

## ***Interactive comment on “Dating of a Dome Fuji (Antarctica) shallow ice core by volcanic signal synchronization with B32 and EDML1 chronologies” by Y. Motizuki et al.***

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This manuscript proposes a new chronology of the Dome Fuji ice core between AD 199 and AD 1900 using synchronization of nssSO<sub>4</sub><sup>2-</sup> signal with the DML B32 ice core. The authors have carefully explained their method, which is a classical method and the resulting chronology is sound.

Response: We thank the anonymous reviewer #2 for her/his helpful comments and suggestions.

However, I am not sure that the resulting chronology presented in this manuscript is enough to make a scientific paper on its own. First the dating method is not original and

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already used in many ice core studies so there is no methodological originality to discuss. Second, the produced chronology is rather short. Third, no scientific implications of this new chronology are discussed concerning regional or global climate change, volcanism, ... As a consequence, I do not recommend to publish this manuscript in its present form. At least a discussion part dealing with the implications of this new chronology should be added.

Response: We will show how our timescales can be applied to the existing <sup>10</sup>Be data of Dome Fuji in the next revision as we indicated in our response to comments by the referee #1. Because of this <sup>10</sup>Be data inclusion, Dr. Kazuho Horiuchi will be a coauthor of the next revision.

Some more specific comments along the text: - Second paragraph of p. 772 is useless since there is not discussion later related to stratospheric influence or the differences between Dome F and other sites. The authors could propose some discussion in this direction either through regional comparison (MAR between DML and Dome F; climatic variations between the two sites, chemical signature of the different Antarctic sites, ...).

Response: We added the second paragraph of p. 772 because it is very distinguished point of Dome F than other Antarctic sites. However, we will shorten the paragraph and will delete the footnote in p. 772. The stratospheric influence at Dome F may be described later shortly related with the description of the smallness of the sea-salt SO<sub>4</sub> contribution (p. 778, L 14-17) in our response to a comment by the referee #1.

Top of p. 775: what is the exact goal of the paper despite producing a third chronology for the top of the Dome F ice core - The raw data are never displayed.

Response: Taking “a third chronology” as the DFS2 timescale in our manuscript, we will show SO<sub>4</sub> raw data from EDML1 in the next revision. Dr. Mirko Severi kindly agreed to provide us with unpublished SO<sub>4</sub> data from EDML1 for our manuscript, and we will display the synchronization between the DF01 SO<sub>4</sub> data and the uppermost part of the EDML1 SO<sub>4</sub> data (before AD 187) in a new figure. We could not include such a

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figure before, because we had only the eruption date information from the EDML1 core (M. Severi, personal communication, 2011, as described in our manuscript). Because of the inclusion of these unpublished data, Dr. Severi will be a coauthor of the next revision.

It would be interesting at least to provide a comparison of nssSO4<sub>2</sub>- calculated with equation 1 and equation 2.

Response: We will add a figure of nssSO4 calculated with equations 1 and 2 as suggested in the next revision.

- paragraph 4.2: Herimite ! Hermite

Response: The typo will be corrected as suggested.

-Part 5: The comparison of the different timescales is important but lacks of conclusion: is there a recommended chronology. Is there a way to combine the different dating information (nssSO4<sub>2</sub>- and 10Be-14C) in one coherent chronology?

Response: There should be a way to combine the different dating information (e.g., nssSO4 and 10Be-14C) in one coherent chronology as you suggested, but this is out of scope of our paper. Instead, as mentioned above, we will show the 10Be flux data on our new timescales and the independent 14C production rate curve in our next revision as suggested by the referee #1, and we will discuss the time period 686-1108 AD in which our synchronization is not using tie-points from volcanoes but some strong variations in 14C can be found related to this problem.

What are the implications of the new chronology with respect to the previous ones.

Response: It is for the first time to construct the chronology for the shallow ice core obtained at Dome Fuji by using annually-resolved nssSO4 data and to apply synchronization with those of an other core (B32) which chronology was determined by annual layer counting. Our chronology was thereby able to be extended down to AD 187. The previous chronologies presented in the preceding studies for Dome Fuji shallow

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ice cores were not such precise and such long compared with the chronology in our paper. We mentioned this kind of thing in Introduction, but we will more clarify the point in our next revision.

- It would be nice to discuss more the implication of the MAR of Dome F: how does it compare with previous estimates?

Response: In our revision, we will compare our obtained MARs with those given by Igarashi et al. (2011, after AD 1260) and those derived for Horiuchi et al. (2008, 10Be-14C, after AD 755) as suggested, in order to improve our manuscript.

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Interactive comment on The Cryosphere Discuss., 8, 769, 2014.

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