Cluster analysis of radiometric airborne images, geochemistry and digital elevation data to map the basic saprolite's surface

Gamma-spectrometric airborne images (U, K, Th) of the Mauges region (SE Armorican Massif, France) clearly show that plateau areas are depleted in K as a result of chemical erosion while Th is fairly constant. In contrast, the valleys are characterized by larger K concentrations reflecting the bedrock original composition which mainly consists of Brioverian micaschists.

To have a better understanding of the pattern of erosion and weathering visible by airborne gamma-spectrometry, these radiometric data are combined with a digital elevation model, along with river and sediment geochemical data by Hierarchy Ascending Classification (HAC – cluster analysis). The multivariable analysis sorts each individual data point into separate groups characterized by radiometry (U, K, Th), geochemistry (B, Ba, Cr, Fe and V), and topographic variables (slope, curvature, erosive capacity).

The resulting groups are then converted into a series of maps purposeful (1) to discriminate more finely lithological contrasts, (2) to highlight different levels of weathering, and (3) to produce a reliable cartography of the basic saprolite's surface. This assumption is validated by field control : in the study area we show a strong correlation between the zones delineated by HAC and the position of basic saprolite's surface or that of the fissured horizon.

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