

Interactive comment on “Statistical analysis to characterize transport of nutrients in groundwater near an abandoned feedlot” by P. Gbolo and P. Gerla

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After reading the comments made by the Anonymous Referee #2 (posted on July 10, 2013), we would like to respond and thank the reviewer for the careful reading of our manuscript.

Response to Comment 1, 2, and 3. We fully acknowledge that a small sample size was used for this analysis, but it does not indicate that meaningful conclusions cannot be drawn from the analysis. Furthermore, our analysis provides a clear and unencumbered template for other applications. For example, refer to these papers:

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1. Bacchetti, P, Deeks, S.G., McCune, J.M., 2011. Breaking Free of Sample Size Dogma to Perform Innovative Translational Research. *Sci. Transl. Med.* 3, 87ps24. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3134305/pdf/nihms-307674.pdf>

2. Anderson, A.J., and Vingrys, A.J., 2001. Small Samples: Does Size Matter? *Invest. Ophthalmol. Vis. Sci.* 42(7):1411-1413. <http://www.iovs.org/content/42/7/1411.full>

3. Dolnicar, S., 2002. A Review of Unquestioned Standards in Using Cluster Analysis for Data-driven Market Segmentation, CD Conference Proceedings of the Australian and New Zealand Marketing Academy Conference 2002 (ANZMAC 2002), Deakin University, Melbourne, 2-4. Accessed at: <http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1286&context=commpapers>

The reviewer did not state which of the statistical analysis used is not sound, but we acknowledge that factor analysis was carried out to strengthen the cluster analysis. Dolnicar (2002) used cluster analysis to review 243 data-driven segmentation studies, with data ranging from 10 to 20,000. Based on both Pearson and Spearman's correlation coefficients obtained, the author concluded that "even very small sample sizes are used for clustering in very high dimensional attribute space". Most often sample sizes used for analysis depend on the scale and accessibility of the study area, and data availability.

Different methods are used to characterize the transport of contaminant and nutrients: time series is simply one of many.

Section 2.1: Originally, temperature and precipitation were not part of the analysis completed for the initial review manuscript. Because climatic factors were used to explain the measured parameters in Well SPS, we will include a brief analysis of temperature and precipitation in the final paper.

In section 2.3.2, we introduced factor analysis and explained the difference between the factor and principal component analysis because some readers may assume these

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techniques are the same. Factor scores were plotted in Figure 6. All the data obtained from the factor analysis need not be presented for publication because of the added length and the fact that the matrices obtained do not relate to the objective of the analysis. Varimax rotation was used (the methods will be addressed more fully in the corrected manuscript).

P 1562, L1-4: Here we suggest possible reasons for the low temperature of groundwater at SPS; some may be better than others. In the revised paper, we will relate this to the added information on climate (temperature and precipitation, see comment on Sec. 2.1)."

P1564, L 14: Please refer to the paper, P1563, L 14. The maximal and minimal concentrated areas refer to the nutrients analyzed.

P1564, L 17: Following earlier reviewer comments, this is one of the revisions that we will make in the manuscript after the discussion period.

P1565, L5-6: This is described in the paper, but reiterated here. Cluster analysis is used to better characterize areas of greater and lesser nutrient concentration. Because much of the nutrient mass originated from a small area of the feedlot, the present distribution, characterized by sampling and multivariate statistics, reveals the transport pattern, and hence, provides a means to roughly predict future distribution.

Table 5: Loading and score were interchanged in the manuscript. Refer to the response for P1564, L 17.

Figure 6: It was an orthogonal rotation (varimax) so it is right that they should be uncorrelated since it is not an oblique rotation. This will be addressed in the revised manuscript.

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