Biogeosciences Discuss., 5, S2085–S2088, 2008
www.biogeosciences-discuss.net/5/S2085/2008/

Biogeosciences Discussions

Interactive comment on "Bacterial diversity in Himalayan glacial ice and its relationship to dust" *by* S. Zhang et al.

S. Zhang et al.

Received and published: 28 October 2008

We thank the referee for his constructive comments. In the following, comments are addressed in the same order as in the reviews:

Question 1: Positive correlation between the Shannon-Weaver index and the Ca2+ concentration is very weak and not linear at all (see Fig 8 on 3456p). I do not really think that the authors proved anything other than that there is a non-existent relationship between Ca2+ and bacterial concentration and Shannon Weaver index respectively.

Response: With comparison to the low correlation coefficient between the bacterial and Ca2+ concentrations (r=-0.135, P=0.351, n=50), the relationship between the Shannon-Weaver index and Ca2+ concentrations is much approved with a higher coefficient (r=0.486, p=0.092, n=13). This is significant at the 90% confidence level. We

agree with the referee that there is a non-existent relationship between the Ca2+ and bacterial concentrations as previously suggested, but a possible relationship between the Ca2+ concentrations and Shannon Weaver index might exist. However, only 13 samples were employed for deducing such a relationship between the Ca2+ concentrations and bacterial community diversity, more samples are needed for verifying such a relationship.

Question 2: Moreover, there is no need to explain the process of dating the ice cores using soluble ions and isotope concentration in the methods section when it is not pursued in Results and Discussion apart from reference to another paper.

Response: The process of dating the ice cores provides a sound background to explain the changes of bacterial community during the warm or cold periods, e.g., Little Ice Age (LIA). Additionally, the biogeosciences community might not be very familiar with the ice core issue, the process of dating the ice cores is of helpful to the wide readers of Biogeosciences.

Question 3: I think they have a lot of data but somehow those are not shown or discussed in the paper. There is a potential to gain a lot of information from the DGGE and bacterial counts data but they are not mention in other way than with regard to the concentration of the Ca2+ ions.

Response: The complex relationship between microorganism and dust in glacial ice was addressed previously in literature as cited in the introduction. Ca2+ can be regarded as a good proxy for atmospheric dust transport in the Himalayan snow and ice. Therefore, we included the Ca2+ concentrations in order to explore the relationship of microorganism and dust in glacial ice. Our results indicated that glacial bacteria might be related with other environmental factors besides Ca2+ concentrations. When glacial microorganism is used as a new proxy for the reconstruction of past climatic and environmental changes, more environmental factors should be taken into account.

Question 4: No explanation is given for different bacterial concentration and community

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diversity at different depths of the ice core and its relationship to the age of the ice or climate condition at that period.

Response: For bacterial concentrations, its variation along the ice core may be possibly related with the period of industrial revolution. The description was included in the revision. For bacterial community diversity, its variation along the ice core probably reflected an imprint of climate change (Zhang et al., 2006). Unfortunately, due to the limited samples and confusion of the ice core climatic records (Hou et al., 2007), we cannot elicit a precise relationship between bacterial community diversity and climatic factors along the ER ice core.

Question 5: In the Abstract it is mentioned:" There are four general periods of bacterial diversity, corresponding to four phases of dust abundance revealed by Ca2+ concentrations. It is indicated that higher bacterial community diversity is associated with warm periods, while lower bacterial community diversity with cold periods." However, there is no evidence given to support this statement.

Response: Examination of the ER ice core shows four general periods of bacterial community diversity, which correspond to four periods of dust revealed by Ca2+ concentrations. In the Himalaya and southern TP, the periods of high dust concentrations generally coincide with warm climate, while that of low dust concentrations with cold climate (Wang et al., 2006). Thus we speculated that high bacterial community diversity is associated with warm climate, while low bacterial community diversity with cold climate. However, we do not have direct evidence to indicate that the periods of high bacterial community diversity (1947-1958 AD and 1752-1847 AD) correspond to warm climate, and the periods of low bacterial community diversity (1868-1932 AD and 1054-1686 AD) correspond to cold climate, especially given the confusion of the Himalayan ice core climatic records (Hou et al., 2007). Thus we excluded the discussion pertaining to temperature in the revision.

References

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Hou, S., Chappellaz, J., Jouzel, J., Chu, P. C., Masson-Delmotte, V., Qin, D., Raynaud, D., Mayewski, P. A., Lipenkov, V. Y., and Kang, S.: Summer temperature trend over the past two millennia using air content in Himalayan ice, Climate of the Past, 3, 89-95, 2007.

Wang, N., Thompson, L. G., and Davis, M. E.: Variations of atmospheric dust loading in the southern and northern Tibetan Plateau over the last millennium recorded in ice cores, Quat Sci, 26 (5), 752-761, 2006 (in Chinese).

Zhang, X., Yao, T., An, L., Tian, L., and Xu, S.: A study on the vertical profile of bacterial DNA structure in the Puruogangri (Tibetan Plateau) ice core using denaturing gradient gel electrophoresis, Ann. Glaciol., 43, 160-166, 2006.

Interactive comment on Biogeosciences Discuss., 5, 3433, 2008.