Dear Editor,

Thank you for your recommendation to respond more clearly on the reviewer's #3 comment about used in our work rate coefficient of the reaction of SO_2 with OH. Following this recommendation, we extended the Table 1 with the results showing the contribution of the OH+SO_2 reaction if the lower rate coefficient from Medeiros et al. (2018) is used.

The Table 1 was modified as follows (changes are shown in red):

Table 1. Comparison of observed [H_2SO_4] with calculations assuming H_2SO_4 formation via oxidation of SO_2 by OH and SCIs. [OH] and [H_2SO_4] are observed concentrations, $[H_2SO_4]^{OH}$ and $[H_2SO_4]^{SCI}$ are calculated H_2SO_4 produced by oxidation of SO_2 by OH and SCI, respectively. Values in square brackets correspond to $[H_2SO_4]^{OH}$ concentrations calculated with a rate coefficient for the reaction of OH with SO_2 from Medeiros et al. (2018) (see discussion in Sect. 4.2).

	Daytime: 7:00 – 20:00		Night-time: 20:00 – 7:00	
	Median (inter-quartile range)	Mean ± 1σ	Median (inter-quartile range)	Mean ± 1σ
[OH], 10^5 cm^{-3}	31 (18; 42)	31 ± 17	1.1 (-0.7; 3.0)	1.7 ± 4.0
[H_2SO_4], 10^5 cm^{-3}	47 (28; 86)	63 ± 49	4.2 (3.1; 6.4)	5.8 ± 4.8
$[H_2SO_4]^{OH} = a + b \times [H_2SO_4]$	a=(-2.0±0.5)×10^5 ; b=0.85±0.02 [a=(-1.1±0.3)×10^5 ; b=0.52±0.01]		a=(-3.1±0.3)×10^5 ; b=0.97±0.1 [a=(-1.7±0.2)×10^5 ; b=0.60±0.05]	
$[H_2SO_4]^{OH}$/ [H_2SO_4], %	95 (79; 129) [58 (48; 78)]	86 ± 4 [52 ± 2]	39 (-8; 84) [23 (-4; 52)]	9 ± 15 [5 ± 9]
1-$[H_2SO_4]^{OH}$/ [H_2SO_4], %	5 (-29; 21) [42 (22; 52)]	14 ± 4 [48 ± 2]	61 (16; 108) [77 (48; 104)]	91 ± 15 [95 ± 9]
$[H_2SO_4]^{SCI}$/ [H_2SO_4], %	10 (7; 16)	12 ± 6	30 (22; 48)	38 ± 24
[H_2SO_4]-$[H_2SO_4]^{OH}$, 10^5 cm^{-3}	1.2 (-12.5; 8.1) [15.2 (8.3; 36.5)]	4.6 ± 3.2 [11.2 ± 3.4]	3.0 (0.8; 5.2) [3.2 (1.8; 5.2)]	3.1± 0.4 [3.3 ± 0.3]
$[H_2SO_4]^{SCI}$, 10^5 cm^{-3}	6.0 (3.7; 8.6)	6.4 ± 3.7	1.4 (1.1; 2.4)	1.8 ± 1.2

Also, we have added some comments to the Sect. 4.2, where this issue is discussed:

"In a recent study of Blitz et al. (2017a, 2017b) a significantly lower rate constant of 5.8×10^{-13} cm^3 $molecule^{-1}$ s^{-1} was derived from experiments with vibrationally excited OH (v=1,2,3)+SO_2 and using the master equation analysis of the pressure and temperature dependence of their own and some others experimental OH+SO_2 reaction rate constants. An even lower rate constant of 4.8×10^{-13} cm^3 $molecule^{-1}$ s^{-1} has been derived by Medeiros et al. (2018) applying more detailed master equation analysis of experimental data from Blitz et al. (2017a, 2017b) and some other data. These recent results have not been confirmed by other studies. Also, they have been discussed but not recommended by the latest JPL evaluation (Burkholder et al., 2019).

Using the lower rate constant from Medeiros et al. (2018) in our study would result in about 2 times reduced H_2SO_4 production by oxidation of SO_2 by OH and would invoke either significantly larger contribution from an additional H_2SO_4 source or a lower H_2SO_4 uptake coefficient, of about 0.5 instead of unity. As shown in Table 1, the reaction of OH with SO_2 would explain only about 50% and 5% of the observed H_2SO_4 production during the day and during the night, respectively."

Sincerely,

Alexandre Kukui