

Review of Gutt MS

This is a long difficult to read manuscript! It reads as though it were composed by a large committee, which of course it was. It is long and very terse which is necessary because it covers an immense amount of ground. Simply put, it is the best LTER proposal I have ever seen. Yet at the same time, it is embarrassing but I have tried to read it three times and really don't understand all that much of it. Yet this is its strength – I suspect that very few people really understand all of it. All the other LTER and MPA proposals and discussions have had a much more narrow focus, usually biology, geochemistry or fisheries and they basically ignore very important physical parameters as they focus on more narrow population or ecosystem dynamics. Here the authors have pulled together all the physical and biological parameters that I can think of (actually more than I had ever thought of) into a coherent and unique framework.

As a reviewer I attempt to understand a manuscript, and then go through the manuscript section by section offering constructive suggestions. In this case as I go through it all I seem able to do is nod my head and agree with the assertions, hence I am not a very useful reviewer. Perhaps the one issue that is missing has to do with fishing impacts which has had such a large but unstudied and virtually unknown ecosystem impact on the Ross Sea. But in your case, there has not been much if any fishing so you really have nothing to talk about except for the virtual removal of whales, so this is not a criticism, but perhaps a suggestion to consider potential fishing impacts a bit more carefully. Yet, I agree that they are minor compared to the climate change problems that you do focus on very carefully.

Your focus on long term observations is sound, yet as you point out, these always lack the physical drivers of the phenomena that the observations record. For example, my own career was spent at McMurdo where I was not allowed to maintain the temporal continuity that I had hoped to have for the observations, but I was still able to report massive changes after decades of relative stasis. Yet the oceanographic and climatic forces actually driving those changes are still a mystery. It is not for lack of interest as there were many proposals to study the oceanography, yet the NSF insisted on investing in very expensive if interesting lake studies and redundant seal programs. So, despite several programs looking at specific biological questions that relied on oceanographic data, those baseline or benchmark data do not exist. More generally, the Ross Sea might be the most interesting ocean system in the Antarctic, but the fishing interests and political clout of CCAMLR has focused on defending at all costs the toothfish industry rather than collecting the type of data you propose in this manuscript. It is this background that makes this paper so appealing to me. Starting around line 117 you describe your objectives and the existing data, and while I have tried to have critical suggestions, I can offer nothing but praise for this effort. Your “Overarching concept” is simply superb.

The method section is excellent, integrating both spatial and temporal scales with large scale processes. And importantly, it is not a wish list fantasy because the authors focus very carefully on the actual sampling techniques. I have no expertise in these procedures, but they seem

consistent with all the oceanographic research I know. You have done an excellent job deciding where to sample. These decisions are based on very solid understanding of the processes and are well defended and appropriate. I just assume that the data management section is adequate.

The three LTER themes are as good as any I have ever seen; indeed, they are much much better than any I have ever seen, especially the other LTER project around the united states that utterly lack the excellent scientific overviews offered in these long sections.

3.1 ecosystem drivers. This long-detailed section offers exactly what is missing in most other projects. It is exactly what we so desperately needed at McMurdo sound (and American kelp projects as well for that matter).

3.2 Ecosystem functioning components represents the focus of the other good LTER studies. The authors have integrated these other projects very well such that this proposal is solidly based on the results of the other very good data that exist. The discussions of limitations and strengths are carefully presented. These are the issues I should know about, but the authors have dug up way more literature than I know, and I can only applaud this section.

3.3 Ecosystem services in my mind represent a form of wishful thinking with the fantasy that fishing organizations such as CCAMLR will respect the data, but it is a necessary section and is exceptionally well thought out and presented. Many of the objectives such as defining the carbon sink, developing biochemical processes, protection of rare species, and environmental processes are critical to all aspects of the future management. While past political winds certainly have made me hyper cynical, the presentation here is powerful and based on very solid scientific thinking. Amazingly, I almost find myself optimistic that a program such as this can be funded. If it can be funded, it will set a powerful example for the rest of the world.

I hope other reviewers can offer more constructive suggestions, since I find myself applauding the manuscript as it is!

I am worried about the prospects of implementing this excellent proposal but accepting this manuscript and publishing it is the first step. Then all of us will have to focus on the difficult political battles to implement it as written rather than have it manipulated to serve special interests. Obviously implementing this program will depend on a new political vehicle that is not crippled by a consensus rule! But first we need to get this manuscript published and read.