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Interactive comment on “Labile Fe(II) concentrations in the Atlantic sector of the Southern Ocean along a transect from the subtropical domain to the Weddell Sea Gyre” by G. Sarthou et al.

Anonymous Referee #1

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General comments. Fe(II) is one of the important Fe species in seawater to understand marine biogeochemical cycle of Fe, but the data of picomolar-level Fe(II) in the open ocean have not been obtained sufficiently. This manuscript presents new data set of labile Fe(II) concentrations in the subtropical South Atlantic and the Southern Ocean from 34 to 57°S. The data quality is good enough to discuss the biogeochemical processes of Fe(II) in these areas. The authors discussed the remineralization process of biogenic Fe by comparing the profile of Fe(II) with that of Th-234/U-238 ratio, which is a unique and interesting idea. The authors also examined Fe(II) oxidation rates us-

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ing the vertically obtained seawater samples, and compared the experimental results with model calculations. These results will also add new information to consider the biogeochemical cycle of Fe(II) in these regions. This manuscript is well organized and readable, but I made some small comments as described below. I hope the comments will brush up some parts of this manuscript.

Specific comments. 1) Page 4177, line 1-11. The authors discussed some possibilities that atmospheric input might affect the labile Fe(II) distributions. In the previous manuscript (Chever et al., 2010), the atmospheric dust transport model was successfully applied to discuss DFe sources, but I don't think this approach is suitable for considering the surface Fe(II) distributions because Fe(II) half life time is too short (2.9 – 11.3 min). If any information of wet deposition in these regions during this cruise, it might be useful for the discussion on surface labile Fe(II) distributions.

2) Page 4178, line 8. In Figure 7, biogenic particulate barium data are shown, but the relationship between Baxs and Fe(II) profiles has not been explained clearly.

3) Page 4178, line 15-23. To discuss the remineralization process of biogenic particles, the authors examined the relationship between Fe(II) and AOU in sub-surface maxima. However, AOU is not a good indicator for the remineralization process near the surface layer. If nitrite and ammonium in seawater were determined at the same stations, it might be useful to compare the profiles of labile Fe(II) with those of nitrite and ammonia because nitrite and ammonia are also released during the remineralization process of biogenic particles.

4) Page 4179, line 3-5. As the authors mentioned, concentrations of some elements in AAWW and AASSW might be different because of biological uptake. However, it would be difficult to connect Fe(II) concentrations with the seasonal variation of water masses since the half-life time of Fe(II) is too short. Some explanation is needed to understand the time-scale differences.

Technical corrections. 1) Page 4167, line 11. "Hansard et al., 2009)" should be

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“Hansard et al. (2009)”. 2) Figure 4. The range of the y-axis is too wide. It is very difficult to see the difference of the slopes.

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