, Transactions on Geoscience and Remote Sensing, vol. 45, issue 7, is also adequate for the penetration depth and is added.

5/ Since the 89 GHz channel on AMSR-E is more sensitive than lower frequency channels to surface snow conditions, why wasn't this channel considered ?

This question is close to the question 3 of the first referee. Hence, we answer jointly to the two questions in the response to the first referee.

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6/ Page 184, line 25. This is a lot to hope for. The 89 GHz channel's footprint is also smaller than the footprints of the 18.7 and 36.5 channels ?

The satellite footprint indeed decreases with increasing the wavelength and assuming that one in situ measurement is representative of the satellite pixel may appear speculative. However, the data shown in this paper demonstrate that the correlation between polarization ratio and presence of hoar is strong despite the difference of scale (few meters for in situ observation and few kilometers for satellite observation) for the 19 and 37 GHz channels, although the footprint is higher than at 89 GHz. In an other hand, the meaning of the line 23 to 25 page 184 is to explain that satellite observations over Dome C (including the point where in situ measurement are collected) are similar to observations of the satellite pixel around.

In order to be clearer, we change the end of the line 25; page 184: " Therefore, our study is based on the assumption that the satellite pixel containing in-situ measurements is representative of the satellite pixels around Dome C ".

7/ Page 188, line 1. Is diamond dust more frequent during the polar winter than the summer season ?

We are not able to answer to this question with the methods and data used in this paper. However, it is probable that diamond dust formation is more frequent during winter, because it's formation is often associated with surface-based temperature inversion (Walden, 2003).

Interactive comment on The Cryosphere Discuss., 7, 175, 2013.

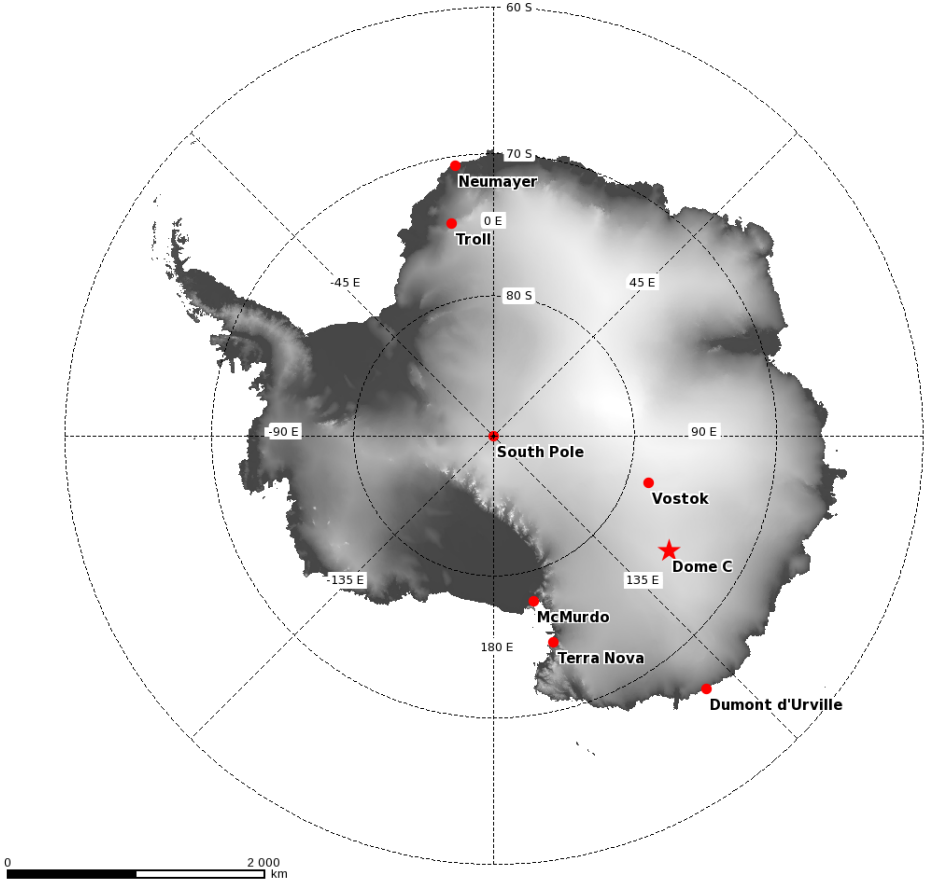

Fig. 1. Location of Dome C on an Antarctic geographic map.

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