

General comments:

This is a synthesis study on Aerosol Iron fractional solubility, compiling all available soluble Al and Fe data over the Atlantic and Pacific oceans. This study has high scientific significance, improving our current understanding of aerosol iron solubility. This paper improves the understanding of the traditional hyperbolic relation between soluble iron and dust/Aluminum. The scientific quality and presentation quality of the paper are excellent and need minimal improvement. The synthesis of a relationship diagram between the EF_{T-Fe} and $[d-Fe]/[d-Al]$ ratio over a large geographical area has global significance. This study will also motivate atmospheric geochemists to make concordant observations of dissolved iron and aluminium. Before the publication of this manuscript, the author should address the following major corrections, which will improve the manuscript. In general, all the axis labels for similar plots should be the same, which should agree with the text description.

Specific comments:

1. The authors considered size-segregated samples from their unpublished data for this study, described in line 75. In the supplementary material, they described that the samples were collected in 7 different sizes. Which size fraction do they consider in this study, and why do they consider it? This information is missing.
2. The author considers that “the ultrapure water and ammonium acetate buffer were uniformly classified as d-Fe, with the same approach applied for Al.” (line 100). A recent assessment of leaching methodology highlighted the impact of different leaching media on aerosol samples (Tang, Mingjin, et al., 2025). The source of Al is traditionally considered to be of crustal origin, whereas Fe can be derived from multiple sources; this can impact the leachability of these metals, which is also discussed in this manuscript. How, then, do the authors justify this difference in terms of d-Fe and d-Al concentrations? The authors should discuss this hypothesis. In addition, they should evaluate the potential changes caused by the different leaching media in their current study.
3. If they use the correlation factor 1.4 proposed by Perron et al. (2020b) for Ammonium acetate leach, do they observe any difference in their current observation (line 104)? It should be explained, and this explanation will be helpful for future observations.
4. Line-125, include references for each discussed process.
5. Line-138, put references for these observations, where aluminosilicate glasses emitted from the combustion process, coal burning .. having EF of Fe <2 but $[d-Fe]/[d-Al] < 0.1$.
6. In Eq.3 define $F_{mineral}$ and F_{anthro} .
7. Table 1, $F_{anthro-dFe}$ (%) Write an equation for this calculation.
8. Line-215, Author described the role of different particle size towards dissolve metal contribution, It should be supplemented by a figure.
9. Line-240, “similar Fe” which type of Fe authors are referring, total Fe or dissolve Fe.
10. Line-240-243, The boundary between...and mineral- Fe_{sol} %”. Rewrite this line, it is hard to follow.

11. Line-276-278, How is the boundary line between combusted and non-combusted anthro-Fe defined?
12. Line-444-447, The supplementary Figure S3b clearly shows a significant number of samples were being plotted in area (v), Add a description on these samples.
13. In Figure 5, 8 and 11 correlation plot should contain the boundary line equation.
14. Line-472, As per my understanding, the figure number is wrong, correct the figure numbers in this line and as well as all subsequent lines.
15. Line-472 and 491, Instead of using the word summer season, either use months or define the summer months. The study area includes both the hemisphere; it is hard to follow the season. Do this correction for all the possible places like line-497,501...
16. Line-516-517, Heard Island located at southwest of Australia change the statement according to that.

Technical Corrections:

1. In line 66, the authors mentioned they used “the molar ratio of d-Fe to dissolved Al...” Is it the molar ratio or the mass ratio?
2. Line-124, label EF_{T-Fe} does not match the Figure 1 vertical axis. Change the vertical axis label in Figure 1.
3. Line-162, correct the notation $F_{mineral}$ and F_{anthro} . In Eq. 2 and line 142 use the notation “ $F_{mineral-dFe}$ ” for the same parameter. Instead of using “F”, it is suggested to use “f” or some other symbol for smooth reading.
4. Line-140 change the 0.10 to 0.1.
5. Line-192 expands the “EF” either to Enrichment factor or EF_{T-Fe} .
6. Figure 2(b) correct the Y axis to EF_{T-Fe} .
7. Figure 3 Put the a and b cation on the figure.
8. Figure 5 (d,e,f) solid black line should be included in the legend.
9. Line-230, Typo correction “mineral- $F_{esol}\%$ ”.
10. Line-239, Typo error “ $F_{esol}\%$ ”.
11. Line-258, “plotted in the area(i) and (ii)” of what? It should be mentioned.
12. Line-275, Typo error” $F_{esol}\%$ ”.
13. Line-311, There is no Figure 4f.
14. Line-436, Refer the figure number for the correlation slope.
15. Line-443, Correct the figure number.
16. Line-435, The Figure 8a is about North Pacific Fe? Correct the Figure number.
17. Line-445-446, Describe the area (iii) and area (iv) of which type of figure.
18. Line-477-478, Insert the figure number.
19. Line 546 and line 548, instead of pelagic, use the word open ocean. The pelagic region can be misleading.
20. Typographic error in Supplementary Figure S1. “(b) between d-Al and d-Fe concentratir4eons”