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Interactive comment on "The sensitivity of primary productivity to intra-seasonal mixed layer variability in the sub-Antarctic Zone of the Atlantic Ocean" *by* W. R. Joubert et al.

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The article is devoted to the study of very important issue related to the deepening of representations about balance of environmental factors influencing Southern Ocean primary production such as light and nutrition. Article advantage is the consideration of primary production and hydrological processes in synoptic scale. Authors try to propose the appropriate hydrological mechanism to explain transport Fe to the upper layer and possibility to utilize this micronutrient by phytoplankton. However, I believe that conclusions of the article should be based on more extensive data. General comments. 1. I believe that investigation of balance between light availability and nutrient limitation via MLD variability impossible without consideration of underwater irradiance, the main nutrients distribution (N, P, Si), "critical depth", euphotic or photosynthetic

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depth. So, resolution of important and complex problem was not supported by sufficient data. 2. Assumption of the absence of vertical NCP changes seems wrong to me. Apparently, in the present article depth-integrated NCP calculations within MLD based on this assumption. Actually, NCP decrease with depth and in the SAZ 45 m horizon is close to the bottom of euphotic zone where NCP is near zero. 3. The authors denote non-linear link between NCP and MLD but did not provide the statistical parameters of this dependence. That's unfortunate due to in general this type of relation between production parameters and MLD previously was registered (Mitchell et al., 1991; Mitchell and Holm-Hansen, 1991; Nelson and Smith, 1991) and it would be interesting to see the new data in synoptic scale. 4. The authors define phytoplankton community summer condition in the Sub Antarctic Zone (SAZ) as a "bloom". As shown in Fig. 2c average chl a values were approximately 0.3 – 0.4 mg m-3 along transects and maximum was close to 0.7 mg m-3. These low chl a concentrations are not the characteristics of bloom conditions (Sullivan et al., 1993). Following the classic works, SAZ is the typical HNLC region (e. g. Banse, 1996). 5. The statement that small thickness of MLD promotes the best light conditions for phytoplankton growth in Southern Ocean should be applied with cautions. As revealed in the recent works relatively longtime exposition in MLD may cause to photoinhibition and decreasing of production characteristics (Alderkamp et al., 2010; 2011). 6. Overall, I think that complexity of the task which authors try to resolve contradicts with approaches and database used in the present article.

Specific comments. 1. To avoid uncertainty in the use of terms net community production (NCP) and net primary production (NPP) we advise to change in future "primary productivity" on "net community production (NCP)" in the title of the article. 2. NPP values should be presented not only in O2 but also in C units.

Technical comments. On the Fig. 2c chl a distribution is presented, but in the comments we can read "NCP vs. MLD". So, drawing content and caption do not match.

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