We thank both reviewers for their valuable and constructive comments.

**Anonymous reviewer #1**

*Major remarks*

As recommended, we created three plots for 2005, 2008 and 2011, in which the concentrations of total inorganic carbon ($C_T$) are shown vs salinity. The conservative mixing lines based on known $C_T$ values for the Lena and Atlantic water (see figure below) are shown as dotted lines (between the green triangle and red rectangle) on each panel.

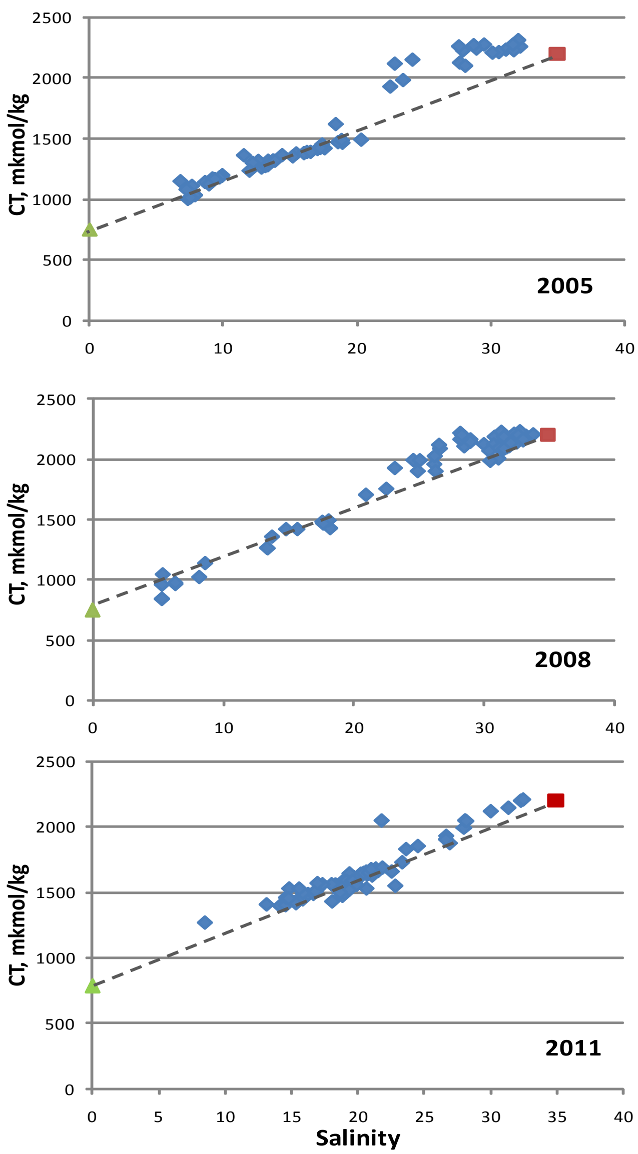


**Figure.** *Distribution of $C_T$ vs salinity: green triangle represents the Lena river end-member (750 mkmol/kg vs salinity 0 psu); red rectangul is the Atlantic water end-member (2164 mkmol/kg vs salinity 34.9 psu).*

As we do not separate data on DIC, we used data on $C_T$, which is sum of dissolved inorganic carbon (DIC) and particulate inorganic carbon (PIC), which is presumably represented by carbonate minerals. Our data show that the decay of eroded particulate OM and OM at the sediment surface results in low in situ pH values (as low as 7.24, total scale) and a naturally acidified marine environment. The southeast part of the Laptev Sea exhibits the lowest values of calcium carbonate saturation ever reported for the open marine environment: in the Buor-Khaya Bay (BKB) area acidification lowers the saturation state of calcite and aragonite in the surface waters to 0.4 and 0.2, and in the bottom water to 0.2 and 0.1, respectively (Semiletov et al., 2012, 2011). Thus, PIC contributes less than 1-2% to $C_T$ in the study area, this parameter, in our opinion, gives very good representation of DIC.

We suggest that the degradation of eroded POC from the cost ("the main substrate for respiration in this system") is mainly responsible for the observed DIC ($C_T$) surplus, which is better seen in salinity range 20-33psu.

*Minor remarks*:

Page 2170: 1-11; thanks: two additional sentences and references to Kodina (2001, 2002) were added.

Pages 2070 and 2171:

1-8; thanks: an additional sentence and reference to Goni et al (2005) were added.

8-12; thanks: this section has been revised to reflect the current state of knowledge about organic matter in Arctic rivers. Recommended references (Amon and Benner 1996; Holmes et al., 2008; Amon et al., 2012) were added.

Page 2175:

1-6; thanks: reference to Fichot et al (2013) was added.

8-12: we mean "slight" oversaturation, because photosynthesis would reduce $pCO_2$ from "strong" oversaturation (>500µatm) to slight (~400 µatm) oversaturation. We rewrote this sentence to make it clearer.

Page 2177:

8-15; we respect the reviewer's suggestion to include a comparison of total fluxes from the tundra to total fluxes on the shelf, but it goes outside the topic of this manuscript and them of the special issue which is the land-shelf interaction in the Lena Delta region.

*Figures:* in the final version of this manuscript all figures that refer to surface water and bottom water layers will include the actual depth ranges of the two.

**Anonymous reviewer #2**

*Major suggestions and comments*: The presentation of the data was substantially improved where it was possible.

The abstract was rewritten (see below) and it gives now a clear and complete summary of what is presented in the manuscript.

**Abstract.** This study aims to improve understanding of carbon cycling in the Buor-Khaya Bay (BKB) and adjacent part of the Laptev Sea by studying the inter-annual, seasonal, and meso-scale variability of carbon and related hydrological and biogeochemical parameters in the water, as well as factors controlling carbon dioxide ($CO_2$) emission. Here we present data sets obtained on summer cruises and winter expeditions during 12 years of investigation. Based on data analysis, we suggest that in the heterotrophic BKB area, input of terrestrially-borne OC varies seasonally and inter-annually and is largely determined by rates of coastal erosion and river discharge. The sedimentation regime in the BKB changes from erosion-accumulation (Type 1) to accumulation (Type 2). Loadings of the water column with particulate material vary by more than a factor of two between the two regimes. Higher levels of $pCO_2$, higher concentrations of nutrients, and lower levels of oxygen saturation were observed in the bottom water near the eroded coasts, implying that coastal erosion and subsequent oxidation of eroded OM rather than the Lena River serves as the predominant source of nutrients to the BKB. Atmospheric $CO_2$ fluxes from the sea surface in the BKB vary from 1 to 50 mM $m^{-2}$ $d^{-1}$ determined by specific features of hydrology and wind conditions, which change spatially, seasonally and inter-annually. Atmospheric $CO_2$ emissions from a thawed coastal ice-complex in the BKB area varied from 3 to 439 mM $m^{-2}$ $day^{-1}$ in two subsequent years (2006 and 2009), suggesting that at the time of observations the eroded coastal area served as a more significant source of $CO_2$ to the atmosphere than the tundra (8.6-9.5 mM $m^{-2}$ $day^{-1}$) on the neighboring Primorsky coastal plain. As the BKB area can be employed as an integrator of ongoing changes in the surrounding environment, we suggest that under ongoing changes, more nutrients, products of eroded OC transformation and river transport, will be delivered to the BKB, increasing rates of atmospheric $CO_2$ emissions from the area.

The title was rephrased as following: “Space-time dynamics of carbon and environmental parameters related to carbon dioxide emissions in the Buor-Khaya Bay and adjacent part of the Laptev Sea”

Thank you for your recommendation to split results and discussion. Nevertheless, as we present multi-year data, the variability of which is determined by spatial, seasonal and inter-annual dynamics of hydrological, hydro chemical and meteorological data, we strongly feel that simultaneous discussion of these inter-correlated data sets helps the reader better understand this very complex system.

The aspect of $CO_2$ fluxes was taken into account and the methods used for flux measurements were added in section “Materials and methods”.

*Further comments:*

Page 2161, 5:  it was corrected.

Page 2161, 24: it was corrected.

Page 2162, 1ft: The second part of this paragraph was rewritten accordingly with reviewer's comments.

Page 2162, 9: it was corrected.

Page 2166, 7ft: Holmes, R. M., B. J. Peterson, A. V. Zhulidov, V. V. Gordeev, P. N. Makkaveev, P. A. Stunzas, L. S. Kosmenko, G. H. Kohler, A. I. Shiklomanov. 2001. Nutrient chemistry of the Ob' and Yenisey rivers, Siberia: results from June 2000 expedition and evaluation of long-term data sets. Marine Chemistry 75(3):219-227.

Page 2166, 15: DOC samples were filtered immediately through glass fiber filters, preserved with HCl to pH~2, and stored in glass vials until analyses via high temperature combustion using Shimadzu TOC (Alling et al., 2010)

Page 2167, 4ft: fine –grained sediments (<0.1mm), coarse grain sediments (>0.1mm)

Page 2167, 14ft: the top-most surface sediment layer is (0-5cm) deep.

Page 2167, 17ft: yes, bottom sediment is the same sample as top-most surface sediment.

Page 2169, last three paragraphs: it was corrected.

Page 2172, 17ft: this sentence was deleted.

Page 2174, 15: it was corrected.

Page 2175, 4ft: In the 2003, 2004, and 2005 cruises atmospheric $CO_2$ concentration was measured using the non-dispersive infrared $CO_2$ analyzer LI-820 with accuracy better than 3% (www.licor.com), while since the 2006 cruise the high precision open-path LiCor-7500 was used (Semiletov et al., 2007). In the 1999 cruise we didn't measure atmospheric $CO_2$. Hence, to calculate air-sea $CO_2$ gradient we used the monthly mean latitude $CO_2$ concentration (http://www.esrl.noaa.gov/gmd/obop/brw/).

The equation published by Wanninkhof and McGillis (1999) was used to calculate the $CO_2$ flux ($F_{CO2}$):

$F_{CO2} = K_0 \cdot k \cdot (pCO_2^{sw} – pCO_2^{air})$,
where $k = 0.0283 \cdot u^3 \cdot (660/Sc)^{0.5}$ and $K_0$ is the solubility of $CO_2$ at the in situ temperature (mol $m^{-3}$ $atm^{-1}$), k is the gas transfer velocity (cm $h^{-1}$), u is the wind speed (m $s^{-1}$), and Sc is the Schmidt number for $CO_2$ defined by Wanninkhof (1992). The wind speeds used in the calculation of transfer velocity were daily averaged values measured on board during each cruise. Air-sea fluxes were calculated at each hydrocast station. For calculating the integrated flux of the study area the station data were interpolated onto a uniform grid obtaining the area-weighted $CO_2$ (and $CH_4$) fluxes (Pipko et al., 2011; Shakhova and Semiletov, 2007; Semiletov et al., 2007). This section is described with more details in the Materials and Methods.

Page 2176, 5ft: The emission of $CO_2$ from the thawing ice-complex permafrost was measured simultaneously with the soil moisture content along the same transects in early September of 2009 (this study) and 2006 (Vonk et al., 2012). The measurements were taken along five aboveground transects crossing the northern part of Muostakh Island from west to east. The $CO_2$ sampling transects roughly followed the soil sampling slopes, in order to assess potential emissions derived from the ice-complex degradation suggested by the bulk and molecular analyses (Vonk et al., 2012). *In situ* $CO_2$ analysis was carried out with two automatic lid chambers attached to an infrared gas analyzer (LICOR 8100), according to similar procedures detailed elsewhere (Semiletov et al., 2004). At the heart of the LI-8100 System lies the Analyzer Control Unit (ACU), an O-ring sealed, weather-tight enclosure that houses system electronics and the infrared gas analyzer used to measure the change in $CO_2$ and $H_2O$ concentrations in the soil chamber. The different mechanisms controlling the opening and closing of the long-term chambers do not affect the measurements. Both chambers lower slowly onto the measurement site to minimize pressure pulsations that change soil $CO_2$ concentrations. In total, $CO_2$ emissions were measured in duplicate or triplicate (3 minutes per measurement) from each sampling site along the five transects. Although most of the $CO_2$ sampling occurred on land, several $CO_2$ measurements were collected at shallow-submerged sites of one transect, to check the $CO_2$ out-gassing beyond the shoreline. Respiration fluxes are reported as $mmol/m^2/day$ (Fig. 16) and represent average values of the duplicate or triplicate measurements. The $CO_2$ fluxes measured in Muostakh Island were around one order of magnitude higher than in situ measurements made on early September 2006 on the neighboring Primorsky coastal plain (high Arctic tundra near Tiksi). In this manuscript we don't focus on description on the Primorsky coastal plain sites, but the bulk and molecular analyses made along the flux transects across the Muostakh Island can be found elsewhere (Vonk et al., 2012).

Page 2176, 21ft: the Figure 3 was redrawn according to reviewer's recommendation.

Page 2176, 23: that conclusion was omitted.

Page 2177, 10ft: that conclusion was omitted.

Page 2177, 12ft: it was corrected.

*Figures 3-16*: All recommended corrections were made.