DIGITAL SOIL CLASS MAPPING AT THE REGIONAL LEVEL USING GAMMA-RAY SPECTROMETRY AND A NUMERICAL CLUSTERING ALGORITHM

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Natural resource management at the district level requires an understanding of the interrelationship between soil physical and chemical properties in order to identify soil management classes. However the collection of soil property information at these levels and this purpose is cost-prohibitive. Increasingly proximal and remotely sensed data sets are being used as surrogates to assist in identifying soil management classes. This includes the use of proximal sensors (e.g. electromagnetic (EM) induction instruments) and remotely sensed data (e.g. secondary terrain attributes derived from a DEM). However, even these have limitations owing to the need to cover large areas and their limited use on flat alluvial landscapes, respectively. Another option is the use of passive remote sensing techniques (e.g. gamma-ray spectrometry data) to map the regolith. Regardless of which ancillary data set is used an objective methodology is also required in order to identify structures or classes that may relate to soil properties and type. In this regard many researchers are increasingly using numerical clustering algorithms (e.g. fuzzy k-means analysis - FKM). In this research we demonstrate how gamma-ray spectrometry data can be used as a surrogate for the collection of soil property data. Structures are identified by passing the data through a FKM algorithm (FuzME v5.0). Using indices such as the fuzziness performance index (FPI) and normalized classification entropy (NCE), we identify $k = 11$ classes and a fuzziness exponent *?* = 2.0 for further interpretation. The $k = 11$ classes correlate well with previously identified geological and geomorphological units in the Edgeroi district (i.e. eroded, alluvial and dust-mantled landforms). A wider interpretation of the clustering showed that the $k = 11$ classes were also consistent with a broader soil survey of the lower Namoi valley. The inclusion of EM data could enhance the $k = 11$ classes by providing detail on subsoil changes as well as top soil changes within the landscape.