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Interactive comment on "Different methanotrophic potentials in stratified polar fjord waters (Storfjorden, Spitsbergen) identified by using a combination of methane oxidation techniques" *by* S. Mau et al.

Anonymous Referee #1

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This manuscript gives the results of a study evaluating the distribution of CH4 oxidizing activity in a polar fjord using radioactive tracers, stable isotopes and molecular approaches. The authors correctly point out that measurements of CH4 oxidation in ocean waters are comparatively rare, especially in high latitude environments. The study is also noteworthy from the perspective that multiple approaches are used to evaluate CH4 oxidation.

In my view the title of the manuscript is a bit confusing and perhaps should be changed. I interpret CH4 oxidation potential to indicate the maximum rate of CH4 oxidation, that

is the zero order (substrate saturated) rate in the Michaelis sense. As in most studies of CH4 oxidation in low CH4 systems, a true "tracer" experiment cannot be performed, where the added isotope does not significantly affect the substrate pool (exception: Pack et al. cited herein). The additions here significantly increased the concentration of available substrate forcing back-calculation of the rate at the ambient substrate concentration from first order rate constants. However, radioactive CH4 additions were not sufficient to elicit a zero order response; half-saturation constants for CH4 oxidation are generally several uM, compared with the <500nM levels observed here, even after Thus, the measured rates are not potential rates, nor are they an estimate of rates at the in situ CH4 concentration, until adjusted via the first order rate constant.

The authors give great detail in the Methods about recovering respired CH4 and CH4 incorporated into biomass or released as dissolved organic matter. However, it is not made clear whether the reported rates are for total CH4 consumed or simply the fraction recovered as CO2, i.e. respired. On a similar note, since the assimilated CH4 was fractionated, it may be useful and insightful to report the fraction incorporated into microbial biomass.

The manuscript would benefit by placing the results in the context of other marine and even freshwater studies. The authors give a wonderful compendium of measured CH4 oxidation rates in Table 1 (referenced only in the Introduction). This could be referenced again in a rate comparison in the Discussion.

Interactive comment on Biogeosciences Discuss., 10, 6461, 2013.