Response to Reviewer Comments on "Exploring Iron Processes in the California Current System Through a Regional Dataset of Dissolved Iron and Organic Ligand Measurements"

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Response to Referee #1 (Léo Mahieu)

We sincerely thank Dr. Mahieu for the careful and constructive review of our manuscript. We greatly appreciate the positive assessment of our data compilation and the detailed comments regarding the interpretation of the ligand measurements. We agree with the reviewer that the interpretation of the CLE-ACSV ligand data requires greater care, as the operationally determined ligand concentrations are not fully independent of the dissolved Fe concentrations used in the titration. We will therefore substantially revise this part of the manuscript and incorporate the suggested excess-ligand analysis into the revised manuscript.

Our responses to general and specific comments in **bolds** are provided below in *italics*.

General comment

1. First, I need to point out the formatting issue of the references, and I also suggest carefully checking the figures location within the text.

Thank you for pointing out the formatting issues with the references and the placement of figures. We have identified references that require to be updated to conform to the journal's formatting requirements, and will update them for resubmission. We will also carefully check the placement of all figures in the revised manuscript to ensure that they appear appropriately within the text and are positioned close to where they are first discussed.

2. Relationship between dFe and ligand concentrations and the use of excess ligand

Most importantly, I have a problem with the interpretation of the ligand data. Indeed, the authors discuss the relationship between the concentration of dFe and of the different ligand classes and conclude on a strong relationship between the two. This is omitting the mathematical bias induced by the interpretation of the CLE-ACSV data, that incorporates dFe concentration within the ligand concentration following the assumption that all the dFe fraction is accessible for competitive ligand exchange with the added ligand. It is, therefore, mathematically logical that the relationship is strong, especially when a high range of dFe value is considered. This assumption is an important limitation to consider, especially in a coastal context, where large amounts of dFe could be inorganic and inert and/or sterically inaccessible for the added ligand. A more accurate way of interpreting this data would be to consider the truly titrated ligand fraction, the excess ligand : eL = L – dFe. An easy solution would be to use the variable already present in the published dataset Ltot = L1+ L2 + L3 + L4, and then look into the relation between dFe and eLtot = Ltot – dFe.

Despite the overall high quality of the manuscript, I believe the issues pointed out above require major revision before publication in the Egusphere, and hope my comments will help the authors in the preparation of their manuscript.

We thank the reviewer for this important comment. We agree that the strong dFe–ligand relationships we originally described require more careful interpretation because of the way ligand concentrations are determined using CLE-ACSV. In this approach, the fitted ligand concentration is not fully independent of dFe because the calculation assumes that the measured dFe pool is accessible to competitive ligand exchange. Consequently, part of the apparent relationship between dFe and ligand concentration may arise from the analytical method itself rather than from direct biogeochemical coupling between Fe and ligands. This limitation is particularly relevant in coastal waters, where some of the measured dFe may occur in inorganic, colloidal, or otherwise kinetically or sterically inaccessible forms.

We followed the reviewer's suggestion and calculated the excess ligand, eL = L − dFe, for samples with co-located dFe and ligand measurements. However, we made one modification to the approach proposed by the Reviewer. Rather than summing all four ligand classes, we focus our main analysis on L_1 and L_1+L_2. We think that this is a more conservative approach that better conforms with the diversity of ligand data measurement methods. The weaker ligand classes (L_3 and L_4, with lower conditional stability constants) are expected to contribute less to Fe complexation at ambient Fe concentrations. In addition, ligand classes determined in different analytical windows may partially overlap, so summing all four classes could complicate the interpretation and potentially result in double-counting of operationally defined ligand pools. Furthermore, the results do not significantly change if we instead use L1+L2+L3+L4 (not shown).

The new analysis is shown in Figure 1, where we compare dFe with both the measured ligand concentration and the corresponding excess ligand for L_1 (top row) and L_1+L_2 (bottom row).

Because the concentrations span several orders of magnitude, we report both log–log Pearson correlations and Spearman rank correlations. The log–log Pearson correlations are calculated only for samples with positive excess ligand, whereas the Spearman correlations include all samples, including those with eL ≤ 0 (samples with eL ≤ 0 are shown as open triangles in Figure 1 but cannot be represented on the logarithmic axes). For L_1, the original dFe–ligand relationship is strong (r = 0.89, ρ = 0.85), but after subtracting dFe, the relationship is substantially weaker (r = 0.27, ρ = 0.11). Similarly, for L_1+L_2, the correlations decrease from r = 0.82 and ρ = 0.82 for total ligand to r = 0.36 and ρ = 0.16 for excess ligand. The reduction is particularly evident in coastal samples. For L_1, the Spearman correlation decreases from ρ = 0.96 to 0.16 after expressing ligand concentration as excess ligand. For L_1+L_2, it decreases from ρ = 0.91 to 0.23. Offshore, the original dFe–ligand relationships are weaker to begin with (ρ = 0.62 for L_1 and 0.36 for L_1+L_2), and only weak relationships remain between dFe and excess ligand (ρ = 0.39 and 0.23, respectively). These results indicate that the strong dFe–ligand relationships in the original analysis were influenced by the mathematical dependence of the CLE-ACSV-derived ligand concentration on dFe.

Thus, we agree with the reviewer that the excess-ligand analysis provides a more nuanced interpretation of the dFe–ligand relationships. Although ligand concentrations exceed dFe in approximately 95% of samples, excess ligand does not increase proportionally with dFe, suggesting that ligand excess is partly decoupled from dFe concentration across the CCS. Consequently, the strong correlation between dFe and CLE-ACSV-derived ligand concentrations does not necessarily indicate a strong biogeochemical coupling. Instead, the differing environmental associations of dFe and excess ligands suggest that their distributions are influenced by partly distinct controls. In particular, eL_{1+2} is negatively correlated with distance from the bottom (r = −0.49) and bottom depth (r = −0.48), and positively correlated with salinity (r = 0.51). These relationships suggest that the distribution of excess ligands may reflect the combined effects of margin-associated inputs and physical transport or mixing. However, given the sparse spatial and temporal coverage of ligand observations, these correlations should be interpreted cautiously, and more extensive observations are needed to better constrain the processes controlling excess-ligand distributions.

In conclusion, we will revise the manuscript to distinguish between operationally measured ligand concentrations and excess ligand (L-dFe) and interpret the dFe–ligand relationships more cautiously. We will keep the interpretation that organic ligands play a crucial role in Fe cycling by protecting dFe from scavenging and thereby contribute to maintaining elevated dissolved Fe concentrations. However, we will clarify that the strong correlations between dFe and CLE-ACSV-derived ligand concentrations do not necessarily indicate a strong biogeochemical coupling, particularly given the substantial reduction in correlation when excess ligand is considered.

Specifically, we will make the following changes to the manuscript:

1. *Abstract: We will revise the statement that "Concurrent Fe and ligand measurements are strongly correlated, suggesting a central role for ligands in stabilizing dFe." We will instead state: "Ligand concentrations exceed dFe in most samples, but the strong*

dFe–ligand correlation is reduced when expressed as excess ligand (L − dFe), indicating that the production of ligand is partly decoupled from the production of Fe ."

2. *Methods: We will add a description of the excess-ligand calculation and clarify the assumptions associated with the CLE-ACSV-derived ligand concentrations, including the assumption that the measured dFe pool is accessible to competitive ligand exchange.*
3. *Figure 7: We will add the new excess-ligand analysis to Figure 7, showing dFe versus ligand concentration and dFe versus eL = L − dFe for L_1 and L_1+L_2. The figure will also identify samples with eL ≤ 0 and distinguish coastal and offshore observations.*
4. *Section 3.4: We will revise the Results to introduce the excess-ligand analysis and compare dFe with both ligand concentration and excess ligand for L_1 and L_1+L_2. We will report both log–log Pearson correlations and Spearman rank correlations and explicitly distinguish the coastal and offshore relationships.*
5. *Discussion: We will revise the discussion of dFe–ligand relationships to acknowledge the mathematical dependence introduced by the CLE-ACSV approach. We will no longer interpret the strong dFe–ligand correlation alone as evidence of direct biogeochemical coupling between dFe and ligand. Instead, we will emphasize that the widespread occurrence of excess ligand indicates substantial ligand availability, while its relatively weak relationship with dFe suggests that additional biological and physical processes contribute to the observed ligand distributions.*

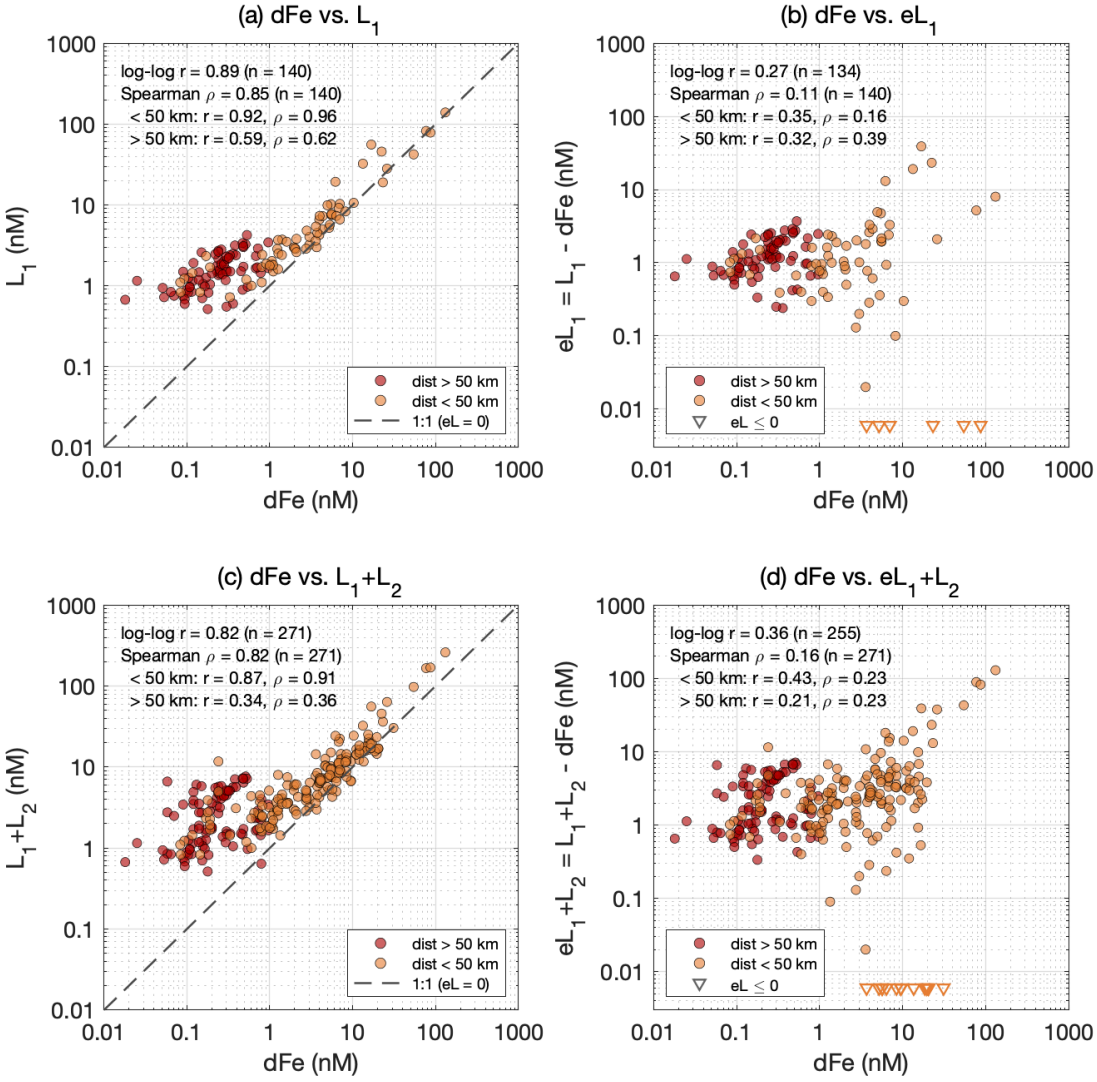


Figure 1: *Relationship between dissolved Fe (dFe) and ligand concentration, expressed as total ligand (left) and excess ligand (right). Top row: strong ligand class L_1 (n = 140). Bottom row: L_1+L_2, summed wherever at least one class was reported (n = 271). (a, c) dFe versus ligand concentration, with the dashed 1:1 line marking L = dFe (eL = 0). (b, d) dFe versus excess ligand, eL = L − dFe. Samples with eL ≤ 0 (6 of 140 for L_1; 16 of 271 for L_1+L_2) cannot be shown on logarithmic axes and are plotted as open triangles along the lower edge of (b) and (d). Both axes are logarithmic. Points are colored by distance from the coast (orange, <50 km; dark red, ≥50 km). Each panel gives Pearson's r on $\log_{10}$-transformed values (excluding eL ≤ 0 samples) and Spearman's rank correlation ρ (all samples), for the full dataset and for the coastal and offshore subsets.*

Specific comments

1. Line 8: you mention a dFe max of 30 nM in the discussion, here it is 10 nM.

We thank the reviewer for pointing out this inconsistency. The manuscript reports a maximum surface dFe concentration of approximately 30 nM in the Northern USWC in the Results section, whereas the Abstract currently refers to approximately 10 nM. We will revise the Abstract so that the reported maximum is consistent with the results and figure.

2. Introduction: maybe a map with general circulation arrows and current acronyms would help unfamiliar readers?

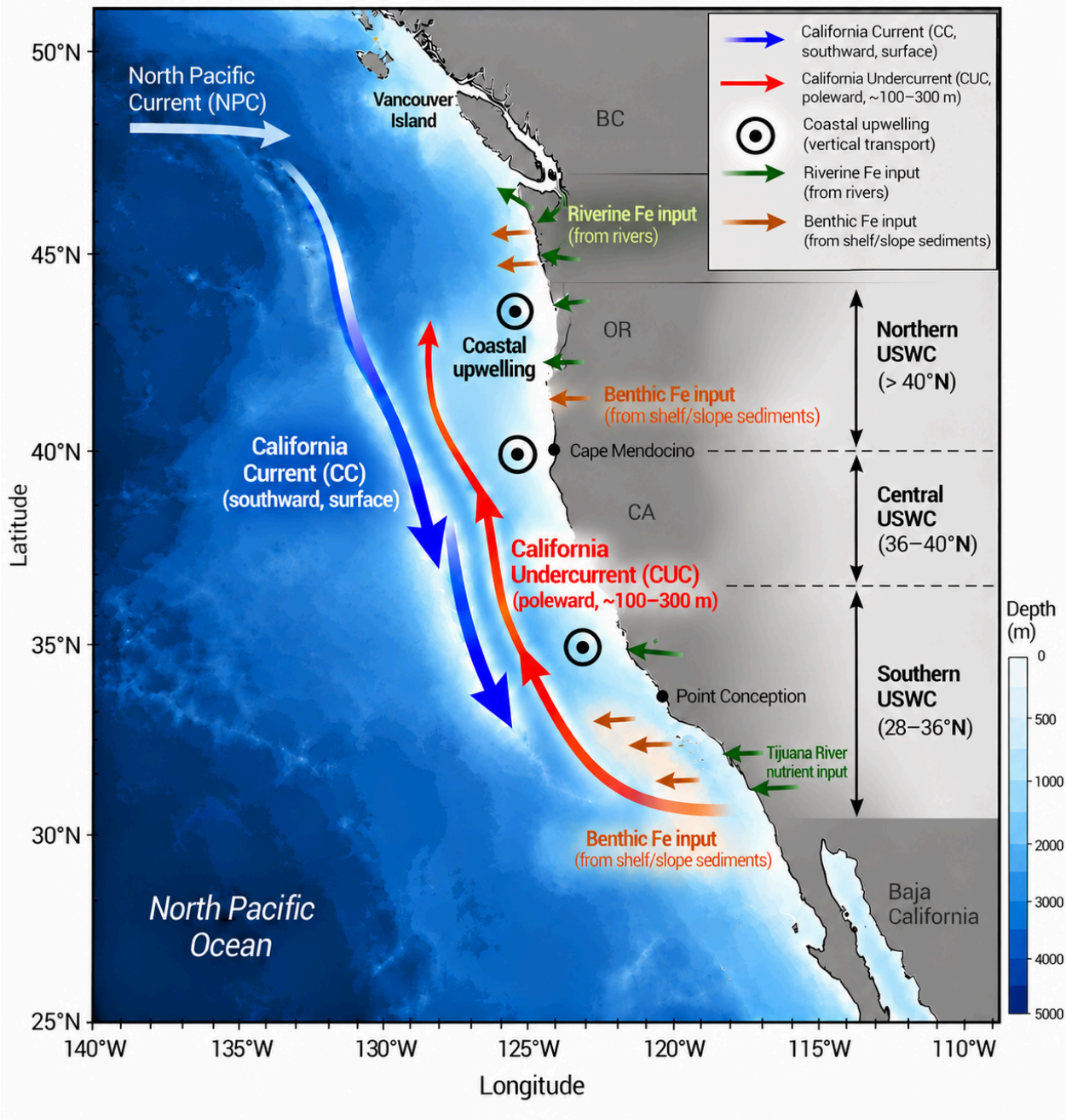


Figure 2. Schematic of the major circulation features and iron transport pathways along the U.S. West Coast. The California Current (CC) flows equatorward in the surface ocean, while the California Undercurrent (CUC) flows poleward along the continental margin at approximately 100–300 m depth. Coastal upwelling transports subsurface waters toward the surface, while riverine and benthic inputs provide important sources of Fe to the coastal ocean. Benthic Fe inputs are shown as offshore fluxes from shelf and slope sediments. Northern, central, and southern USWC regions are indicated by latitude. Arrows represent generalized circulation and Fe transport pathways and are not intended to depict instantaneous or spatially uniform flow.

We appreciate this suggestion. We agree that a schematic map showing the major circulation features and current acronyms will help readers unfamiliar with the California Current System better understand the physical context of our study. We will therefore add a new conceptual map as Figure 1 in the revised manuscript, showing the major circulation features relevant to Fe cycling, including the southward-flowing California Current (CC), the poleward California Undercurrent (CUC), and coastal upwelling. A draft of the figure is presented here, as Figure 2. The figure also illustrates the major Fe sources and transport pathways discussed in the manuscript, including riverine and benthic Fe inputs. The major Northern, Central, and Southern USWC regions are also indicated to provide geographic context.

3. Line 12: statement about Fe and ligand relationship to be adjusted following the modification from the general comments.

We agree with the reviewer and will revise the statement in the Abstract to reflect the results of the excess-ligand analysis. Please see our main response above.

4. Lines 75–77: unnecessary text

We agree with the reviewer and will remove these lines from the Introduction to improve conciseness.

5. Lines 92–107: introduce the notion of excess ligand here.

We agree that the concept of excess ligand should be introduced earlier to provide the appropriate context for interpreting the CLE-ACSV measurements. In the revised manuscript, we will introduce and define the concept of excess ligand in the Methods section as follows:

"Because the CLE-ACSV-derived ligand concentration includes the contribution of dFe under the assumption that the measured dFe pool is accessible to competitive ligand exchange, we define the excess ligand concentration as eL = L − dFe. Here, L represents the operationally determined ligand concentration, and eL represents the ligand concentration remaining after accounting for the dFe contribution. This excess ligand provides an estimate of the ligand fraction that is not directly accounted for by the measured dFe concentration." We will then introduce the use of excess ligand in the subsequent analysis and distinguish it from the total operationally measured ligand concentration.

6. Section 3.2: this section is way longer than the other results subsection. You might want to split it, maybe as i) dFe vertical distribution, ii) dFe cross-shore distribution, and iii) ligand distribution. If done so, The current section 3.3. should be moved before description of ligands distribution.

We appreciate this suggestion. We agree that Section 3.2 is substantially longer than the other Results subsections and covers several distinct aspects of the dataset. We will reorganize the Results to improve readability by separating the current Section 3.2 into three subsections addressing: (i) dFe vertical distribution, (ii) dFe cross-shore distribution, and (iii) ligand distribution.

We will also move the current Section 3.3 on dFe seasonality before the description of ligand distributions. This will provide a more logical progression through the Results, from the spatial and vertical distributions of dFe, to its temporal variability, and then to the distribution of ligands and the relationships between dFe, ligands, and environmental variables.

7. Section 3.2: You might want to consider adding a table describing the vertical and cross-shore variations of dFe, truly dissolved dFe, total dissolvable dFe, and ligands (split by classes or not). That would help the readers to take home a clear and concise piece of information.

We appreciate this suggestion and agree that a concise summary would help readers synthesize the main patterns in the dataset. We will add a summary table (see below) to the Supplementary Material describing the major vertical and cross-shore distributions of combined dFe, truly dissolved Fe, total dissolvable Fe, and the different ligand classes. The table also highlights key sampling limitations, particularly for sparsely sampled ligand classes, and distinguishes the deep coastal enrichment in combined dFe from the distributions of the two Fe pools considered separately.

Table S3. Summary of vertical and cross-shore distributions of dissolved iron and organic ligands along the U.S. West Coast. The table summarizes the main observed patterns in the compiled dataset. Interpretations of sparsely sampled distributions are qualified accordingly.

Variable	***Vertical distribution***	***Cross-shore distribution***	***Sampling limitations***

Combined dFe	*Coastal concentrations are approximately 1 nM near the surface, reach up to 10 nM around 100 m, decline to approximately 3 nM near 300 m, and exceed 10 nM near 1000 m. Offshore concentrations increase from 0.2–0.3 nM at the surface to approximately 0.5 nM around 250 m, remaining around 0.7–1 nM at greater depths.*	*Surface concentrations reach approximately 10–30 nM nearshore and decline to approximately 0.1 nM offshore. The steepest decline occurs within the first 100 km from the coast.*	*The apparent deep coastal maximum is strongly influenced by a small number of high total dissolvable Fe measurements.*
Truly dissolved Fe	*Coastal concentrations are approximately 1.5–1.7 nM near the surface, with a subsurface maximum of up to 9–10 nM at 60–100 m. Concentrations decline to 2–3 nM at 100–300 m and increase modestly to 4–6 nM at 500–1000 m. Offshore concentrations increase gradually from 0.2–0.3 nM near the surface to approximately 1–1.5 nM at 500–2500 m.*	*Enrichment occurs nearshore, particularly in surface waters and near the seafloor, with concentrations generally declining offshore.*	*Vertical coverage is more evenly distributed than for total dissolvable Fe.*
Total dissolvable Fe	*Coastal concentrations show a broad subsurface maximum of approximately 3–20 nM at 40–100 m. Some deep samples at 300–1000 m reach tens to several hundred nM.*	*Highest concentrations occur mainly over shallow shelves within approximately 10–50 km of the coast, declining to approximately 0.1–0.3 nM within 100–200 km offshore.*	*Approximately 86% of measurements are from the upper 50 m. Deep coastal maxima rely on only 2–4 observations, and offshore sampling below 200 m is sparse.*

L1	*Median concentrations are approximately 1–3 nM. A nearshore subsurface maximum occurs around 50 m; concentrations appear to increase gradually with depth farther offshore.*	*Concentrations are generally higher than dFe and tend to decrease with distance from the coast.*	*Sampling is concentrated in the Southern USWC; coverage is limited compared with dFe.*
L2	*Concentrations generally exceed dFe. A nearshore subsurface maximum occurs around 100 m; concentrations appear to increase gradually with depth farther offshore.*	*Concentrations generally decrease offshore.*	*Measurements are concentrated in the Central USWC.*
L3	*Concentrations generally exceed dFe. A nearshore subsurface maximum occurs around 100 m; concentrations appear to increase gradually with depth farther offshore.*	*Concentrations generally decrease offshore.*	*Measurements are concentrated in the Central USWC.*
L4	*Available observations show variable concentrations, with a reported nearshore subsurface maximum around 100 m.*	*A robust cross-shore pattern cannot be established.*	*Only 16 measurements are available.*
Siderophores	*Median concentrations are approximately 0.3 nM. Elevated concentrations occur in some deep, low-oxygen waters.*	*A robust cross-shore pattern cannot be established.*	*Only 22 measurements are available; concentrations are generally lower than those of other ligand classes.*

8. Lines 239–248: I globally agree with the comments on saturation of the stronger ligands and larger excess of weaker ligands, but I still want to see a relationship with excess ligands.

We agree with the reviewer that examining the relationship between dFe and excess ligands is important for interpreting the apparent differences among ligand classes. We will therefore expand the analysis in the revised manuscript to explicitly examine the relationship between dFe and excess ligand (eL = L − dFe). The new analysis is presented in Figure 1 in this response, which compares dFe with both ligand concentration and excess ligand for L_1 and L_1+L_2. For L_1, the strong relationship between dFe and ligand concentration ($r = 0.89$, $\rho = 0.85$) is substantially reduced when expressed as excess ligand ($r = 0.27$, $\rho = 0.11$). Similarly, for L_1+L_2, the correlations decrease from $r = 0.82$ and $\rho = 0.82$ for ligand concentration to $r = 0.36$ and $\rho = 0.16$ for excess ligand. We also evaluate these relationships separately for nearshore (<50 km) and offshore (≥50 km) samples.

We will incorporate these results into the Results section and revise our discussion of ligand saturation and excess ligand accordingly. In particular, we will distinguish the strong relationships between dFe and the operationally measured ligand concentrations from the substantially weaker relationships observed with excess ligands. This analysis shows that the strong dFe–ligand relationships originally described are influenced by the dFe contribution to the CLE-ACSV-derived ligand concentration. We will therefore interpret the correlation between dFe and total operationally measured ligand more cautiously and will not suggest this strong correlation alone is evidence for direct biogeochemical coupling. Instead, we will discuss the remaining variability in excess ligands in the context of processes that may independently influence ligand distributions, including ligand production, consumption or degradation, and physical transport.

9. Line 302: should be R = 0.7 – 1.0

*Thank you for catching this error. We will correct the reported range from **R = 0.7–0.9** to **R = 0.7–1.0**, consistent with the correlation coefficients reported in the Results.*

10. Line 303: I disagree with the statement suggesting that siderophores are increasing with dFe. The siderophores increase is too small, and is the smallest of many detected siderophores of independent relationship to iron.

We agree with the reviewer that our previous wording overstated the evidence for a relationship between siderophore concentrations and dFe. Although a positive correlation between siderophore concentrations and dFe is observed in the compiled dataset, the reported correlation coefficient is lower than those for L1, L2, and L3. Siderophore concentrations are also generally lower than those of the other ligand classes. Thus, we will keep the observed positive relationship but describe it more cautiously in both the Results and Discussion.

Specifically, in the Results, we will revise the current statement suggesting that "siderophore concentrations increase with dFe" to clarify that siderophore concentrations are generally lower than dFe and the other ligand classes, and that their positive correlation with dFe is relatively weak compared with those observed for the other ligand classes. In the Discussion, we will further revise the interpretation to avoid implying a direct mechanistic dependence of siderophore concentrations on dFe. We will instead emphasize that the observed relationship may reflect multiple interacting processes, including siderophore production, degradation, transport, and Fe availability. The sparse spatial and vertical coverage of the siderophore measurements also limits our ability to distinguish among these processes.

11. Lines 302–312: to be corrected following general comments.

We agree with the reviewer that this section should be substantially revised in light of the excess-ligand analysis. Specifically, we will rewrite this section as follows:

"A first notable finding is the strong relationship between dFe and all ligand types (R = 0.7– 1.0). Concentrations of dFe and ligands increase together, and ligand concentrations are often higher than dFe concentrations, except for siderophores, which represent only a small fraction of the ligand pool (Moffett and Boiteau, 2024).The strong correlations between dFe and the operationally measured ligand concentrations initially suggest close coupling between Fe and organic ligands, consistent with previous observations of Fe–ligand relationships in coastal and open-ocean environments (Boiteau et al., 2019; Bundy et al., 2014, 2015, 2016; Buck et al., 2007). However, our excess-ligand analysis indicates that this apparent coupling should be interpreted with caution because part of the relationship arises from the contribution of dFe to the CLE-ACSV-derived ligand concentration. After accounting for this contribution, excess ligand is only weakly related to dFe, particularly offshore. The weak relationship between excess ligands and dFe suggests that their distributions are not tightly coupled across the CCS. Instead, the distribution of excess ligands may reflect the combined effects of margin-associated inputs and physical transport or mixing, rather than simply tracking dFe concentrations. At the same time, the presence of substantial ligand excess does not rule out an important role for particulate and colloidal processes in regulating Fe availability. For example, Tagliabue et al. (2023) proposed that authigenic particles may dominate Fe removal near continental margins through the "colloidal shunt" process. Furthermore, the interpretation of CLE-ACSV-derived ligand concentrations depends on the extent to which the measured dFe pool is accessible to competitive ligand exchange, which may be complicated by the presence of colloidal or kinetically inaccessible Fe. Because our compilation does not include systematic measurements of Fe speciation across dissolved, colloidal, and particulate pools, we cannot independently quantify the effects of these processes or assess their relative contributions to coastal Fe cycling. Our results therefore highlight the need for coordinated measurements of dFe, ligand concentrations and composition, and colloidal and particulate Fe to better constrain the interactions among organic complexation, Fe removal, and physical transport in the CCS."

This revision replaces our previous interpretation that the strong dFe–ligand correlations directly demonstrated tight Fe–ligand coupling. We will keep the broader conclusion that organic ligands are an important component of Fe chemistry in the CCS, while acknowledging that the observed

dFe–ligand relationships cannot, by themselves, establish direct biogeochemical coupling or the relative importance of organic complexation versus particulate and colloidal processes.

12. Figure 8: First occurrence of the acronyms Lig1, Lig2, Lig3, Lig4, Side. This correlation table should also include Ltot and eLtot.

In the revised manuscript, we will define L1, L2, L3, L4, and siderophores at their first occurrence in the text and use these abbreviations consistently thereafter. We will also revise Figure 8 to include L_{tot} and eL_{tot}, allowing the correlation analysis to distinguish between the total operationally measured ligand pool and the excess ligand pool after accounting for dFe. The figure caption will be revised accordingly to define the variables and clarify the statistical analysis. We will also ensure that the terminology used in Figure 8 is consistent with the revised discussion of the excess-ligand analysis.

13. Lines 324–340: you might want to integrate other references such as the following to discuss ligand production by bacteria in iron limited conditions:

Mellett, T., Monreal, P., Kunde, K. et al. Iron availability modulates bacteria carbon cycling in the mesopelagic. Sci Rep 16, 22360 (2026). https://doi.org/10.1038/s41598-026-49839-8

Bundy, R. M., K. N. Buck, B. D. Jenkins, et al. 2026. "Differences in Siderophore Production During the Growth of Phytoplankton in Southern Ocean Incubation Experiments Under High- and Low-Iron Conditions." Environmental Microbiology 28, no. 9: e70410. https://doi.org/10.1111/1462-2920.70410.

Thank you for these helpful references. We agree that Mellett et al. (2026) and Bundy et al. (2026) provide relevant recent evidence for the regulation of microbial ligand and siderophore production under different Fe conditions. We will incorporate these studies into the discussion of potential ligand sources and production mechanisms in the revised manuscript.

Specifically, we will expand the paragraph beginning with "Previous studies have proposed that ligands can be produced by bacteria under Fe-limited conditions…" to provide additional context on the biological regulation of ligand production. We will add the following text:

Recent experimental studies further support the link between Fe availability and microbial ligand production. Mellett et al. (2026) showed that Fe availability can modulate bacterial activity and carbon cycling in the mesopelagic, highlighting the role of Fe in regulating microbial processes beyond primary production. Similarly, Bundy et al. (2026) found differences in siderophore production by phytoplankton under high- and low-Fe conditions, providing evidence that Fe availability can influence the production of Fe-binding compounds. These studies support the possibility that Fe availability may contribute to the spatial variability of ligand concentrations observed in our compilation, although the limited spatial and temporal coverage of ligand measurements prevents us from directly resolving the underlying production mechanisms.

14. Discussion and conclusion: I think this section would gain in readability being split into discussion subsections and a separate conclusion.

We agree that separating the Discussion and Conclusions would improve the readability of the manuscript. We will reorganize Section 4 into a ***Discussion*** *section with appropriate subsections, followed by a separate* ***Conclusions*** *section summarizing the principal findings and implications of the compilation.*

Response to Referee #2 (Randelle Bundy)

General comments: The manuscript written by Anh Le-Duy Pham and coauthors called "Exploring iron processes in the California Current System through a regional dataset of dissolved iron and organic ligands measurements" discusses a compilation of iron and organic iron-binding ligand data from along the U.S. West Coast, primarily documenting the nearshore to offshore transport of iron and ligands. The paper was very well written and I enjoyed reading it. I have very minor comments highlighted below.

*We sincerely thank Dr. Bundy for the thoughtful and supportive review of our manuscript. We appreciate the positive assessment of the manuscript and the helpful suggestions regarding terminology, presentation, and interpretation. We address each comment (***in bolds***) below (in italics).*

1. It could just be something with the formatting of the online pdf, but the references are in a strange format which makes it difficult to tell what is an in-text citation.

We thank the reviewer for pointing out the reference-formatting issue. We will carefully check the reference formatting throughout the manuscript and ensure that in-text citations are clearly distinguishable and conform to the journal format.

2. Line 44: You could also cite this recent compilation of GEOTRACES ligand data (Whitby et al. 2024).

Thank you for suggesting this reference. We will add Whitby et al. (2024) to the Introduction in the discussion of recent global syntheses of marine organic ligand data as follows:

"Despite these advances, a comprehensive regional synthesis of Fe and organic ligand measurements along the USWC is still lacking. Recent global syntheses of GEOTRACES-era observations have substantially expanded our understanding of the distribution and organic complexation of bioactive trace metals and their ligands in the global ocean (Whitby et al., 2024). However, the only major compilation of dFe measurements is global in scope and consists primarily of open-ocean observations (Tagliabue et al., 2012), while regional nutrient compilations for the USWC have yet to incorporate Fe (Olsen et al., 2019)."

3. Line 68: I am assuming Undercurrent here means the California Undercurrent? If so, please specify.

Yes, we are referring specifically to the ***California Undercurrent****. We agree that this should be stated explicitly and consistently and will replace the "Undercurrent" term with "California Undercurrent (CUC)".*

4. Lines 75–77: I don't think you need these lines, but that is more a personal preference and will leave it up to the authors.

We agree that these lines are not essential and will remove them to make the Introduction more concise.

5. Line 90: My only more major comment on the paper is that in the results section it was sometimes difficult to tell if you were talking about the dissolved Fe fraction or total dissolvable fraction. I think here, since you specify that you have lumped together the Fe datasets and will refer to them both as "dFe" throughout, you can focus your results and discussion on the combined dataset. Since you present the separated data in the supplement, I don't think you need to dedicate as much space in the main text about where these two datasets agree or disagree, in order to avoid confusion for the reader. In some places I think you can keep it to a simple one or two sentence explanation as to why in some cases the trends you observe are driven by the total dissolvable fraction exclusively, but otherwise you can focus on the combined dataset.

We appreciate this important point. We agree that the distinction between the truly dissolved and total dissolvable Fe datasets can occasionally make the Results difficult to follow, particularly because we use "dFe" as an umbrella term for both operational pools. We will revise the Results to focus more clearly on the ***combined dFe dataset*** *for the main analysis, while retaining the separate analyses of truly dissolved and total dissolvable Fe in the Supplementary Material. Where the observed pattern in the combined dataset is driven specifically by the total dissolvable fraction, we will state this explicitly and briefly rather than devoting extensive discussion to the separate datasets in the main text.*

6. Line 152: Here are you referring to the combined dFe dataset? I think you are, but it is not clear because sometimes you refer to dissolved Fe in the manuscript as "dFe", sometimes "truly dissolved Fe" and sometimes "dissolved Fe". It is also not clear if this difference in nomenclature is meant to mean you are talking about the combined dataset, or just the operational pool of Fe. My sense is you could simplify as mentioned above, but if you would like to the keep the manuscript as is, perhaps you can introduce slightly more specific nomenclature where if you are talking about dissolved Fe as an operational definition you use dFe, and if you are talking about the combined dataset of dissolved + total dissolvable Fe you can use something like dFedata or some other similar abbreviation.

We agree that the terminology can be clearer, particularly in distinguishing the combined dataset from the individual operational Fe pools. As described in our response to the previous comment, we will simplify the presentation by focusing the main Results and Discussion on the combined dFe dataset, while retaining the separate analyses of truly dissolved Fe and total dissolvable Fe in the Supplementary Material. Specifically, throughout the main text, we will use "dFe" when referring to the combined dataset of truly dissolved and total dissolvable Fe. We will use "truly dissolved Fe" and "total dissolvable Fe" only when discussing the individual operational pools or when briefly explaining a pattern in the combined dataset that is driven predominantly by one of these pools. We will revise the terminology throughout the manuscript to apply this distinction consistently and will clarify the definition of dFe at the beginning of the Methods section.

7. Section 3.2: I wasn't sure here either if the first paragraph is referring to the combined dataset, and then the subsequent paragraphs are talking more specifically about the different operational pools of Fe.

We agree that the current organization of Section 3.2 does not always make it clear whether the text refers to the combined dFe dataset or to a specific operational Fe pool. As described in our responses to the previous comments, we will revise the section so that the main Results focus consistently on the combined dFe dataset, with "dFe" referring to the pooled measurements of truly dissolved and total dissolvable Fe. Specifically, we will revise the opening and subsequent paragraphs of Section 3.2 to make clear that the reported vertical and cross-shore patterns refer to the combined dFe dataset unless otherwise stated. We will substantially reduce the detailed comparisons between truly dissolved and total dissolvable Fe in the main text and retain these separate analyses in the Supplementary Material. Where a feature of the combined dFe distribution is driven predominantly by one operational Fe pool, we will briefly identify this in the main text and refer readers to the corresponding Supplementary figures for the detailed comparison.

8. Figure 4: Could you perhaps note in the legend, or with some kind of horizontal line in Figure 4a, what the average bottom depth is for the stations < 50 km from the coast is? It would be interesting to know where the average bottom depth is in relation to that sub-surface feature in dFe.

Thank you for this helpful suggestion. We agree that showing the average bottom depth of stations within 50 km of the coast provides useful context for interpreting the subsurface dFe feature. We have therefore added a horizontal dashed line at 536 m in Figure 4a, representing the mean bottom depth of stations located less than 50 km from the coast. We have also added "Mean bottom depth, dist < 50 km (536 m)" to the figure legend.

In the revised manuscript, we will refer to this depth in the Results when discussing the subsurface dFe distribution, allowing readers to directly compare the depth of the observed dFe feature with the average seafloor depth of the nearshore stations.

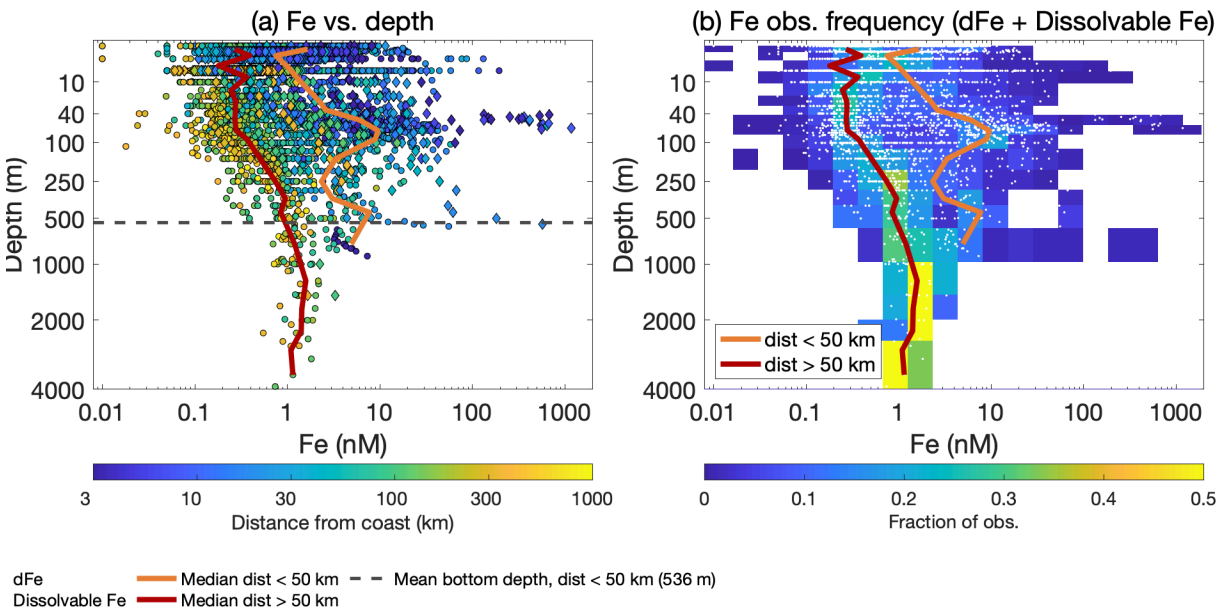


***Figure 3**: (a) Vertical profiles of iron (Fe, nM) along the U.S. West Coast. Each symbol is one measurement, colored by distance from the coast (km); circles are dissolved Fe (dFe) and diamonds are dissolvable Fe. Solid orange and red lines show the median Fe concentration, computed from dFe and dissolvable Fe combined, for nearshore (< 50 km) and offshore (> 50 km) measurements, respectively. The dashed grey line marks the mean bottom depth (ETOPO1) of nearshore stations (< 50 km; 536 m). (b) Frequency distribution of Fe measurements (dFe and dissolvable Fe combined, all distances) as a function of depth. Background colors show the fraction of measurements falling in each logarithmic concentration bin within each depth layer. White dots show individual measurements; solid orange and red lines show the median Fe for nearshore (< 50 km) and offshore (> 50 km) measurements, respectively.*

9. Figure 6: I thought the seasonal analysis was really interesting, despite its limitations (this is just a comment I know, but it was interesting to see the difference seasonal trends in each region of the coast).

We appreciate the positive comment. We agree that the regional differences in seasonality are an interesting aspect of the dataset and will keep this analysis while making its limitations clear, particularly the uneven temporal and spatial sampling among regions.

10. Line 323: In Boiteau et al. (2019) they also noted that some of their elevated siderophore concentrations were deeper in the water column where there were indicators that there could have been some lateral transport of sediment material (indicated by lower beam transmission). So it could also be that the negative siderophore correlation

with oxygen is due in part from a shelf remineralization signature, rather than an in-situ remineralization signature.

Thank you for pointing out this important alternative interpretation. We agree that the negative correlation between siderophores and O_2 should not necessarily be interpreted solely as evidence for in situ remineralization or production under low-O_2 conditions. We will incorporate the reviewer's suggestion into the revised manuscript by discussing the possibility that the observed relationship may also reflect shelf-derived or sediment-associated material transported laterally into deeper waters, as suggested by the observations of Boiteau et al. (2019). Specifically, we will revise the relevant discussion as follows:

Siderophores exhibit a strong negative correlation with O_2, while the moderately weak ligand L2 shows strong positive correlations with macronutrients. In contrast, the weaker ligand classes L3 and L4 do not exhibit significant relationships with macronutrients, O_2, temperature, and salinity. The strong correlations between L2 and macronutrients, and between siderophores and O_2, support the common assumption in ocean biogeochemical models that ligands are produced during remineralization and via organic matter exudation (Pham and Ito, 2018; Völker and Tagliabue, 2015). In particular, the negative correlation between O_2 and siderophores, which is the strongest correlation observed in Figure 8, is consistent with observations in the North Pacific linking siderophore accumulation to heterotrophic respiration in the subsurface "twilight zone" (Li et al., 2024). However, this relationship may also reflect lateral transport of shelf-derived or sediment-associated material into deeper waters. Boiteau et al. (2019) observed elevated siderophore concentrations at depth in association with lower beam transmission, suggesting a potential contribution from laterally transported sedimentary material. Thus, the negative correlation between siderophores and O_2 in our compilation may reflect a combination of in situ remineralization and shelf-derived material transported laterally into the water column, rather than being attributable exclusively to in situ remineralization.