

## ***Interactive comment on “Speciation of $^{127}\text{I}$ and $^{129}\text{I}$ in atmospheric aerosols at Risø, Denmark: insight into sources of iodine isotopes and their species transformations” by L. Y. Zhang et al.***

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Thanks a lot for the constructive comments. We have considered all comments and carefully revised the MS according to these comments. The comments and questions from the referee are answered below item by item.

1. The investigation has utilized a sample collection procedure of aerosols that provide all sizes of aerosols (including dust). It is understandable that as the first study, the procedure was reasonable, but in future investigations it will be vital to have the dust and aerosols sizes separated to properly estimate resuspension and other material

C8475

size effects.

Answer: We agree with the referee. The size effect is important on the distribution and dispersion of iodine and its species, which should be well investigated in the future. Resuspension of the deposited iodine is one very interesting topic, which will help to understand the atmospheric behaviors of iodine, especially radioactive iodine released from accident.

2. It will be good to have a definition of atmospheric aerosols and dust in the beginning of the introduction in order to focus the reader on what is analyzed.

Answer: Thanks for the comment. We added one sentence to give the definition of atmospheric aerosol in the beginning of the introduction.

3. I agree with the authors that lack of international standards for the atmospheric aerosols when it comes to iodine makes the comparison rather floating, but this issue can be an excellent inter-laboratory exercise for the future.

Answer: We agree that it will greatly improve the analysis of  $^{129}\text{I}$ , not only for speciation but also total  $^{129}\text{I}$ , if some inter-laboratory exercises are organized in the future. We will be happy to participate in such an intercomparison if such one is organized in the future.

4. Although not directly pertinent to subject of the investigation, it will have been interesting to obtain visual images (using SEM) of the aerosols particles to get some idea about size distribution and forms.

Answer: Thanks for this suggestion, we agree with the referee. Using more advanced technologies, such as SEM and TEM for aerosol morphology, XRF and ICP-MS for trace elements, IC for inorganic ions, will provide more ideas for interpreting the atmospheric iodine behavior. Therefore, our future may combine these techniques with speciation analysis of  $^{129}\text{I}$  and  $^{127}\text{I}$  in aerosols.

5. It is not clear what was the effect of temperature and wind speed on the iodine

C8476

species distribution and may be this part needs further elaboration.

Answer: We appreciate for this comment. In this paper, we didn't find any significant effect of temperature and wind speed on iodine species due to the limited aerosol samples and iodine species data points. A systematic investigation on time-series aerosols is needed to elucidate the effect. This might be carried out in our future work.

6. It was interesting that the authors used a correlation with  $^7\text{Be}$  isotope, but I am sure they know that these two isotopes have rather different atmospheric chemistry and physical behavior. The correlation between  $^{127}\text{I}$  and  $^7\text{Be}$  is rather interesting (although not many data points) and most likely point out iodide as possible adsorption site for  $^7\text{Be}$ . However, the authors did not mention the chemical procedure or the measurement technique used for  $^7\text{Be}$ . As with iodine,  $^7\text{Be}$  can also fractionate differently between water soluble and insoluble. A reference at the end of line 23 on page 25152 is needed.

Answer: Thanks for the comment. The significant correlation between  $^{127}\text{I}$  and  $^7\text{Be}$  and no correlation between  $^{129}\text{I}$  and  $^7\text{Be}$  were observed in this investigation, which is rather interesting. We agree that iodine and beryllium have different chemical and physical properties and distinct behaviors in the atmosphere. We tried to explore the formation process of iodide using these information, but it seems a big challenge due to lack of sufficient evidence (more data points). Therefore, we have to delete the discussion of this part.

7. The paper provides interesting information about iodine isotopes and species, and some improvement can be achieved through consideration of the comments.

Answer: Thanks a lot for all of the comments. We have considered all of the comments, and the manuscript is revised and improved according to these comments.

Yours sincerely,

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C8477

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C8478