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## ***Interactive comment on “Local versus field scale soil heterogeneity characterization – a challenge for representative sampling in pollution studies” by Z. Kardanpour et al.***

### **Anonymous Referee #2**

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#### General comments

This interesting paper deals with the determination of the spacing range between sample locations when developing a sampling strategy to characterize the spatial heterogeneity of a 60m-soil transect (i.e., a 1-D horizontal configuration) in a contaminated area. The authors use variograms determined by the analysis of different soil characteristics along the soil transect (and especially their specific characterizing features: nugget, sill and range) to assess the maximum spacing at which samples must be taken to ensure a good representativeness of the specific soil transect variance at the scale defined by the study. Here, the variogram is then not use as a basis for data

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interpolation (e.g., kriging) but as a simple tool for the characterisation of the site spatial heterogeneity: this is really useful and clever, and should be more intuitive in many other sampling strategy developments. However, this study is limited to the spatial characterisation of a 60m 1-D soil transect while most of the recent studies dedicated to soil spatial characterisation are 2-D or 3-D based. Moreover, in case the next step of the study is the assessment of the main factors driving the spatial heterogeneity of the soil contamination, the unidimensional approach could be limiting if we consider the factors implied in soil development, the potential factors implied in the contaminant input and transport within soil, and their non-unidimensional interactions in space.

## Specific comments

In the 'Materials and Methods' section, the parts dedicated to the 'location and sampling pattern' and 'Mass reduction/subsampling procedure' should be a bit more detailed, and maybe some simple figures/schemes could help. Moreover, how did you exactly sample the 200-300g of soil in the 0-15cm soil layer? Have the samples been prepared (any grinding, sieving ...) before the sub-sampling procedure? Have they been homogenised? In other words, are you sure that the final sub-sample is representative of the original 200-300g bulk sample? Did the authors evaluate potential errors induced by all these treatments (from field work to the finalization of the sub-samples)?

Why did exactly the authors compare the statistics calculated from the small-scale roman square approach (so, a 2-D sampling scheme) located at the center of the transect with the measurements made along the whole 1-D soil transect on figures 2-5? We understand that is a way to introduce a discussion about small-scale vs large-scale spatial variability but this discussion remains short and a bit confusing. This point should be more developed.

Some questions: Is the study of the small-scale roman approach is a way to check the nugget effect in variograms, or simply to observe the local variability between two

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2, C357–C359, 2015

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samples located along the transect? Considering that most of the observations made along the transect are contained into the  $\mu \pm 2sd$  (fig 2-5) based on the small-scale approach, is it still relevant to use a single sample at each location rather than a composite sample based on the roman-grid approach to characterize the soil variability along the transect? Finally, are you sure that the variograms describe well the spatial heterogeneity of the different parameters?

Technical corrections

The use of the term 'profile' is a bit confusing as it refers (for me) to vertical soil profile and not horizontal one (here, the term 'transect' would be maybe more adequate?). Please, check the spelling of the references and the spaces (some are missing and some are doubled ; e.g. l. 39, 56, 213. . .).

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Interactive comment on SOIL Discuss., 2, 619, 2015.

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