Airborne Gamma-Ray Spectrometry in 2017: solid ground for new development.

Fortin, R. [1], Hovgaard, J. [2], Bates, M. [3]


OUTLINE

Decades of development and operational usage have brought airborne gamma-ray spectrometry (AGRS) to maturity. This has been recognized by the publication in the 1990s of standard guidelines that have been accepted by industry and governments and that are in worldwide use today. Over the last decade, while still based on the same proven system configuration favoring high volume detector arrays, commercial systems have been upgraded with digital electronics and are reaching an unprecedented degree of robustness and consistency. This renewed data quality offers the possibility to revisit data processing and interpretation ideas that appeared previously interesting, in theory, but challenging to implement in practice. It also allows investigating new approaches in data collection that are now technologically available to practitioners.

For example, first, by considering the differential signal between each individual detector of the system’s array, directional information on the origin of the signal can be extracted and included in the mapping process to potentially enhance spatial resolution. Eventually, detector arrangement can also be optimized to increase directionality in the system’s response. Also, second, use of noise-adjusted singular value decomposition has become common practice for noise reduction, but further interpretation of this type of spectral decomposition can provide additional information that is useful in mapping selected radio-isotopes. In parallel, other approaches to spectral decomposition, using for example, model-based spectral components, are also being investigated and could result in significant improvement in the quality of Uranium and Thorium mapping. But these two points also call for a better understanding of the response of detectors in various acquisition geometries. This can be achieved by numerical simulation of gamma-ray transport with Monte Carlo packages backed by experimental validation. In turn, this modelling also prepares the development of formal data inversion procedures for airborne gamma-ray spectrometry.

Improvements to end-product quality should offer better contrast when targeting mineral deposits with AGRS, either directly or through alterations or geochemical dispersal. But, the increased readability and significance of end-products will also convey the value of AGRS for framework mapping of surficial geochemical variations and allow an insightful integration within bedrock and surficial mapping projects, providing more layers of information that will be useful at the planning, field work and compilation phases.