

## ***Interactive comment on “Effects of stabilized Criegee Intermediates (sCI) on the sulfate formation: A case study during summertime in Beijing-Tianjin-Hebei (BTH), China” by Lang Liu et al.***

### **Anonymous Referee #3**

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#### General comments

This manuscript presents a modeling study to quantify the contribution of stabilized Criegee Intermediates (sCI) on the sulfate formation in the BTH region using a source-oriented WRF-Chem model. The topic is well within the ACP domain and is well addressed, the methodology is sound, and the results are well presented. The work can be accepted for publishing after the following minor issues are addressed.

#### Specific comments

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(1). The authors use the results of the sCI contribution on the sulfate formation at one station (NCNST) to draw a general conclusion in the BTH. This is a bit of overstretch. It needs to be clarified. Besides the results at the NCNST site, it would be valuable to select a larger source area and a downwind area to discuss the contributions of the sCI and other three pathways. With this expansion, the paper would present a more general picture of the sulfate sources in the BTH.

(2). Regard the effects of sCI on the sulfate formation, in addition to the oxidation of SO<sub>2</sub> by sCI, sCI may also contribute to the sulfate formation through enhancing the atmospheric oxidation capacity, since sCI may enhance the ozone formation and ultimately enhance OH, and thus enhance the SO<sub>2</sub> oxidation by OH. The latter can be called the indirect effects by sCI. It would be helpful to evaluate the sCI's indirect effects.

(3). Not considering the aqueous SO<sub>2</sub> oxidation in cloud or fog droplets on one hand may underestimate the sulfate formation, and on the other hand may overestimate the contributions from other sources, including the sCI source.

(4). There is no information on emission inventory used in the simulation.

(5). In the abstract, the statement “The primary emission accounts for around 22~24% of sulfate concentrations due to high SO<sub>2</sub> emissions” is confusing. Is this due to the sulfate emissions and due to the SO<sub>2</sub> emissions?

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