

## ***Interactive comment on “On contribution of horizontal and intra-layer convection to the formation of the Baltic Sea cold intermediate layer” by I. P. Chubarenko and N. Y. Demchenko***

### **Anonymous Referee #1**

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#### General comments:

The paper is well written and treats the very interesting subject of cascading of water masses in the Baltic Sea. The contents is good, the English is excellent.

However, I have some critics. After reading the paper 3 times I still have not completely understood how the processes of CIL formation should work. The authors sometimes speak about warming, sometimes about cooling. However, they forget to explain once and for all the exact mechanism of CIL formation.

It is also unclear to me why Tdm exists. As I understand, this Tdm is possible only

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for water cooler than 4 degrees in lakes, and even lower temperatures in the Baltic. But the authors talk about water masses with a temperature of 20 degrees, and still mention the Tdm. Is it because of the salt content? I have no idea.

Unfortunately, instead of clarifying some aspects that have to do with deep water formation and cascading, the authors tend to confuse as much as they can. There is a lot of material in the paper, and sometimes I think that presenting one point well of the many points they treat would be much better than scoping over all the processes they do actually treat.

It is also not clear what the contribution of the authors are. It seems to me a good (but confusing) review, but I cannot find a clear statement where the authors have introduced original new concepts, data, modeling. I think it is important that the authors should say exactly what are the new, original contributions in this paper on the subject.

I have to say that I am not an expert on the subject. But I expected at least. after finishing this paper, to know more on the subject. I am afraid this did not happen. I am much more confused than before. Therefore I would ask the authors to be much more clear when they explain the Tdm formation, and maybe give also some examples.

Specific comments:

Abstract: After reading the abstract it is not clear to me what is the subject of the paper. In the abstract they mention spring heating, but soon after, in the Introduction they talk about winter convection, i.e, cooling.

p 583, 21-24: how is it possible. Surface water is cooler than bottom water, which is above Tdm, so the bottom water is warmer than 4 degrees? How can then exists cooler water above this warmer water? You must explain better. You should explain better the mechanism of CIL formation and the Tdm mechanism

p 585, 10-15: again not clear. Can you make an example (with temperatures etc.) so one can understand better what is going on?

p 587, 5-15: Is this important for the paper?

p 585, 17: What is F?

p 591, 5-15: not clear. Now the intermediate water is warmer?

p 592, 19-30: Not clear: if we have a down slope current, then there will be a return flow in the surface layer, right?

p 595, 10: You have a new section 3 here. But should be compared to winter cooling and cascading. But this is section 2.1. So I feel the organization is not good. You could call section 2 directly Winter cooling, then it would make more sense to me.

p 595, 20-25: give a temperature example.

p 597, 2-9: Does this mean that the masses are heated from below 2 degrees, say? Doesn't this process of complete mixing happen in autumn?

p 598, 10: negative buoyancy flux... I thought you were heating??? It is really not clear if you simulate heating or cooling. Sorry for not understanding.

p 603, 20 to 605, 19 is repeated in the manuscript -> delete

Fig 4: several hours later... of what?

Fig 5: units on the x axis

Fig 6: measured when?

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Interactive comment on Ocean Sci. Discuss., 5, 581, 2008.

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