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Interactive comment on “Response of soil microorganisms to radioactive oil waste: results from a leaching experiment” by P. Galitskaya et al.

P. Galitskaya et al.

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Dear Referee, we are very thankful for your comments. Below you will find our answers on them. In attachment, there is the revised manuscript where changes are tracked by red color.

1) Petroleum is very complicated mixture. Specific information about petroleum pollutant composition can be helpful. We did measure content of different fractions in the sample H: we found there 36% aromatics, 27% aliphatic hydrocarbons, 16% aliphatics, 21% resins, so the content of heavily biodegradable fractions (aliphatic hydrocarbons and resins) was higher than in the crude oil. This information is included into “Materials and Methods” section (paragraph 2.1). However we did not analyze the content of specific compounds, or changes of fractions’ content over time and in dependence on soil layer.

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These questions are important and may become objectives of the new study.

2) Although multi-variance statistical analysis has been used, correlation between the index for microbial activity and contamination level is needed to demonstrate the effects of specific pollutants on the soil community. Here we disagree with the referee. Since the independent covariates are factors (categorical variables), not scalars, correlation can't be calculated.

3) Provided that the focus of the paper is to demonstrate the effects of radioactive oil wastes, more mechanism discussion is helpful for illustrating how the oil pollutant affect the soil community. For example, how the radionuclides and oil products interact with each other? Are their effects additive? We added sentences about mechanisms of toxicity of hydrocarbons and radionuclides on soil microbes into "Introduction" section. However, the interaction between these two pollutants and its influence on soil microflora has not been studied yet. Our paper is trying to answer the question about separate influence of radionuclides and hydrocarbons basing on the assumption that the common effect is just the simple sum of the two, but not additive. Further investigations are needed to answer the question about the additive effect.

Page 1755 Lines 4-9 Some discussions about the significance of oil products pollution can be helpful. How much soil was contaminated by such pollutants? We found it relevant to add into "Introduction" section the amount of oily waste which is yearly produced

Page 1756 Lines 23-26: The migration rates were mentioned in the objective, while no relevant analysis and calculation were found in the results. We added the sentence "It was shown that only low amounts (up to 0.8%) of TPH and radionuclides leaked into soil" into "Results and Discussion" section.

Page 1757 Line 25 How to quantify the total hydrocarbon content from IR analysis? How was standard curve built up given the complicated components? More details need to be given. The IR method used in the investigation permits to estimate the

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12, C1625–C1628, 2015

Interactive
Comment

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Interactive Discussion

Discussion Paper



Interactive
Comment

quantity of C-H bindings in the sample. Standard curve was created using soil polluted by known concentration of oil. Using this curve, coefficient for recalculation of results obtained by IR spectrometer into TPH content was obtained.

Page 1758 Lines 9-16 How to separate Ra, Th and K? How were their concentrations determined? Separation was done automatically by the equipment software on the basis of gamma spectrum peaks. .

Page 1765 Lines 10-13 Is there any correlation between the toxicity data and concentration of pollutants? No, and sometimes this correlation is not expected, because pollution can be caused not only by pollutants themselves, but also by intermediates of oil decomposition, or by additive effects. Because of this comment and comments of the other reviewers, we deleted the data concerning toxicity of the samples from the article.

Page 1766 Lines 1-8 Did authors calculate the fraction of pollutants released to the soil from disposal? We did measure content of different fractions in the sample H: we found there 36% aromatics, 27% alphanenes, 16% aliphatics, 21% resins, so the content of heavy biodegradable fractions (asphaletenes in resins) was higher than in the crude oil. This information is included into “Materials and Methods” section (paragraph 2.1). However we did not analyze the content of specific compounds, or changes of fractions’ content over time and in dependence on soil layer. These questions are important and may become objectives of the new study.

Page 1767 Lines 1-12 What is the reason for the differential impacts of petroleum products and radionuclides? Some mechanisms of toxic influence of petroleum products and radionuclides were added into the “Introduction” section.

Page 1768 Is there any relationship between the structure/community change and the soil functions? More tight connection between different parts of the result need to be addressed. And also for the occurrence of specific strain, is there any culture experiment-based data to support the results from SSCP analysis? The connection

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Discussion Paper



Interactive
Comment

between the community structure and functions is very important, indeed. However, it was not in focus of this study, so, unfortunately we can just present the changes in functions (biomass, respiration and enzyme activity) and shifts of structure. More detailed investigations concerning this topic are needed. We did not conduct any culture-dependent experiments because they can mislead.

Page 1773 Lines 19-21 Too general. Please rephrase this paragraph. Rephrased

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/12/C1625/2015/bgd-12-C1625-2015-supplement.pdf>

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