

Interactive comment on “Sources of Fe-binding organic ligands in surface waters of the western Antarctic Peninsula” by Indah Ardiningsih et al.

Anonymous Referee #1

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General comment: This study investigated Fe-binding organic ligands distribution up to 600-m depth at 5 stations in the western Antarctic Peninsula (WAP). The research area covered the front and southern boundary of the Antarctic Circumpolar Current (ACC) as well as the zone influenced by the Coastal Current (CC) near the peninsula. The results indicated that the organic ligands on the shelf were associated with ice-algal exudates and melting sea-ice in surface water, and those in the deep shelf water were supplied via resuspension of shelf or sediments. The ligands concentration always exceeded dissolved Fe concentration, suggested that any additional Fe input can be stabilized in the dissolved form via organic complexation. Overall, this manuscript is well written and organized. But there are two points to be considered.

(1) The relationship between complexation capacity of the ligands and Fe distributions

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The authors explained the relationship between complexation capacity of the ligands and Fe distributions in the beginning of section 4.2, but it was about the specific sample. How was the overall trend?

(2) The meaning of excess ligands In this study area, [L⁻] was always observed and additional Fe input was expected to be stabilized in the dissolved form. Although particulate Fe was not investigated in this study, it was expected that some portion of Fe might exist as particulate form in the WAP (Seyitmuhammedov, 2020). The co-existence of [L⁻] and particulate Fe sounds like a contradiction. How do the authors think about the contradiction? But I could not access the reference Seyitmuhammedov (2020) via online because it is Doctoral thesis; so I'm not sure whether Seyitmuhammedov (2020) researched the total dissolvable Fe during the same cruise to this study. If so, please explain brief results from Seyitmuhammedov (2020).

It is well recognized that the Fe speciation data in the ocean is important to understand Fe cycle in marine environment, the result and finding obtained in this study are valuable for future studies. Several minor comments are listed below.

Minor comments: Page 2, L38. CO₂ "2" should be written in subscript.

Page 3, L72-79. Humic substances (HS) and HS-like substances. . . Complicated notation. Because this study did not investigate the HS and HS-like substances specifically, the authors can unify the terms and explain in this section.

Page 4, L114-115. Low density polyethylene bottle (LDPE, Nalgene). In general, GEOTRACES cookbook recommends fluorinated high density polyethylene bottle (FLPE) or Teflon bottles for the sampling of ligands in order to avoid the absorption to the bottle wall. Did the authors check the influence of the difference on the CLE-AdCSV?

Page 6, L137-. Section 2.3 Did the authors apply air purge method? Please add the information about the purging method.

Page 6, L158-159. . . the product of [L⁻] and log K, . . . Probably the authors can elimi-

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nate "log" from the sentence.

Page 7, L164-165. The conditional stability constant of... Did it mean that different calibration result from the original method (Abualhaija and van den Berg, 2014) was obtained?

Page 8, Figure 2 (b)and(c). Please add the boundary line between mCDW and uCDW in Figures 2 (b) and (c).

Page 9, Figure 3 (a), (b) and (c) Please add the titles for x-axis.

Page 11, Figure 5 (b) and (c). Please add the data points in the Figures 5 (b) and (c), too.

Page 12, L249- Section 4.1 Why there was the huge differences in [L'] distributions in deeper water between stations 70 and 72? Both stations are located in the shelf region but separated by a sill. It is very interesting. In the deeper waters at station 72, high Si* and low N/DFe values were observed. Is [L'] likely to have a relationship with Si* or N/DFe?

Page 13, L285 However, given... I think the mixing process influenced on the distribution of phytoplankton as well as on those of Fe, L and nutrients. I think the ligand production rate by phytoplankton is different between species and their physiological status, too.

Page 16, L341-. Section 4.2. Are there any information about the phytoplankton species during this observation?

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