Remote sensing and high-resolution DEM data integration of slave province kimberlites, NWT.

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As part of the Slave Province Geophysical, Surficial Materials and Permafrost Study, the Northwest Territories Geological Survey (NTGS) has commissioned a number of studies in the area. This group started a project analyzing recently collected high-resolution airborne geophysical data, and as part of the analysis an updated GIS database has been built. This involves remote sensing and high-resolution DEM data. The objective of this work is to help mineral exploration and mining companies better understand the range of geophysical signatures associated with kimberlites in the Slave Geological Province (SGP). One of the many advantages of GIS is the ability to compile several datasets into one document, allowing for direct analysis across said dataset. A plethora of data sources are available to the public, none larger than the Open Data Inventory. This data set includes a collection of past geologic and geophysical reports from multiple government organizations. Ancillary information such as geotechnical boreholes can be used in tandem to improve analysis. Although the Open Data Inventory provided plenty of information, remote sensing imagery needed to be found elsewhere. NASA's Earthdata was used to search and retrieve both Landsat 8 and ASTER images of the study sites. Lastly, a high-resolution digital elevation model (DEM) was required for surficial analysis. While the Canadian Government provides a DEM, it was too coarse a resolution to help interpretation. Through the University of Minnesota, the Polar Geospatial Center provided a 2-meter and 5-meter resolution DEM (Arctic DEM). Most satellite imagery used was of the highest quality available but due to poor conditions (clouds, sensor error, etc.) some lower tier images were needed. GrassGIS was utilized to compute atmospheric corrections to correct the radiance signal from satellite images. Primary analysis, was performed using the suite of tools provided in ArcMap. First, normalized band ratio images were created to locate regions where different types of alteration occur. Next, composites of the band ratios were created to explore relationships between the multiple types of alteration that exists within a cell. Finally, all these data were merged with interpretation products derived from the airborne geophysical data (e.g. structures and dykes). The attributes of these interpreted layers (e.g. orientation and generation) along with the remote sensing images are helping to create a better geoscientific model for the signature of kimberlites.