

## Spatial and Geostatistical Analysis of Surficial Soils of the Contiguous United States

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**Abstract :** The U.S. Geological Survey conducted a soil survey and subsequent mineralogical and geochemical analyses of over 4800 samples taken across the contiguous United States between the years 2007 and 2013. At each location, samples were taken from the top 5 cm, the A-horizon, and the C-horizon. Many studies have looked at the correlation between the mineralogical and geochemical content of soils and influencing factors such as parent lithology, climate, soil type, and age, but it seems little has been done in relation to quantifying and assessing the correlation between elements in the soil on a national scale. GIS was used for the mapping and multivariate interpolation of over 40 major and trace elements for surficial soils (0-5 cm depth). Qualitative analysis of the spatial distribution across the U.S. shows distinct patterns amongst elements both within the same periodic groups and within different periodic groups, and therefore with different behavioural characteristics. Results show the emergence of 4 main patterns of high concentration areas: vertically along the west coast, a C-shape formed through the states around Utah and northern Arizona, a V-shape through the Midwest and connecting to the Appalachians, and along the Appalachians. The Band Collection Statistics tool in GIS was used to quantitatively analyse the geochemical raster datasets and calculate a correlation matrix. Patterns emerged, which were not identified in qualitative analysis, many of which are also amongst elements with very different characteristics. Preliminary results show 41 element pairings with a strong positive correlation ( $\geq 0.75$ ). Both qualitative and quantitative analyses on this scale could increase knowledge on the relationships between element distribution and behaviour in surficial soils of the U.S.

**Keywords :** correlation matrix, geochemical analyses, spatial distribution of elements, surficial soils

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