Low SO_2 emission rates from the summit crater of Teide volcano, Tenerife, Canary Islands

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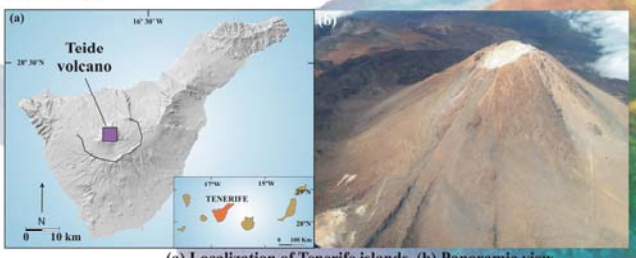
Recent analysis of Teide fumarole gas revealed the presence of SO_2 content in the volcanic-hydrothermal discharges from the summit crater. This geochemical observation was not reported in the past (Pérez et al., 1992). With the aim to investigate SO_2 emission rates from the summit crater of Teide volcano, COSPEC and miniDOAS measurements were performed in a stationary mode. The obtained results indicate that SO_2 emission rates from the summit crater of Teide volcano were lower than the detection limit established by the used analytical and methodology procedure. A second attempt to evaluate SO_2 emission rates from the summit crater of Teide volcano was performed in September 2005. DOAS and TDL systems were able to measure SO_2 and CO_2 concentrations of the atmosphere inside the crater, which is a combination of atmospheric air and fumarole gas, along an optical path of 80 meters. This experiment will allow us to evaluate the SO_2/CO_2 ratio in the atmosphere inside the crater. After excluding the CO_2 contribution from the atmosphere, the estimated SO_2/CO_2 ratio by means of ORS inside the crater (0.7×10^{-5}) are slightly similar to the observed SO_2/CO_2 ratio in the fumarole gases (2×10^{-5}). The slightly differences of these two observed ratios could be related to the existence of an additional source of CO_2 for the atmosphere inside the crater, diffuse CO_2 emission. These SO_2/CO_2 ratios times fumarole CO_2 emission rate measurements will allow us to evaluate the actual SO_2 emission rates from the summit crater of Teide volcano. Measurements of fumarole CO_2 mission rates were performed by means of a tracer gas method (Mori et al., 2001). The observed values showed an average of $5,6 \pm 0,2$ Kg·d^{-1}. If we assume the existence of 100 fumarole vents in the summit crater of Teide volcano, CO_2 emission rates associated to visible emanations could be ~ 0.5 t·d^{-1}. This estimated CO_2 emission rate is two orders of magnitude lower than the observed diffuse CO_2 emission rate on September 2005, ~ 15 t·d^{-1}. This observation might explain the slightly observed differences between SO_2/CO_2 ratios in the air crater and fumarole gas. Therefore, SO_2 emission rates from the summit crater of Teide volcano could be ~ $5.7 \cdot 10^{-6}$ to $1.6 \cdot 10^{-5}$ t·d^{-1}. These estimated SO_2 emission rate values are much lower than those observed from continuously emitting active volcanoes, 2.6 to 4000 t·d^{-1} (Andres and Kasgnoc, 1998). These geochemical observations do not support the reawakening of Teide volcano as others scientists have described (García et al., 2006).

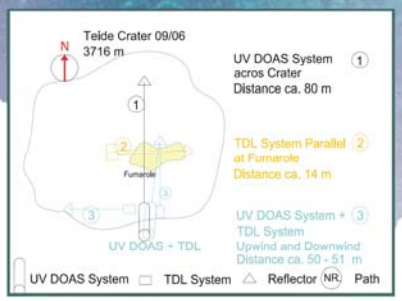


(a) Localization of Tenerife islands, (b) Panoramic view of the summit cone Teide volcano

CO_2 flux measurements from fumaroles at the summit crater of Teide volcano using CH_4 as gas tracer.

Time	Temp.	CH_4 flux	CO_2	CH_4	CO_2/CH_4	CO_2 flux
17/09/2005	*(ºC)*	*(g/d)*	*[ppm]*	*[ppm]*	*mass ratio*	*(kg/d)*
10:20	16,6	80	307377	11967	70,6	5,6
10:26	16,6	80	307736	12071	70,1	5,6
10:34	16,6	80	305426	12166	69,0	5,5
10:41	16,6	80	305734	12223	68,8	5,5
10:48	16,6	80	305021	12229	68,6	5,5
10:52	16,6	80	306099	12341	68,2	5,4
10:59	16,6	80	306867	12403	68,0	5,4
11:06	16,6	80	306679	12418	67,9	5,4
11:12	16,6	80	308575	12494	67,9	5,4
13:23	30,2	88	288839	12862	61,8	5,4
13:31	30,2	88	295540	12906	63,0	5,6
13:39	30,2	88	302982	12936	64,4	5,7
13:45	30,2	88	329884	12954	70,0	6,2
Mean						5,6
DesvStand						0,2

SO_2 flux measurements by means of COSPEC and miniDOAS in stationary mode at the summit crater of Teide volcano.

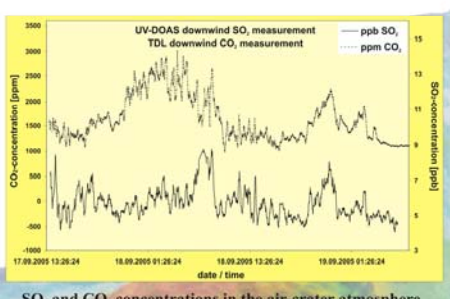


Deployment of ORS systems at the summit crater of Teide volcano.

SO_2 and CO_2 contents in the fumarole gas and air-crater atmosphere of Teide volcano and their respective SO_2/CO_2 ratios.

TEIDE	Date	CO_2	SO_2	SO_2/CO_2
		[ppm]	*[ppm]*	*mass ratio*
Fumarole gas Teide	dic-03	92278	2,337	3,68E-05
Fumarole gas Teide	dic-04	92653	5,676	8,91E-05
Fumarole gas Teide	ene-05	68825	7,886	1,67E-04
Fumarole gas Teide	may-05	64656	2,837	6,38E-05
Fumarole gas Teide	jun-05	949206	2,188	3,35E-06
Fumarole gas Teide	sep-05	55224	1,140	3,00E-05
Fumarole gas Teide	oct-05	40691	2,331	8,33E-05
Air Teide Crater	sep-05	700	0,005	1,04E-05

UV-DOAS and TDL systems for SO_2 and CO_2 measurements in the air atmosphere inside the summit crater of Teide volcano



SO_2 and CO_2 concentrations in the air-crater atmosphere of Teide volcano.

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- Parque Nacional del Teide.

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