Geophysical Research Abstracts
Vol. 20, EGU2018-17812, 2018
EGU General Assembly 2018

Integration of drone-borne hyperspectral and geomagnetic data. A combined approach in geologic remote sensing. A test from the Siilinjärvi carbonatite, Finland.

Robert Jackisch (1), Robert Zimmermann (1), Sandra Lorenz (1), Ari Saartenoja (2), Markku Pirttijärvi (2), and Richard Gloaguen (1)

(1) Helmholtz-Zentrum Dresden-Rossendorf, Helmholtz Institute Freiberg, Freiberg, Germany (r.jackisch@hzdr.de), (2) Radai Oy, Oulu, Finland (ari.saartenoja@radai.fi)

The worlds need for critical materials sees a surge since the last two decades. Most of Europe's larger mineral deposits have been discovered and exploited by now. A rising need to include formerly unattractive or inaccessible prospects is apparent. Here, using drones for detailed prospecting of small areas comes in handy. Drones have the advantage of being cost-efficient, easily deployable and having a short turn-around time for high resolution data.
With this study, we introduce a novelty approach for non-invasive mineral exploration based on the integration of remote sensing applications. In particular, we combine the advantage of light-weight drone technology with a snapshot hyperspectral camera and a magnetometer. The platform delivers specified, integrated measurements of spectrometric high-resolution surface images fused with data of the earth's magnetic field. This allows us to identify surficial rock exposures and the estimation of the subsurface proportions of the aforesaid target.
The sensor system is attached to an octocopter platform with a flight endurance of around 30 minutes. A fixed-wing drone is used to acquire magnetic data of the same target with a larger area. The combined data is processed through a framework of correction software and projected on digital elevation models (DEMs) from the target area. The DEMs are acquired via Structure-from-Motion Multi-View-Stereo photogrammetry. Hyperspectral data is corrected for topographic effects and automatically georeferenced using the MEPHYSTo toolbox. Magnetic data is calibrated for orientation effects and corrected for diurnal and external induced field fluctuations via base station recordings. We validate the measurements with a field-tested assembly of different techniques, e.g., mineralogical and geochemical analysis, in-situ ground spectroscopy and geomagnetic readings.
The results are promising and we demonstrate that drone-based exploration becomes more affordable, intuitive and accessible to the mining sector and the geoscientific community.