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## ***Interactive comment on “Volcanic forcing and climate variations during the last glacial period”***

### **by A. F. Flinders**

**Anonymous Referee #1**

Received and published: 8 November 2012

General comments: The author tries to make a connection between volcanism, greenhouse gases and climate (DO cycles) by using wavelet analysis on the GISP 2 sulfate, O-18, ECM, 10Be, accumulation and dust records using the GISP-2 time scale. The paper is severely flawed due to inappropriate use of method and lack of knowledge of literature. The author claims and assumes properties and processes that are directly wrong. The paper should be rejected, and I urge the author to contact my excellent colleagues at the “Institute for the study of Earth, Oceans and Space” at University of New Hampshire to learn more.

Specific comments: An ice core record of “insoluble micro-particulate sulfate” does not exist. Some measurements on elemental sulfur from insoluble micro-particles have been done; but by far most measurements are of soluble sulfate (i.e. SO<sub>4</sub><sup>2-</sup>) either by

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ion-chromatography or by continuous flow analysis. Sulfate has several sources: Terrestrial minerals (e.g. gypsum), Marine salts, Marine biology (e.g. from phytoplanktonic DMS), Terrestrial biology (e.g. H<sub>2</sub>S) and of course volcanic activity. To claim that total sulfate is from volcanoes is wrong. Check the literature.

Sulfate in ice cores correlates really well with dust and calcium, and they all correlate with O-18 ice which should demonstrate that the bulk of the sulfate signal across D/O events is climatic and not due to volcanism.

The author assumes that the climatic variations of the D/O events are global, which they are not. The bi-polar see-saw has been observed also in ice cores. Therefore the rationale of the paper does not hold, since climate variations in the North and the South are out of sync.

Global levels of methane and CO<sub>2</sub> are also out of sync. as the methane follows the D/O cycles in the North whilst the CO<sub>2</sub> levels follow the Southern ocean temperatures. Both gases cannot follow the same “volcanic signal”.

Using wavelet analysis on ice core time series has been done before, almost 20 years ago, albeit with different aims and rationales.

The GISP-2 time scale was good at its time 20 years ago; but the author should use the present standard time scale, GICC05modelext, and he will observe big changes. The changes are not so much in the absolute ages, but rather in the duration of Stadials and Interstadials, and this has changed our view on accumulation rates across D/O events which directly leads to a different 10Be curve.

Why is Mayewski et al. 1997 not cited, as they were the producers of the sulfate curve from GISP-2. Read the paper in JGR 1997.

ECM is totally unsuited for wavelet analysis across D/O events because the signal is completely unlinear. Due to high content of calcium carbonates in the cold stadials the ice chemistry becomes slightly alkaline killing the ECM signal. ECM is not a measure

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of dust. ECM records the acidity as the signal is a function of H<sup>+</sup> concentration (pH value).

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8, C2292–C2294, 2012

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