EGU2020-12546
https://doi.org/10.5194/egusphere-egu2020-12546
EGU General Assembly 2020

Application of multi-sensor unmanned aerial system for identification of hydrothermal alteration zones

Yosoon Choi[1], Jieun Baek[1], Jangwon Suh[2], and Sung-Min Kim[2]
[1]Pukyong National University, Department of Energy Resources Engineering, Busan 48513, Korea, Republic of
[2]Kangwon National University, Department of Energy Engineering, Samcheok 25913, Korea, Republic of

In this study, we proposed a method to utilize a multi-sensor Unmanned Aerial System (UAS) for exploration of hydrothermal alteration zones. This study selected an area (10m × 20m) composed mainly of the andesite and located on the coast, with wide outcrops and well-developed structural and mineralization elements. Multi-sensor (visible, multispectral, thermal, magnetic) data were acquired in the study area using UAS, and were studied using machine learning techniques. For utilizing the machine learning techniques, we applied the stratified random method to sample 1000 training data in the hydrothermal zone and 1000 training data in the non-hydrothermal zone identified through the field survey. The 2000 training data sets created for supervised learning were first classified into 1500 for training and 500 for testing. Then, 1500 for training were classified into 1200 for training and 300 for validation. The training and validation data for machine learning were generated in five sets to enable cross-validation. Five types of machine learning techniques were applied to the training data sets: k-Nearest Neighbors (k-NN), Decision Tree (DT), Random Forest (RF), Support Vector Machine (SVM), and Deep Neural Network (DNN). As a result of integrated analysis of multi-sensor data using five types of machine learning techniques, RF and SVM techniques showed high classification accuracy of about 90%. Moreover, performing integrated analysis using multi-sensor data showed relatively higher classification accuracy in all five machine learning techniques than analyzing magnetic sensing data or single optical sensing data only.