Solid Earth Discuss., 7, C176–C178, 2015
www.solid-earth-discuss.net/7/C176/2015/

Solid Earth
Discussions
Open Access

Interactive comment on "Elemental quantification, chemistry, and source apportionment in golf course facilities in semi-arid urban landscape using portable x-ray fluorescence spectrometer" *by* T. K. Udeigwe et al.

U. Kramar (Referee)

utz.kramar@kit.edu

Received and published: 9 March 2015

Overall, it's an interesting article that demonstrates the applicability of Portable XRF as a tool for for field analytics. In detail, however, a couple of points is unclear and inaccurate that need to be rewritten and clarified before publication. Currently, an overestimation of the possibilities of pXRF may result. Sample preparation: here is unclear from the description whether the samples were only crushed and then the fraction was sieved <2 mm, or whether the samples have been finely ground. This is a very critical issue especially for XRF analysis. The aliquot of the sample really analyzed

by XRF is in general only few mg since the penetration depth of the radiation from the analyzed elements is only 50- 500 microns. Along the radiation path out of the sample the radiation is absorbed by all the elements in the sample or even the grain from which the Radiation comes. That depending on the composition of the sample or the grain changes the radiation yield, i.e., in coarse-grained samples, the radiation yield from each grain is different for the same concentration of the element. The analytical accuracy affected considerably by sample inhomogeneities and different matrix effects. The quantification of the elements with the pXRF needs a more precise and detailed description. Here it is, it was measured with three beams. What kind were the three beams? Different excitation voltages, different filters? Explain why 3 beams were used. Next XRF is very critical to the sample geometry, since the intensity (approximately) decreases with the square of the distance. Was the geometry in which the samples were measured and the sample position reproducible. This is a big problem with on-site measurements (e.g. Potts et al., Geostand. Newslett. 1997, 21, 29-41; Kramar & Puchelt, J. Geochem. Explor.1981, 15, 597-612; Lubecki et al., Gechimica Acta, 1968,465-479).

To results and discussion: these points are only descriptive. Discuss the mechanisms which can lead to an enrichment of element e.g. anthropogenic sources or climatic induced effects e.g. Artificial watering in arid areas can cause that Fe-Mn may be released from deeper areas and be transported to the surface during the evaporation due to capillary effects. (Formation of desert varnish). Mobility of elements: the mobility a fixation of elements depends on pH and redox conditions as well as exchange capacity of e.g. clay minerals. Refer to eh-pH- diagrams (e.g. Brookins: Eh-pH diagrams for Geochemistry. 1988, Springer, 184 pp.) and look for clay contents (at least qualitatively).

Minor points are: Detection limits and reproducibility have to be specified (this is essential!). Statistical Analysis: For statistical analysis PCA was used. PCA is based on the correlation matrix or the variance-covariance matrix. Basics for both are at least an

approximate normal distribution and linear relationships. The data have been tested and possibly outlier eliminated? A table with the factor loadings and a table with the factor scores should be given.

Interactive comment on Solid Earth Discuss., 7, 37, 2015.