

Interactive comment on “New insights on the role of organic speciation in the biogeochemical cycle of dissolved cobalt in the southeastern Atlantic and the Southern Ocean” by J. Bown et al.

Anonymous Referee #1

Received and published: 4 April 2012

General Comments: This manuscript reports the organic speciation of Co in the Southern Ocean. The sampling and analytical work is very thorough, and the results presented are discussed adequately. Some effort is however needed in editing the grammar and syntax. The manuscript is very often confusing as it is, especially in the discussion section. I have suggested some rewording, but more work is required.

Specific comments: Line 57: add a sentence about the role of Co in the global ocean, typical concentrations and vertical distribution in the Southern Ocean, and co-limitation in Southern Ocean Line 108: define PTFE Line 109: define LDPE Line 113-114: “in the dark at ambient temperature” rather than “at dark and ambient temperature” Line

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140: 0.5% v:v? same at line 150. Line 147-151: correct the wording. E.g., “Once the cell was emptied, 3mL of the sample solution were pumped to rinse the system, and 15mL then used for analysis. At the end of each titration, the voltametric cell was rinse with acidified MilliQ water (HCl Ultrapure, 1‰ v:v) and MQ water.” Line 234: the deep waters DCo concentrations at L1, S1 and L2 (40-60pM) do not appear higher than the other stations sampled away from the continental margins. Have the authors ran any statistical test to say this feature is significant? L236-237: I don’t see any scavenged-type profiles for DCo at any of the ACC station (ie. surface DCo>deep DCo). Rather they are either nutrient-like (S2, L3, S3, L4, L6) or conservative (S4, L5 and L7). L241-244: The low DCo at the bottom of profile S5 is not that obvious on Figure 3. Maybe refer to Table 1 instead. L316: “Determination of Cobalt speciation” rather than “Cobalt speciation determination” L331: Could there be a second class of ligands involved (weak organic ligands)? L336-341: remove “for instance”- and coma after (Duckworth et al., 2009) L337-349: the section on the redox state of Co with regards to organic ligands complexation is not very clear. Maybe itemize the potential culprits. What is the most plausible scenario to explain the absence of curvature? L363-364: Figure 7 is confusing without the legend on the figure. L364: remove “deep” L366-369: rephrase L370-373: Rephrase to “our conditional stability constants are 1 to 5 orders of magnitude higher (1017.9 to 1020.3) than those reported elsewhere (1015.6 to 1017.2; Ellwood and van der Berg; Ellwood et al., 2005; Saito and Moffett, 2001). L375: replace “with” with “in” L376: remove “for instance” here and throughout the manuscript. L378-379: “allowing for the detection of weaker Co organic complexes than in our study”. Use “Comparison” rather than “Comparability” L383: rephrase in something like “may be an option as a standard to use in future studies” L385: maybe break this section with subtitles for each area described (ie. STZ, AAC, Weddell Gyre) L402-409: Do the authors have an idea on the phytoplankton species present in this study (especially from L1 to S2)? A reference to Beker et al. (in prep) is given later in the text. Can the authors include the main findings of that paper, and how it would affect L production? L426: add “the” before “surface” L428: add “the” before “cycles” L427:

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remove “s” after ratio L428” “the” before “cycles” L433: “in” rather than “on” L433-436: the L concentrations at L1, S1 and L2 in I-AAIW and SE-NADW do not appear higher than the other stations sampled away from the continental margins. What’s the averaged [L] at the other stations compared to those from the STZ? L449: Use “in our study” rather than “in this study” throughout the manuscript, as it is difficult for the reader to know which study the authors refer to. L469-471: this has already been said in lines 460-461. Maybe put the ranges in L460-461. L482: remove “the” before “biological uptake” L483-486: replace “that” by “which” and “they do not allow studying the bioavailability” by “they do not allow to study the bio-availability” L503: Just say “to evaluate any limitation hypothesis in these waters” L507-509: rephrase L566-568: That sentence could be in the results section as well, as it was difficult to associate the trends observed in Figure 3 to water masses described in Figure 2. L568-570: Wouldn’t advection from the South Africa margins bring low O₂ waters rather than high O₂ waters?

L637-648: correct the punctuation and missing spaces in the acknowledgements section.

Page 36: Figure 2. In addition to the fronts, it would be helpful to indicate the location of the stations on this figure. It makes it much easier for the reader to follow the results section.

Interactive comment on Biogeosciences Discuss., 9, 3381, 2012.

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