

Impact of volcanic sulfate aerosols on the Quasi-Biennial Oscillation

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Supplementary material

Table -S1: SAOD, radiative forcing at the TOA (W m^{-2}), heating rates (K d^{-1}), Sulfate aerosol concentration (ng m^{-3}) for all volcanoes during 2001-2013 in the zonally averaged of the tropical region ($20^\circ \text{S} - 20^\circ \text{N}$).

Sr. no.	Volcano	Month Year	AOD	RF at TOA (W m^{-2})	Heating rates (K d^{-1})	Sulfate aerosol (ng m^{-3})
1	Shiveluch	June 2001	0.00039	-0.82 ± 0.13	0.00094 ± 0.001	7.80
2	Ruang	September 2002	0.00086	-0.68 ± 0.31	0.00092 ± 0.0004	16.32
2	Reventador	November 2002	0.00075	-0.72 ± 0.07	0.00083 ± 0.0006	34.37
4	Anatahan	May 2003	0.00065	-0.88 ± 0.30	0.0012 ± 0.0002	27.56
5	Manam	November 2004	0.0016	-0.79 ± 0.48	0.0012 ± 0.0005	23.31
6	Sierra Negra	Oct 2005	0.0019	-0.87 ± 0.54	0.00099 ± 0.001	66.94
8	Soufrière Hills	May 2006	0.0019	-0.67 ± 0.11	0.00073 ± 0.0001	65.00

8	Rabaul	October 2006	0.0034	-1.22±0.65	0.0015±0.0008	92.17
9	Jebel at Tair	Sep 2007	0.0012	-0.69±0.19	0.00093±0.0003	52.79
10	Chaiten	May 2008	0.00076	-0.63±0.10	0.00089±0.0008	32.43
11	Mt okmok	July 2008	0.00075	-0.51±0.38	0.0014±0.0003	29.42
12	Kasatochi	August 2008	0.00076	-0.26±0.02	0.0010±0.00006	28.35
13	Redoubt	Mar 2009	0.0020	-0.86±0.89	0.00073±0.0008	32.19
14	Sarychev	June 2009	0.0040	-1.40±0.17	0.0019±0.00073	52.36
15	Eyjafjallaj okull	April 2010	0.0013	-0.81±0.60	0.0012±0.00089	48.63
16	Merapi	November 2010	0.0020	-0.88±0.19	0.0010±0.00031	46.43
17	Grimsvotn	May 2011	0.0065	-1.03±0.44	0.0025±0.00022	65.79
18	Nabro	June 2011	0.0097	-2.04±0.81	0.0026±0.00086	133.51
19	Puyehue-Cordon Caulle	June 2011	0.0097	-2.04±0.81	0.0026±0.00086	127.87
20	Etna	April 2013	0.00086	-0.70±0.25	0.0006±0.00024	40.11

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Table – S2: Sulfate aerosol concentration (ng m^{-3}) for all volcanos during 2001-2013.

Sr. no.	Volcano	Sulfate Aerosol (ng m^{-3})
20° S - 20° N		
1	Ruang	16.32
2	Reventador	34.37
3	Anatahan	27.56
4	Manam	23.31
5	Sierra Negra	66.94
6	Soufrière Hills	65.00
7	Rabaul	92.17
8	Jebel at Tair	61.63
9	Merapi	46.43
10	Nabro	133.51
20° N - 40° N		
11	Etna	41.76
20° S - 40° S		
No Volcano		
40° N - 90° N		
12	Shiveluch	6.34
13	Mt okmok	31.42
14	Kasatochi	29.86
15	Redoubt	34.76
16	Sarychev	112.31
17	Eyjafjallajokull	50.59
18	Grimsvotn	50.68
40° S - 90° S		
19	Chaiten	31.27
20	Puyehue-Cordon Caulle	30.89

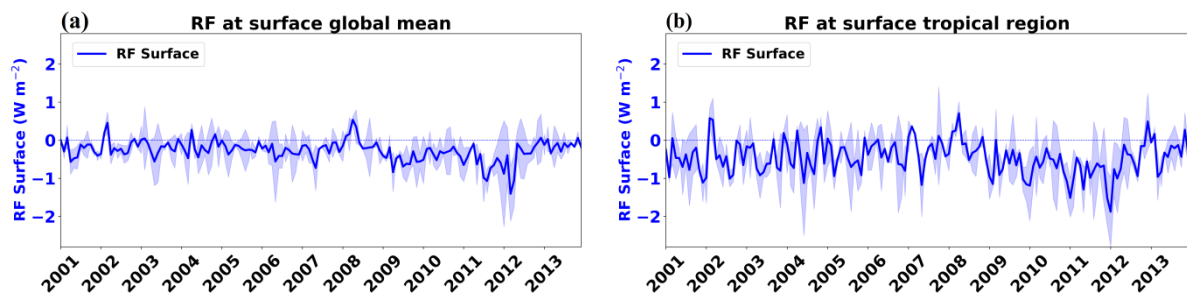


Fig S1: (a) Global mean radiative forcing at the surface in W m^{-2} , (b) same as (a) but zonally averaged over 20° S - 20° N.