

Interactive comment on “High resolution 900 yr volcanic and climatic record from the Vostok area, East Antarctica” by E. Yu. Osipov et al.

Anonymous Referee #2

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This paper presents new volcanic record of the last 900 yr in four snow/firn cores from the Vostok Station area, in East Antarctica. The main tools used in this study are the identification of volcanic using nssSO₄. The paper contributes to ongoing debate concerning the impact of volcanic eruption on the past climate and estimation of the temporal variability in snow accumulation. The manuscript subject is appropriate for the Cryosphere and data are very important, however there are some issues and the manuscript must be improved.

My main concerns are the following issues: the stratigraphic link between the snow/firn pit/core, the evaluation of nssSO₄ background, the comparison of volcanic record between the firn cores, the comparison with only the record of SP, DC, and RP and absence of comparison with others East Antarctica volcanic record, the snow accumula-

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tion variability with others records and the general trend in Antarctica, the interpretation of Na record is not well described and analysed.

Comments:

Figure 3 should show the 4 volcanic records and their overlap and link.

All the pit/cores analysed are in an area of 1.4 km, where snow precipitation and post deposition process, dry deposition and wind process (glaciological process), must be very similar, therefore the background value of sulfate concentration must be very similar. The nss SO₄ background value should be calculated by averaging concentrations over the all pit/cores, after excluding samples clearly associated with volcanic events.

The Vostok record should be compared also with others inland East Antarctica volcanic record Dome A (Jiang et al., 2012), Dome Fuji (Igarashi et al., 2011), SPQML (Anschütz et al., 2011) cores, and coastal record Princess Elizabeth Land and Lambert Glacier (YM85 Takahashi et al., 2009, G15 Moore et al., 1991; DT-401 Ren et al., 2010) Talos Dome (Stenni et al., 2002), DML (Sommer et al., 2000, KarlÓğf et al., 2000) and Law Dome (Plummer et al., 2012). The difference of amount of volcanic signal observed between the cores should be more analysed and discussed, also inside the Vostok area where the different record overlaps.

The snow accumulation temporal variability must be compared at least with the closer site (DC, DA, DF), and general trend in Antarctica (Monaghan et al., 2006; Frezzotti et al., 2013), moreover the previous study at Vostok (Ekaykin et al., 2004) pointed out that the that the snow accumulation and isotope periodicity are correlates with the Pacific Decadal Oscillation index, implying a climatic teleconnection between central Antarctica and the tropical Pacific. New studies point out the correlation of tropical pacific with climate of Antarctica (ex. Fogt and Bromwich, 2006, Ding et al., 2011b; Schneider et al., 2012; Frezzotti et al., 2013), discussion of snow accumulation VS record could improve the value of manuscript.

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The interpretation of Na record is not clear, the different in Na concentration is similar to the snow accumulation variability, the record should be analysed and discussed in more detail or deleted.

Specific Comment

Snow accumulation unit must be mm we yr⁻¹ everywhere. The uncertainty related to the source of errors should be described.

Abstract and everywhere: The snow accumulation is calculated from 1259 and 2010, it is not clear on the base of which data has been evaluated the accumulation <1260. The date of 1093 from the sample bottom is an estimation of age and relatively snow accumulation is a loop discussion. The last dated reference is 1260, the older age and snow accumulation are extrapolated.

Pag 1963 line 9 and 10 warm instead of worm

Pag 1965 line 9-19; The counting of years using Na record is not compatible with sample rate (2-3 cm) and with wind redistribution at site (Ekaykin et al 2004; Eisen et al., 2008), for an annual resolution at least occurs 8-10 sample, instead of 2 or 3. Moreover the value of 32±2 mmwe yr⁻¹ is more than 30% of value of Pinatubo-2010 (24.9 mm we yr⁻¹). Value in the text and table must identical.

At pag 1968 line 8-9 is pointed out "that mixing of snow layer in Vostok area is estimated to be not more than 7-8 yr at least ..." this is not compatible with the year counting.

Pag 1965 line 24 and 25; see comment

Pag 1966 line 14 and 15; 1230-1270 and 1410-1460 are arbitrary interval of the volcanic eruptions and not interval of increased sulfate content.

Pag 1967 line 11-12; VR does not content more volcanic event if appropriate background is used.

Pag 1967 line 29; The presence of core gaps of 42 yr must be describe in length, age

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and gaps interval

Pag 1968 line 5 V12 (1809)

Pag 1969 line 11; 1259-1600 AD

Pag 1970 line 21 and 22; spatial variability is analysed in more detail in Eisen et al 2008 and reference within and others papers (Dome A Ding et al., 2011a, Wang et al., 2013; Dome Fuji Kameda et al., 2008 Fujita et al., 2011; Dome C Urbini et al., 2008 etc.).

Pag 1970 line 25; which is the source of 24.7 value? at page 1965 is 32

Pag 1974 line 4; confront with Frezzotti et al., 2013 and reference within

Interactive comment on The Cryosphere Discuss., 7, 1961, 2013.

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