Using Open-Access Remotely Sensed Data to Support Greenfield Mineral Exploration: Methods and Lessons from Case Studies

Mana Rahimi[1]
[1]Mineral Deposit Research Unit (MDRU) - University Of British Columbia (UBC), Vancouver , Canada

The availability of open-access remote sensing data is increasingly becoming an important information source for mineral exploration strategy and planning, especially in greenfield areas. These datasets offer the ability to rapidly assess geological features, alteration patterns, and structural controls across large and often inaccessible areas. Greenfield regions often lack detailed ground mapping, making remotely sensed observations a critical first step toward defining geological features linked to understanding subsurface mineralization.

Classic and advanced methodologies for extracting value from open-access remotely sensed data to support mineral exploration are reviewed; traditional techniques such as band ratios, spectral indices, principal component analysis, and structural interpretation are widely used for mapping alteration zones and geological features. Advanced workflows apply machine learning algorithms and fuse satellite imagery with airborne geophysical and elevation datasets to enhance exploration targeting. The best-suited methodologies are selected depending on the exploration scale, the geological context, and the targeted mineralization style. The advantages and challenges associated with the remote data processing methods are discussed, offering practical insights into their application in greenfield settings.

Case studies from mineralized regions demonstrate how using open-access remotely sensed data, combined with integrated exploration methods, can strengthen targeting decisions, improve exploration efficiency, and help reduce geological uncertainty in greenfield environments. These examples highlight the advantages and the practical challenges of applying remotely sensed data in real-world exploration projects.