Biogeosciences Discuss., 12, C3486–C3488, 2015
www.biogeosciences-discuss.net/12/C3486/2015/

Biogeosciences
Discussions
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Interactive comment on "Methane distribution, flux, and budget in the East China Sea and Yellow Sea" *by* M.-S. Sun et al.

Anonymous Referee #1

Received and published: 10 July 2015

As the title indicates, this manuscript measures methane distributions and fluxes from which a methane budget is estimated in the East China Sea and Yellow Sea. Discrete samples of seawater were collected and analyzed for methane concentration. Cores of sediment were also collected and incubated to determine methane emission from the sediments to the water column. Samples were collected during five cruises conducted in 2011 from March through December. The data collected was used in a steady-state box model to constrain a methane budget. While even a preliminary methane budget in the East China Sea and the Yellow Sea would be extremely valuable, the analysis presented here is crude and thus significant uncertainties occur.

Page 7021, Line 16-24: Insufficient details are presented to reproduce the methane concentration measurements in the water column

Page 7022, line 1-20: The authors incubated sediment cores in order to get the flux to the water column. While this incubation process was conducted at near in-situ temperatures, it takes the cores out of their natural environment (e.g. pressure is different) and can lead to errors in their emission estimate. A common method for measuring sediment emission is to measure the sediment methane concentration distribution and compare it with bottom water concentrations in a diffusive flux calculation. Please explain why this incubation technique was used and how it agrees with the concentration gradient technique.

Page 7023, line 1-5: The authors did not measure the local atmospheric concentration of methane in their air-sea flux calculations and instead used values from monitoring networks. Local atmospheric concentration gradients of methane have been observed which can influence the sea-air flux calculation substantially. Also, the dissolved surface water concentration of methane was sampled with discrete samples. This causes extremely coarse sampling resolution and can lead to errors when spatial concentration changes and gradients are not sampled. Since automated techniques exist to get higher spatial measurement resolution (e.g. Gulzow et al., 2011), I'm wondering why this more crude technique was used. This investigation presents data from a continental shelf environment and continental shelves are known to have substantial methane gradients (which is supported by their data in Fig. 3). I'm worried that spatial gradients in surface water CH4 concentrations were missed.

The authors should indicate how water temperature, salinity, and dissolved oxygen were measured.

I do find steady-state models extremely informative for the calculation of oceanic methane budgets. However, the authors attempt to constrain several different sources and sinks while ignoring others. First, no isotopic measurements of methane were provided in an attempt to fingerprint different sources. Second, the model ignores inputs from methane seepage and groundwater inputs of methane as well as methane losses associated with aerobic methane oxidation in the water column. While all of

these can be substantial, the omission of aerobic methane oxidation likely leads to the greatest error. Methane oxidation in the water column is a substantial sink of methane and needs to be considered here. Methane seeps, groundwater inputs, and aerobic methane oxidation in the water column must all be considered before even a preliminary methane budget can be established in this region.

Interactive comment on Biogeosciences Discuss., 12, 7017, 2015.