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Interactive comment on "Microbial biomass and basal respiration in Sub-Antarctic and Antarctic soils in the areas of some Russian polar stations" *by* E. Abakumov and N. Mukhametova

Anonymous Referee #2

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General comments

The paper content is suitable to Solid Earth Discussion and deals with an important topic including data of microbial biomass C and soil respiration under laboratory conditions of some antartic soils of different latitude, which is quite uncommon. Main criticism is the experimental set up that it is not clear (soils selected, soil sampling and manipulation before analysis, soil methods). Limitations of the experimental set up should be taken into account in the discussion.

Specific comments

-Title, it should be less general since only a few soil samples are analyzed

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-Material and methods.

The information should be focussed on selected soils of different latitude. The criteria used for soil selection and the number of soils selected for the study at each latitude should be clearly indicated (soils, horizons for each soil, depth of soil samples collected. . .). Details of soil sampling (surface area, points of soil sampling, soil depth, number of samples collected, replicates, amount of sample,..) as well as soil manipulation before soil analysis should be included (sieve, temperature and time of storage, rehumectation, . . .). The representativity of soil samples and soil manipulation are critical factors for data interpretation. More details should be given for methods used (e.g. temperature and moisture used for soil incubation during laboratory incubations, measurements of CO2???,O2??. . .).. It is well-known that biochemical properties such as biomass C and soil respiration were greatly affected by both soil conditions and soil manipulation; for example soil respiration is influenced by soil moisture, temperature and the availability of C and nutrients, therefore field conditions at sampling time and pretreatment of soil samples before analysis (air-drying, sieve, storage, pre-incubation, rehumectation..) as well as incubation conditions (moisture, temperature) are critical, particularly in these soils from extreme climatic conditions. The range of values and limitations of the techniques used (microbial biomass C and soil respiration) in some of these soil samples with very low carbon and relatively high pH (7-7.7, abiotic production CO2 in soils with CaCO3???) should be also taken into account (precision of measurements, coefficient of variation of measurements, mean values of X field replicates $\pm$ SD? SE??). Reasons for exclusion of same samples should be given (e.g. horizon C in 2 Lithosols of King-George Island). Experimental design should be included some statistical analysis to compare soil values according the factors considered (latitude?, horizon?, depth?)

-Results.

Numerosous studies have showed that microbial biomass and soil respiration decreases with the depth of soil and correlates significantly with soil organic matter and

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most microbial parameters. This should be taken into account in data interpretation (depth, soil properties). Thus, relationships of microbial parameters with soil organic C should be analyzed. In order to compare data obtained in soil samples with different organic matter content, microbial values (microbial biomass C and soil respiration), besides absolute values (see table 2, expressed as mg g-1 soil) relative values (expressed as mg g-1 organic C) should be also calculated. This allow the authors to analyse both total organic content and labile fraction of soil organic matter with respect to total content (microbial C/total C, respiration/total C, extractable C/total C). Likewise, data of soil properties (pH, moisture content, nutrient availability, C availability, ..) should be used to discuss the data. Data of extractable C can be also included (extractable C in unfumigated soil –0.5M SO4K2-derived from microbial biomass estimates).

Tables 1 and 2. Depth of soil samples analyzed should be indicated. Other soil properties, if available, can also be included (available C, available nutrients, ..). Mean values±SD, SE of different field replicates (?) should be indicated for all parameters. Units should be also indicated (metabolic quotient??) and results should be compared using statistical analyisis.

-Abstract, discussion and conclusions.

Limitations of the experiment should be taken into account in the discussion of the results (a few soil samples, soil samples of different soil types and different horizons

-and hence soil depth- collected from different latitude in Antartic). I consider that the experimental set up is complex to extrapolate and establish some general conclussion on soils of three different latitude in Antartic. It should be noted that soil respiration under laboratory conditions instead of respiration under field conditions are used and therefore results cannot be extrapolated directly to field conditions. Limitations of methods used should be also considered (range of detection, coefficient of variation of measurements, influence of soil manipulation). Results should be revised carefully

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and analysed with caution considering all these factors and limitations (few soil samples, experimental set up, methods). Values should be compared with other obtained previously in the same area by other authors.

To sump up I also consider that the ms should be revised taking into account these considerations before publication.

Interactive comment on Solid Earth Discuss., 6, 869, 2014.