

Atmos. Chem. Phys. Discuss., referee comment RC1
<https://doi.org/10.5194/acp-2021-460-RC1>, 2021
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Comment on acp-2021-460

Anonymous Referee #1

Referee comment on "Contribution of combustion Fe in marine aerosols over the northwestern Pacific estimated by Fe stable isotope ratios" by Minako Kurisu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-460-RC1>, 2021

General comments

This paper presents and discusses the contribution of Fe from combustion and natural sources to atmospheric aerosols over the ocean on the basis of Fe isotope ratios to evaluate the combustion Fe that may affect fractional Fe solubility. The authors show multiple data of the fractional solubility and Fe species in addition to Fe isotope ratios. They also compared the observed data with the output of a model calculation. Overall, the paper is well written and provides new insights into our understanding of sources of aerosol Fe and the solubility in particles by using Fe isotope ratios. While the data presented are valuable, there are some issues that need to be worked out and clarified before its publication in ACP.

Specific comments

(1) One of my concern is on the two different sets of the samples obtained by the two cruises: one obtained in winter (KH-13-7) and the other in summer (KH-14-3). The authors combined the data sets of the two cruises and classified into three groups by the trajectory analysis in terms of possible source regions. This classification is based on the emission area and transport pathways, while photochemical activities that may have affected photochemical and acidification processes (L. 458) during the transport of aerosols, are expected to be different between the periods of the two cruises. Is there any possibility that such difference in the photochemical fields of the atmosphere may have affected Fe fractional solubility, fraction of iron species, and Fe isotope ratios, even within the same group? I think the authors should add some more discussion on this point.

(2) I suppose that the fractions of group I, II, and III in each cruise samples reflect the difference in the metrological conditions (wind fields) as well as the differences in the geographical locations where the aerosol samplings were made between winter (KH-13-7)

and summer (KH-14-3). If this is true, I think the authors should mention it in the text.

(3) L.328: "Fe oxides were only found in the group III samples," while they are dominant ion species identified in the group III (Figure 5e). Is this attributable to the oceanic region where the aerosols were sampled, or is this related to the specific season? Not only saying "different sources," but also additional discussion on possible sources or processes of this fraction should be made.

(4) In the text, it would be helpful to show the averages and standard deviations of the concentrations, fractional solubility, and isotope ratios of Fe in each group (I, II, and III) in addition to the ranges. I understand that the number of data would become limited in each classification, but still the average values and the variation provide some basic information.

(5) The authors show the term "East Asia" quite often (e.g., six times in the abstract). Maybe they intend to say that East Asia is characterized by anthropogenic sources, while they also discuss possible effect of biomass burning in Siberia which is not included in East Asia. According to Figure 2(a), some air masses are coming from far west and passed over eastern part of the Eurasian continent, while some pathways in the south of 30 degree north are not clear to me. Please briefly characterize "East Asia" in terms of sources (terrestrial natural source is also expected) and clarify the pathways of the trajectory in Figure 2(a).

Minor comments

(6) L.360: "...suggesting an importance of aerosols with low $\delta^{56}\text{Fe}$ values": importance in terms of what?

(7) The word "transportation" generally refers to a system or method for carrying passengers or goods by a vehicle or a vessel or an airplane. For atmospheric aerosol or air masses, "transport" is generally used and is more appropriate word.

(8) Figure 11: The authors should mention what the size of the pie chart indicates. Maybe the magnitude of the concentrations and flux?