Ministère des Ressources naturelles et des Forêts
Québec

Read-me

Direction générale de Géologie Québec

SIGÉOM
Système d'information géominière du Québec

High Resolution Spectrometry of Quebec

Spectrometry is a geophysical method of measuring gamma radiation from natural radioactive sources on the Earth's surface. Potassium, uranium and thorium are the main elements that emit this type of radiation in nature. The abundance of potassium measured by the spectrometer is proportional to the number of gamma photons emitted by 40K, while the amount of uranium and thorium is estimated indirectly using the gamma photons emitted by their respective daughter products (214Bi for uranium and 208Tl for thorium). Spectrometry is a surface method sensitive to radioactive radiation from the top 20-60 cm of the ground.

These spectrometric maps were compiled from data acquired since 2008 during combined airborne (or helicopter-borne) magnetic-spectrometric surveys carried out by the Ministère. Indeed, most recent aeromagnetic surveys included a spectrometric component, except for those carried out during the winter season. The traverse spacing varied between 150 m and 300 m and the flying height between 50 m and 100 m. The data from each survey was reprojected into the NAD83 Québec Lambert coordinate system and interpolated into 75 m grid cells using the minimum curvature method.

Details of data acquisition and processing are included in the service provider reports that accompany each survey. All spectrometers used in these surveys have been calibrated and processing procedures are more or less standard. The concentrations of 40K, eTh and eU are estimated at ground level. Thus, for adjacent surveys, the concentrations of these elements should show some continuity. However, there are discontinuities ("map faults") which are largely caused by differences in soil moisture levels during data acquisition and by the filtering procedure adapted to the noise level of each survey. In order to obtain uniform maps without apparent joints, it is necessary to add a constant determined from the average values of the overlapping areas between surveys. For example, the mesh of survey A is adjusted to that of adjacent survey B to define a new mesh AB which is in turn adjusted to the mesh of adjacent survey C and so on, to finally obtain a large block merging the different contiguous surveys. This is a simplification of the methodology described in Minty (2000). After merging the adjacent surveys into discontinuous blocks, they are grouped into a single Québec-wide grid using the Geosoft Grid Mosaic tool.

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This levelling procedure improved the continuity of the grids and avoided map faults. However, these products do not present the original concentrations of elements measured in each of the surveys. Therefore, although this compilation can be used for mapping large areas (regional studies), we recommend using the digital data from the spectrometric survey(s) covering the area of interest for work at a more local scale. These data are available in Examine for each survey.

Reference:

Minty, B., 2000 – Automatic merging of gridded airborne gamma-ray spectrometric surveys. Exploration Geophysics; volume 31, pages 047-051.

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