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Interactive comment on “One year of continuous measurements constraining methane emissions from the Baltic Sea to the atmosphere using a ship of opportunity” by W. Gülzow et al.

Anonymous Referee #1

Received and published: 25 September 2012

It is well known that coastal areas have a high potential to emit large amounts of methane (CH₄) to the atmosphere. However, up to now, studies of CH₄ emissions from oceanic areas have been hampered by (i) the fact that traditionally used GC-FID methods could only provide a low temporal resolution and (ii) the availability of ship time. The development of OA-ICOS instruments in combination with the use of ships of opportunity allow for the first time to obtain a temporal and spatial resolution of CH₄ in surface waters which should enable us to significantly improve the CH₄ emission estimates from coastal areas. The ms under review presents a novel data set of CH₄ surface measurements on board a cargo ship crossing the Baltic Sea on a regular basis. The conclusions are justified by the results.

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However, I have a few critical remarks which should be considered in a revised version. Thus, I can only recommend publication after some minor revisions.

Major comments

1) Large parts of the introduction (see sections 1.1 and 1.2) are very lengthy and therefore should be shortened considerably. It is not necessary to repeat in detail what is known from the literature.

One important, recently published, article has been ignored: Bange et al. (2010), *Biogeosciences*, 7, 1279-1284.

2) Section 2.2: There is no word about the quality of the xCH₄ data from the NOAA station in Poland. Where is it located? At the coast? Are the data affected by terrestrial/marine CH₄ sources? What are actual values used? Have the data been filtered for pollution events? etc. Please add this information.

3) I am wondering why the authors did not make at least an attempt to quantify the overall annual emissions from the Baltic Sea. They have a data set in their hands which opens the door for a first reasonable regional-weighted and temporal resolved emission estimate...

4) Large parts of the 'Results and Discussion' are very lengthy and therefore should be shortened considerably (see e.g., sections 3.2, 3.3, 3.5) Maybe a table summarizing the most important results would help to improve the clarity and readability of the article.

4) Fig 3: Usually upwelling is described by plotting CH₄ vs. SST; see e.g. Rehder et al., *GBC*, 2002. I would like to suggest that such a figure should be added and discussed.

Minor comments Page 9899, line 7: Bates et al. (1996) 'A reevaluation of the open ocean source of methane to the atmosphere' (*JGR*, 101, 6953-6961) has been ignored. Please add.

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Page 9926, lines 22-23: I could not find a 'model-based estimation of sea-air exchange of methane' in Bange (2006). Please correct.

Interactive comment on Biogeosciences Discuss., 9, 9897, 2012.

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