

## ***Interactive comment on “Isotopic constraints on the role of hypohalous acids in sulfate aerosol formation in the remote marine boundary layer” by Qianjie Chen et al.***

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Chen et al. investigate the role of hypohalous acids on sulfate formation in the mbl. The study is very interesting and it should eventually be published in ACP if the following major issues can be resolved:

### **Major Issues**

- I find it confusing that the manuscript switches between cloud droplets and aerosol particles. It looks like measurements of aerosols are compared to model

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results of cloud chemistry. Is this the case? If yes, please explain why this approach can be valid.

- In Table 1, you cite Fogelman et al. (1989) and Troy and Margerum (1991) as references for  $\Delta^{17}\text{O} = 0$  for the reactions  $\text{S(IV)} + \text{HOX}$ . However, I do not see any isotope chemistry in these papers. How do you derive this zero value? How would your results change if  $\Delta^{17}\text{O}$  is non-zero for  $\text{S(IV)} + \text{HOX}$ ?
- You conclude that a fraction of 33 to 50 % of the sulfate can be produced by about 0.1 pmol/mol HOX. Vogt et al. (1996), however, needed 100 times more HOX (10 pmol/mol) to achieve a similar fraction (60 %). Why is there such a big difference between these two studies? Can the difference be explained by different rate coefficients that were used? Were different reactions included in these studies? If not, what else could it be?

### **Specific comments**

- Abstract: I think it should be mentioned here that uncertainties in reactive halogen concentrations are probably the main reason why halogen chemistry is excluded in large scale models (apart from uncertainties in the reaction rates).
- page 5, line 131: Here you list several ions which were measured. Unfortunately, the list does not include bromide. Since the reaction  $\text{HOBr} + \text{S(IV)}$  produces bromide, it would be very interesting to know bromide aerosol concentrations. Would it be possible to analyze the samples for bromide?
- page 6, line 173: Metal-catalyzed oxidation of  $\text{S(IV)}$  is mentioned here. Could you add the information which metals (Fe?, Mn?) are included in the model and how the model calculates their concentrations? I think this information is necessary to

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understand why this pathway contributes less than 1 % to S(IV) oxidation in the model.

### Technical Comments

- The physical properties “mixing ratio” and “concentration” are used as if they were identical. This is not the case! (for details, see <http://www.rolf-sander.net/res/vol1kg.pdf>) Please check all occurrences of the word “concentration” in the main text and check if it should read “mixing ratio” instead.
- page 13, line 366: If Le Breton et al. is still in review, it should be called (2016) not (2015).
- page 16, line 439: The unit “permil” is missing for  $\Delta^{17}\text{O}$ .

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