

## ***Interactive comment on “Dramatic increase of reactive VOC emission from ships at berth after implementing the fuel switch policy in the Pearl River Delta Emission Control Area” by Zhenfeng Wu et al.***

**Anonymous Referee #2**

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The manuscript of Wu et al. with the title of “Dramatic increase of reactive VOC emission from ships at berth after implementing the fuel switch policy in the Pearl River Delta Emission Control Area” characterized the emissions of PM<sub>2.5</sub>, SO<sub>2</sub> and VOCs from ships at berth before and after implementing the fuel switch policy with a FSC limit of 0.5% in the Pearl River Delta ECA in south China. After implementing the fuel switch policy, the EFs of SO<sub>2</sub> and PM<sub>2.5</sub> for coastal vessels dropped 23 by 78% and 56%, however, the EFs of NMHCs increased by a factor of 15 times before implementing the new policy. The reactive alkenes overtook alkanes to become the dominant group,

C1

which led to the sharp increase of ozone formation potential. The results showed that this change may threaten ozone pollution control in the harbor cities. This is a well-written manuscript. The results could help to improve our understanding of another side of fuel switch policy and raised the concerns for reactive VOCs emissions from ships, and found river vessels might have even larger emissions of VOCs and NO<sub>x</sub> than coastal vessels. I highly recommend this manuscript to be accepted by the journal.

Minor revisions,

line 18, change “to reduce” to “reducing”;

line 19, change “matters” to “matter”;

line 19, change “emission” to “emissions”;

line 20, change “south” to “southern”;

line 21, change “a” to “an”;

line 21, delete “in south China”;

line 22, change “emission” to “emissions”;

line 22, change “coastal vessels” to “the coastal vessels”;

line 22, change “dropped” to “decreased”;

line 23, change “the EFs of non-methane hydrocarbons (NMHCs), however, reached” to “however, the EFs of the nonmethane hydrocarbons (NMHCs), were”;

line 24, change “about” to “approximately”;

line 24, change “emission” to “emissions”;

line 25, change “NMHCs” to “the NMHCs”;

line 26, change “more rich” to “richer”;

C2

line 28, change “the new policy” to “the new policy was implemented”;  
line 28, change “reactive alkenes” to “the reactive alkenes”;  
line 29, change “for per kilogram of fuel burned, emitted NMHCs” to “the emitted NMHCs per kg of fuel burned”;  
line 29, change “about” to “approximately”;  
line 30, change “coastal vessels” to “the coastal vessels”;  
line 30, change “river vessels” to “the river vessels”;  
line 31, change “their EFs of NMHCs” to “the EFs of their NMHCs”;  
line 35, change “coastal or ocean-going vessels” to “the coastal or ocean-going vessels”;  
line 35, change “along with” to “in addition to”;  
line 35, change “river vessels” to “the river vessels”;  
line 38, change “total world merchandise trade” to “the total global merchandise trade”;  
line 39, change “it is no surprise that” to “unsurprisingly”;  
line 42, change “would give rise to” to “can cause”;  
line 42, change “areas,” to “areas”;  
line 42, change “environmental burden” to “the environmental burden”;  
line 46, change “more” to “a more”;  
line 47, change “brought about” to “resulted in”;  
line 49, change “resulted” to “has resulted”;  
line 50, change “aerosols” to “aerosols, respectively,”

### C3

line 51, change “revealed” to “has revealed”;  
line 55, change “reduce” to “be reduced”;  
line 56, change “emission sources” to “emissions sources”;  
line 67, change “VOCs” to “the VOCs”;  
line 68, change “north” to “northern”;  
line 69, change “As a matter of fact, previous” to “Previous”;  
line 70, change “Meanwhile” to “In addition”;  
line 75, change “January 1, 2017 to December 31, 2019” to “1 January, 2017, to 31 December, 2019”;  
line 76, change “estimated” to “estimated”;  
line 76, change “atmospheric” to “atmospheric”;  
line 77, change “south” to “southern”;  
line 81, change “bring about” to “result in”;  
line 82, change “shut down” to “shut down”;  
line 82, change “emission” to “emissions”;  
line 88, change “like” to “such as”;  
line 92, change “in comparison” to “for a comparison”;  
line 97, change “the fifth” to “fifth”;  
line 98, change “the seventh” to “seventh”;  
line 98, change “contribute near 40%” to “account for nearly 40% of”;  
line 99, change “nine” to “the nine”;

### C4

line 101, change “FSC” to “the FSC”;

line 101, change “be lower” to “have been less”;

line 102, change “that” to “in that”;

line 147, change “on average decreased from  $2.2 \pm 0.5\%$ ” to “decreased from  $2.2 \pm 0.5\%$  on average”;

line 148, change “though” to “although”;

line 150, change “hydrocarbons” to “hydrocarbons,”;

line 151, change “chromatograms” to “chromatograms, than those of coastal vessels before the policy”;

line 157, change “performance of combustion system” to “the performance of the combustion system”;

line 185, change “, and also larger” to “and higher”;

line 185, change “engineering vessel” to “engineering vessels”;

line 185, change “crusing condition” to “cruising conditions”;

line 186, change “the maximum” to “a maximum”;

line 199, change “individual” to “the individual”;

line 199, change “remain” to “remained”;

line 210, change “before” to “before implementing the new policy”;

line 210, change “after implementing the policy, respectively” to “, respectively, after implementing the policy”;

line 212, change “NMHCs from river vessels were” to “the NMHCs from the river vessels was”;

#### C5

line 212, change “coastal vessels” to “the coastal vessels”;

line 213, change “showed” to “shown”;

line 213, change “dominated the emission of NMHCs with a share of” to “were dominant in the emissions of the NMHCs at”;

line 214, change “individual” to “the individual”;

line 223, change “had a share up to 70.9%” to “accounted for up to 70.9% of those emissions”;

line 223, change “variety of the” to “variation in”;

line 224, change “big” to “large”;

line 224, change “compositions of VOC emissions” to “the compositions the VOC emissions”;

line 225, change “only restricted” to “restricted only”;

line 225, delete “can be”;

line 226, change “diesels” to “diesel fuels used”;

line 226, change “sampling might also lead” to “the sampling might have also led”;

line 228, change “potentials” to “potential”;

line 229, change “OFPs of VOCs from ship exhausts” to “OFP of the VOCs from ship exhaust”;

line 230, change “Formation Potentials (OFPs)” to “formation potentials (OFP)”;

line 231, change “ships emission” to “ships emissions”;

line 232, change “reactivity,” to “reactivity”;

line 237, change “rise of” to “increase in”;

#### C6

line 237, change “like” to “such as”;  
line 240, change “coastal vessels” to “the coastal vessels”;  
line 241, change “OFPs” to “OFP”;  
line 241, change “coastal vessels” to “the coastal vessels”;  
line 245, change “suggests” to “suggest”;  
line 246, change “SOAFPs of VOCs from ship exhausts” to “SOAFP of the VOCs from ship exhaust”;  
line 250, change “Like” to “Similar to”;  
line 251, change “SOAFPs” to “SOAFP”;  
line 252, change “to interpret” to “in interpreting”;  
line 252, delete “(IVOCs)”;  
line 261, change “higher” to “higher than that of the other ships”;  
line 262, change “has: to “had”;  
line 262, change “river vessels” to “the river vessels”;  
line 262, change “test ships” to “the tested ships”;  
line 262, change the value” to “a value”;  
line 273, change “one the three ECAs newly established” to “one of the three newly established ECAs”;  
line 280, change “of EFs” to “in the EFs”;  
line 280, change “more” to “the more”;  
line 288, change “did bring about largely” to “resulted in substantially”;

#### C7

line 289, change “for” to “due to”;  
line 290, change “coastal vessels” to “the coastal vessels”;  
line 290, change “is” to “was”;  
line 290, change “use” to “had used”;  
line 290, change “all along and thus” to “the entire time and thus were”;  
line 291, change “much higher” to “high”;  
line 291, change “larger emission” to “high level of emissions”;  
line 292, delete “would”;  
line 292, change “how to further lower the emission” to “and further lowering the emissions”;

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