

## ***Interactive comment on “Arctic Ocean circulation and variability – advection and external forcing encounter constraints and local processes” by B. Rudels***

**Anonymous Referee #1**

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General Comments:

This manuscript describes current understanding on the Arctic Ocean circulation, advection, and local processes, following an introduction of the history on Arctic Ocean expeditions and researches. It is based on many of the author's previous publications and his lecture of “Fridtjof Nansen Medal” at EGU 2011 General Assembly. (<http://www.egu.eu/awards-medals/awards-and-medals/award/fridtjof-nansen/bert-rudels.html>). Five topics mentioned in this manuscript are very important, which are classical issues on the Arctic physical oceanography as the author mentioned. However, thinking about recent sea-ice reduction due to global warming, it is

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also new and top topics to understand on-going environmental change of the Arctic Ocean.

One shortcoming of this manuscript is that some of recent published papers are not referred. For example, Proshutinsky et al. (2009, JGR-Oceans) and some papers in the special issue “Beaufort Gyre Climate System Exploration Studies” have shown many interesting results on freshwater storage, ocean mixing, and ocean circulation mainly in the Canada Basin. It is just the latest information that Polyakov et al. (JPO, in press, doi:10.1175/2011JPO4606.1) investigated heat flux from the Atlantic layer in the Laptev Sea. My guess is that the readers are interested in such new results regarding the five topics as well as the authors' ones. I would like to recommend the author to include more information of recent published papers as much as possible.

In conclusion, the readers will be able to understand very well what the author has been thinking and doing his research on “the Arctic Ocean circulation and variability”. I believe this manuscript is suitable for publication on Ocean Science. Some minor comments are shown below.

Specific minor comments:

1) As the author wrote at the end of this manuscript, wind-driven component is ignored in his conceptual models. Thinking about recent sea ice decay and reduction in the Arctic Ocean due to global warming, wind-driven component presumably becomes more important for not only ocean circulation but also water-mass modification processes. Therefore, some of the readers will be interested in a discussion on wind-driven component from a start of reading. My comment to the author for such readers is that the authors should add more about wind-driven component using appropriate references.

2) Section 1. Although I like this introduction to know the history of the Arctic Ocean expedition, my feeling is that it seems to be somewhat long as a scientific paper. The author may have to abbreviate the descriptions of these topics, especially before Nansen's Fram expedition (if possible).

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3) Some figures are not clear. Especially, maps, lines and grids in the figures which were drawn by Ocean Data View are too thin or small to find what those show (e.g., Fig.7, 8, 10, 12, and 13). I recommend the author re-making them to be easy-to-understand.

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Interactive comment on Ocean Sci. Discuss., 8, 2313, 2011.