

AIRBORNE GEOPHYSICAL SURVEY, ST. ALBAN'S AREA

Gerry Kilfoil



Figure 1: Map showing location of the survey and flight paths

In the Fall of 2015, a combined airborne magnetic gradiometer and radiometric survey was flown in the St. Alban's map area, Bay d'Espoir region, on the south coast of Newfoundland (Fig. 1). The 8200 km of survey cover all of the NTS 01M/13 map area, except the northeast corner. Flights were oriented in a northwest-southeast direction, perpendicular to the predominant geological trend, with lines spaced at 150 m and orthogonal control lines spaced at 1000 m. Figure 2 shows Goldak Airborne Surveys' fixed-wing aircraft used during the survey, equipped with magnetometers in wingtip pods and tail stinger. Gander airport was used as a base of operations throughout the survey. Late-season weather and the rugged topography of the region were challenges to data acquisition.



Figure 2: Goldak's Cessna Caravan aircraft equipped for airborne survey

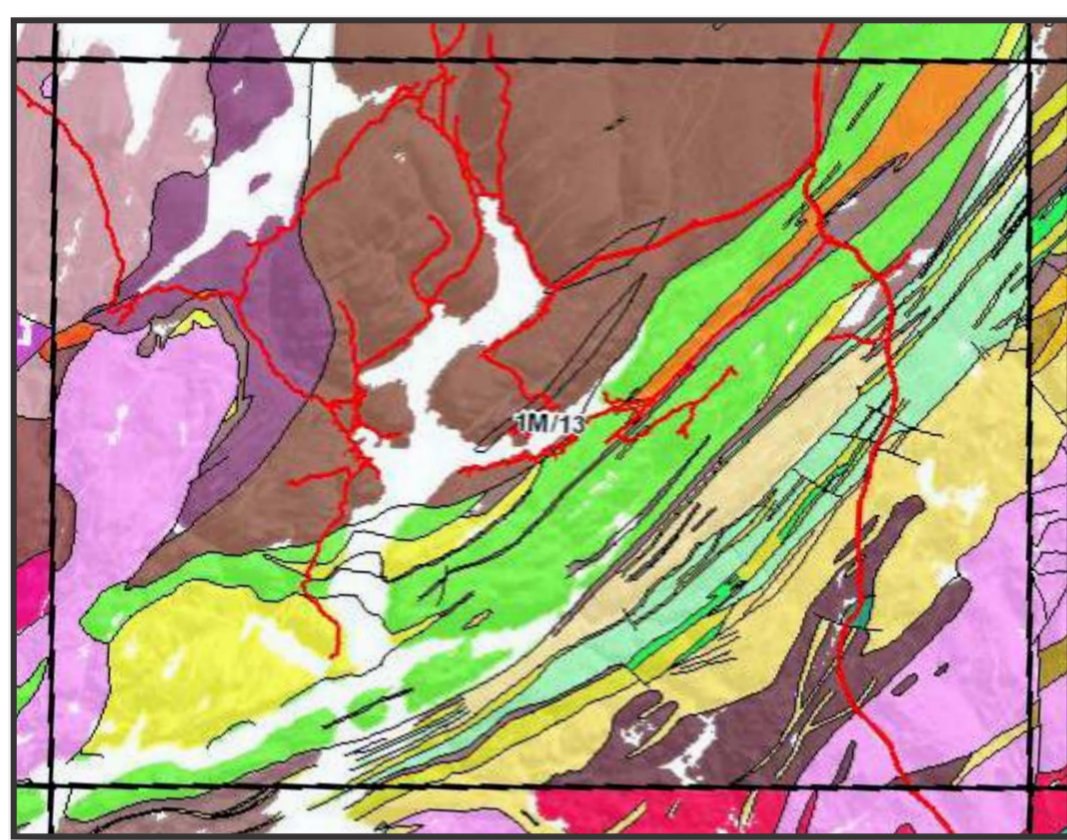


Figure 3: Generalized bedrock geology of the survey area

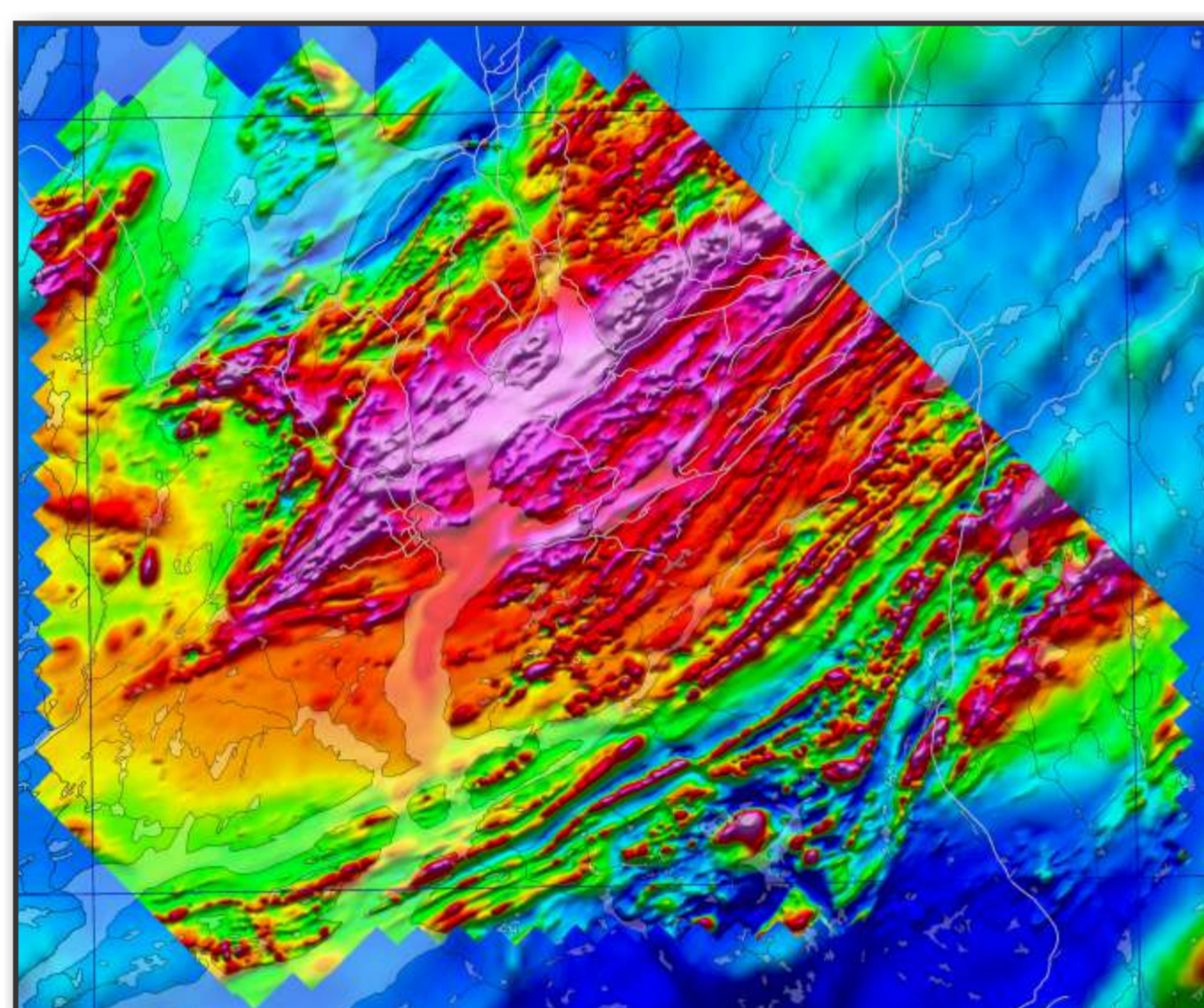
The data were processed in early 2016, and results were released in April as digital Open File NFLD/3272. Digital products from the magnetic results were: residual magnetic field, its 1st and 2nd vertical derivatives, and horizontal gradients in 4 directions. The radiometric results yielded 8 standard digital map products: maps of the concentrations of each of the 3 radioelements (K, U, Th), a "dose rate" equivalent exposure map, 3 derived ratio maps, and a ternary map. As well, a map of digital elevation within the survey area was generated.

Links to the maps (PDF format) for digital Open File NFLD/3272 can be found at:

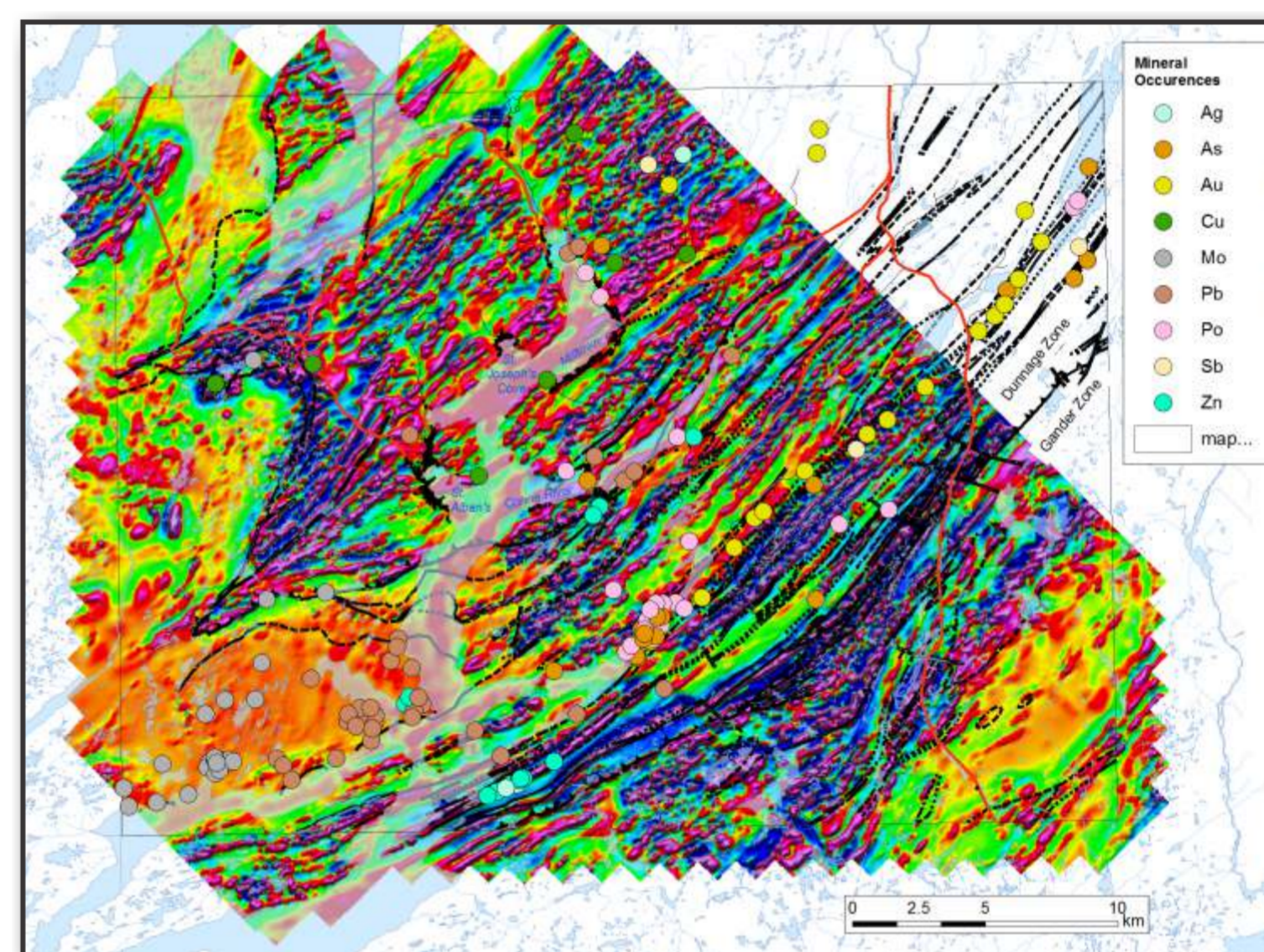
www.nr.gov.nl.ca/nr/mines/geoscience/publications/openfiles

A metadata link near the end of the above page provides access to:

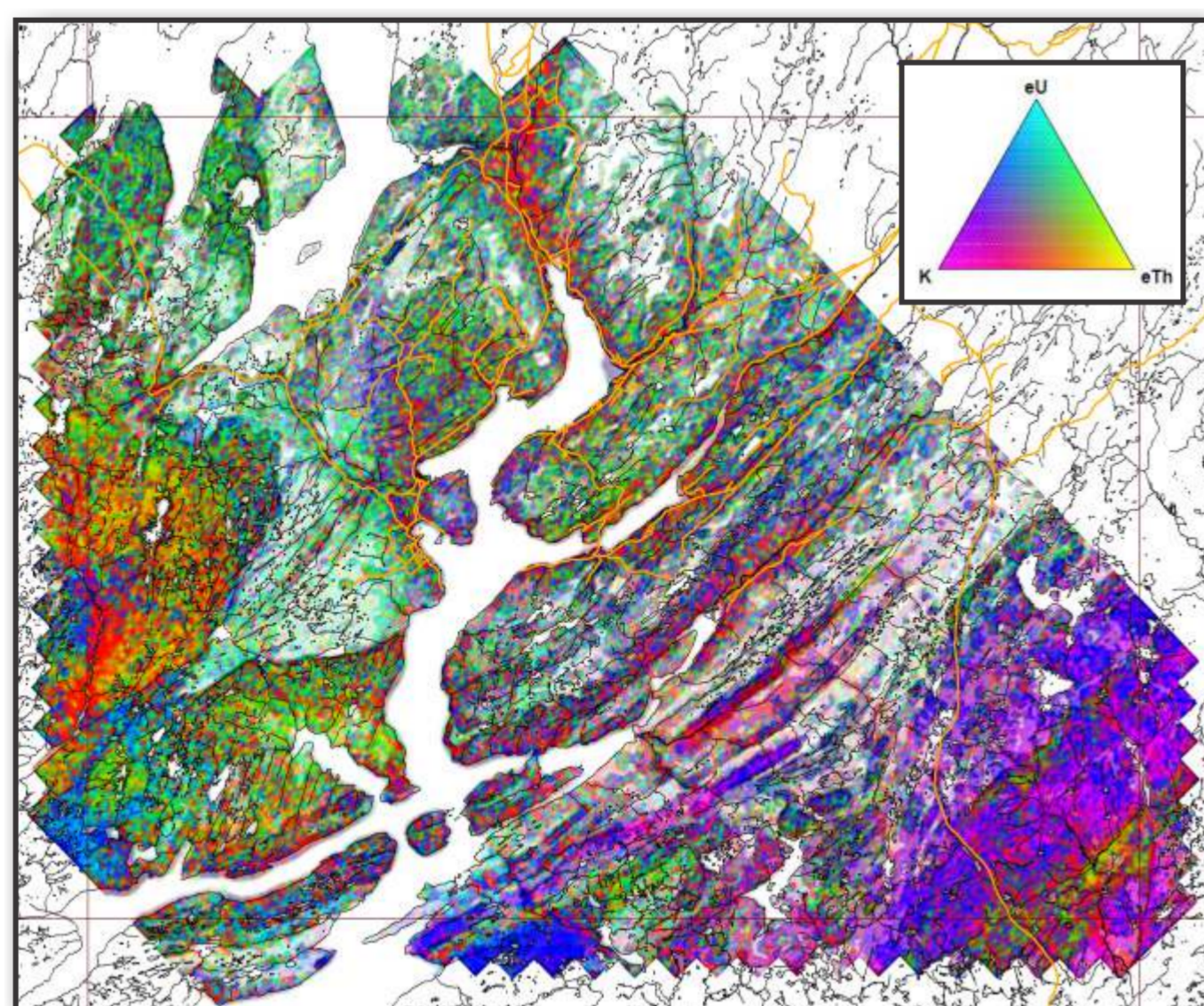
- The contractor's logistical report, with the full details of the survey
- Final processed data recorded during flights, and interpolated grids
- High-res images and other digital products generated from the data in GIS-ready formats



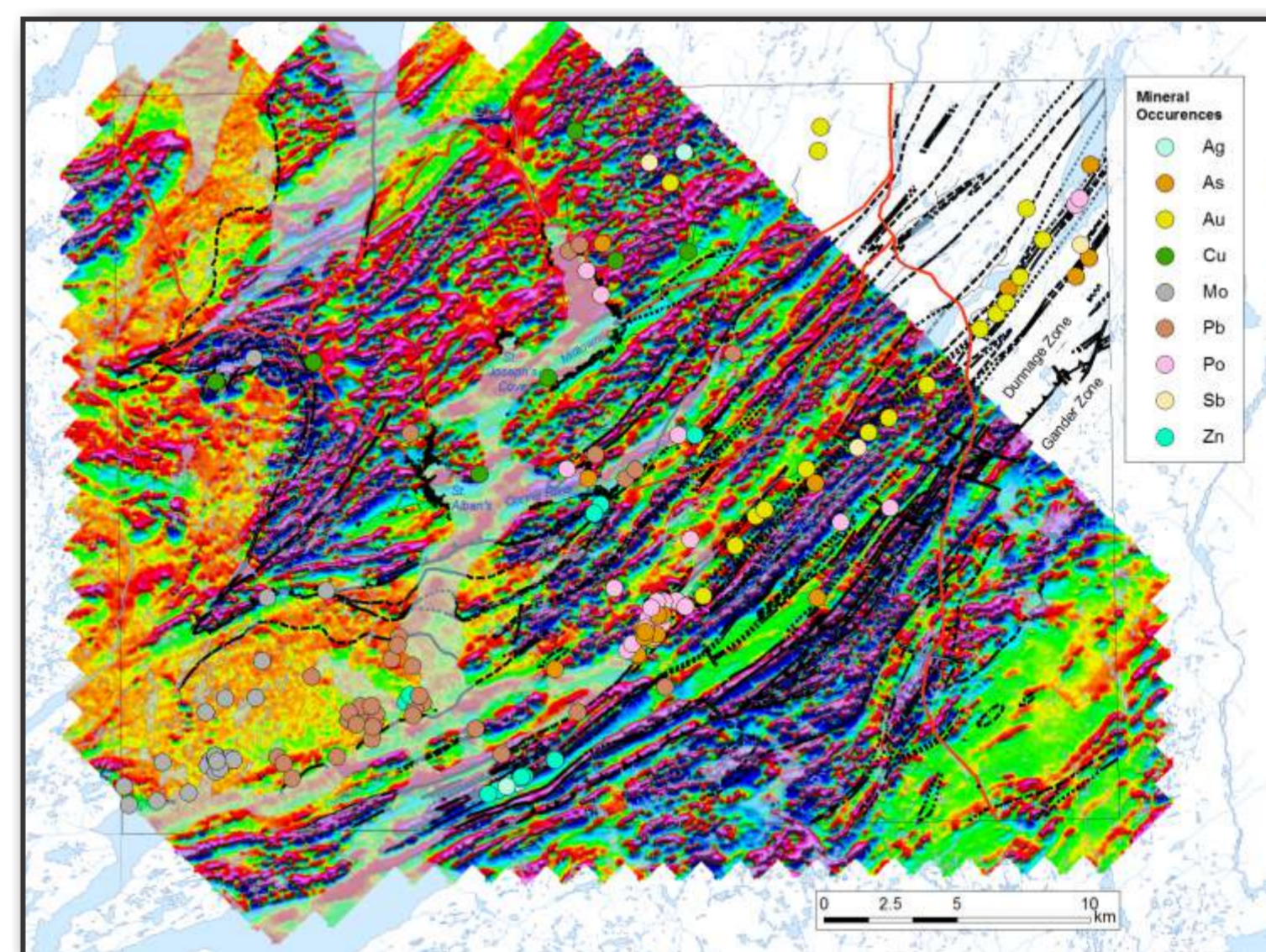
Map 1: Residual Magnetic Field



Map 2: First Vertical Derivative of the Magnetic Field, with Geological Boundaries and Mineral Occurrences



Map 3: Ternary Map of Relative Radioelement Concentrations



Map 4: North-South Horizontal Gradient of the Magnetic Field

Preliminary Interpretation

Map 1 shows the residual magnetic field (bright colours) superimposed on the residual magnetic field from the regional 1960's vintage GSC survey (shades of blue). Note the contrast in the level of detail between the two datasets. Map 2 shows its 1st vertical derivative, with geological contacts and faults added. The most striking features on these maps are the highly linear anomalies oriented northeast-southwest in the central part of the survey, over metasedimentary and volcanic rocks of the Baie d'Espoir Gp. (shades of brown, green, yellow and orange on Fig. 3). This linear pattern contrasts sharply with the more uniform magnetic patterns over intrusive complexes (pink and purple colours, Fig. 3), which occur in the North Bay granite suite along the western side of the survey area, as well as in the Gaultois and Northwest Brook granites in the southeast. East-west to northwest-southeast oriented breaks or minor displacements in these patterns can be identified; several of these coincide with the mapped locations of faults. The area has been known to host several mineral occurrences – these are most abundant in more accessible areas along roads or near the coastline where bedrock is best exposed. Note that specific types of occurrences (eg. Au, Pb, Zn, Cu) tend to be concentrated along distinct magnetic linears, representing a particular sedimentary/volcanic rock unit or a faulted contact. High-definition magnetic surveys can potentially be used to trace these trends into the region to the north and east of the 01M/13 map area, where Baie d'Espoir Gp. rocks have been identified, but are poorly exposed.

Map 3 is a ternary image generated from the gamma-ray spectrometric results, a presentation which represents the 3 radioelement concentrations (U, Th & K) as varying intensities of 3 primary colours (see inset). On this map, areas having a specific colour tone can be correlated with corresponding geology. The colour strength is proportional to the total radiometric signal measured during survey – that is, areas which appear washed out identify parts of the survey where the radiometric signal was attenuated to varying degrees. The radiometric signal is completely attenuated over water and somewhat to strongly attenuated in areas covered by bogs and glacial deposits (more common in the northern and eastern parts of the survey, away from the coast). Areas dominated by crystalline intrusive or metamorphic rocks tend to have the strongest radiometric response. Note that certain granites can be distinguished by their distinct and contrasting colours.

Map 4 shows the measured horizontal magnetic gradient in the north-south direction. When compared to Map 2, this gradient direction shows the same predominant northeast-southwest magnetic trends, but also best highlights many of the more subtle east-west oriented features which crosscut this fabric. In particular, note these east-west features in the northwestern part of the map.