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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ancient versus modern mineral dust transported to high-altitude alpine glaciers evidences saharan sources and atmospheric circulation changes" *by* F. Thevenon et al.

M. Sigl

siglmich@yahoo.de

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Page 860 10-12: Language problem: "during low rates of dust deposition"

15: Language problem: "the greatest . . .dust event". Do they mean the largest event and if so. how do they define the magnitude of dust events based on their data? "dust event deposited around 1780-1790" Did the event last for 10 years? Is it due to the sampling resolution? Is the dating uncertainty 10 years? If so, why is the dating uncertainty that large if there is a distinct time marker dated at 1783 at 53.52 m. At which

depth is the "greatest dust event" compared to the time marker? Older or younger? Or does the sample include the time marker? Language problem: "Higher dust deposition . . ."

16/17: ". . .ca 20 years after the industrial revolution of 1850" Which industrial revolution is meant? Switzerland, Italy, England? What has the industrial revolution to do with the mineral dust? They do not show records of air pollution. Does that simply mean 1870?

20: Language problem: "Meanwhile . . ."

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5: "there is a lack of ice-core data about mid-latitude dust characteristics covering the preindustrial period" What about the ice cores drilled from KUP Heidelberg? Dust records are published by Wagenbach et al. 1996 and Wagenbach & Geis, 1989.

6/7: ". . .evaluate European preindustrial atmospheric dust emissions" As far as I understand from the Abstract the emissions take place in the source region (Sahara) and the deposition takes place in the European Alps. So what is recorded in your archive? Emission or Deposition? From Europe or Africa?

27/28: Although the authors state that the Southern Alps act as barrier to the transport of southwesterly dust laden winds from the Sahara they later use dust data from Jungfraujoch on the Northern face of the Alps as an analogue to Colle Gnifetti at the southern face. It is questionable if dust has similar source regions, transport histories for two such different study sites.

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1 This reference is wrong! Jenk et al. 2006 describe a different ice core, not Colle Gnifetti

12-15 "A previous study has demonstrated that the CG archive allows the reconstruction of changes in the dynamic of the southwesterly dust-laden winds from the Sahara,

in relation to variability in large-scale atmospheric circulation patterns" This is a strong statement compared to the actual content of the mentioned paper. In Thevenon et al. 2009, the link between NAO and dust is drawn basically from literature (Prospero and Nees, 1986; Chiapello and Moulin, 2002). The low and varying sampling resolution of the ice core does not allow for a direct comparison with decadal-scale atmospheric circulation series.

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Results show evidences that the dust deposited at CG and JFJ of Saharan origin, a fact that is well known for decades (see Haeberli 1977, De Angelis & Gaudichet 1991, Wagenbach et al. 1996)

24/25 Is not the structure of light colored (dust depleted) versus dark colored (dusty) "layers" an artifact of the varying sampling resolution throughout the ice core. The number of your total data points (around 35) is not significantly higher than the number of major dust events recorded at this ice core site over the last 400 years. In not "layering" determined from how the sample boundaries are defined. You did not choose an equidistant sampling (either in space or time). Page 866

29 How do this data compare to available high-resolution records of Pb and other heavy metals from the same ice core site (Barbante et al., 2004, Schwikowski et al. 2004)

Page 867 What is the difference between your back-trajectory modeling approach compared to the previous attempts of Schwikowski et al. 1995, Collaud Coen et. al. 2004, Sodemann et al. 2006. who all calculated back-trajectories for JFJ and the Alps?

Page 868 8-12 The conclusion that isotopic data from Colle Gnifetti ice core should suggest the African origin of dust in Greenland or the presence of dust from Gobi at Colle Gnifetti is not supported by the data. Figure 3 does not show error bars of the isotopic data (from Figure 2 one can conclude that the error for certain samples is in the range of 0.05-0.1 for 87Sr/86Sr. Overall the isotopic data shows a strong scattering

of all data points. Only the data from Antarctica differs distinctly. Moreover the data for certain areas is only constrained by few data points (in fact it is one data point for the Gobi desert). Any attempt to suggest source regions of dust from Figure 3 is therefore questionable.

13/14 Kang et al. 2003 link highly resolved mineral dust records from Alaska, Himalaya and Greenland to atmospheric circulation pattern in the Northern Hemisphere. They draw no conclusion concerning Saharan dust transported to Alpine glaciers. Hypotheses of a links between dust deposition and winter drought conditions over Northern Africa (and an eventual link to circulation pattern) as "suggested" (Lines 14-25) by the authors should therefore be tested by comparing well established highly resolved ice-core dust data until the very recent past (Al, Ca, Fe) directly to instrumental and proxy data of North African drought or winter NAO.

26-29 and Page 869 1-13 The content of these results does not fit very well to the context of the general paper

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