Multi-parameters statistical analysis of K, Th and U concentrations in Eastern Senegal: implications for the interpretation of airborne radiometric

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In geological mapping, maps of K, Th and U concentrations provided by airborne radiometric surveys are widely used to delineate geological units in tropical regions from the few rare outcrops. Indeed, thanks to their specific geochemical properties and behaviors, K, Th and U allow to trace geological processes. However, the combination of the concentrations of these radioelements does not allow to determine in a unique way a lithology or a geological history. We examine the potential value of mapping the statistical parameters of K, Th and U concentrations for geological mapping, using for this purpose airborne radiometric in Eastern Senegal. The mean, standard deviation, skewness and kurtosis were calculated for a scale (or base length) of 30 kilometers. We noted that values of the skewness and kurtosis follow closely the theoretical relationships between these two parameters for log-normal distributions. Log-normal distributions may be frequent at the scale of analysis. We also noted that the typical length-scale of variations of the statistical parameters decreases for higher moments (skewness and kurtosis, with respect to the mean and standard deviation) of the variable. This can be explained in the presence of mixtures of log-normal distributions. The area was then classified into 8 units according to a combined clustering analysis of the four statistical parameters. The 8 clusters do not show obvious correlations with geological units, but we rather reflect a combination of lithology and surface processes. We have tentatively interpreted the 8 units in terms of lithology and erosional context.