EGU General Assembly 2020

A supervised technique for drill-core mineral mapping using hyperspectral data

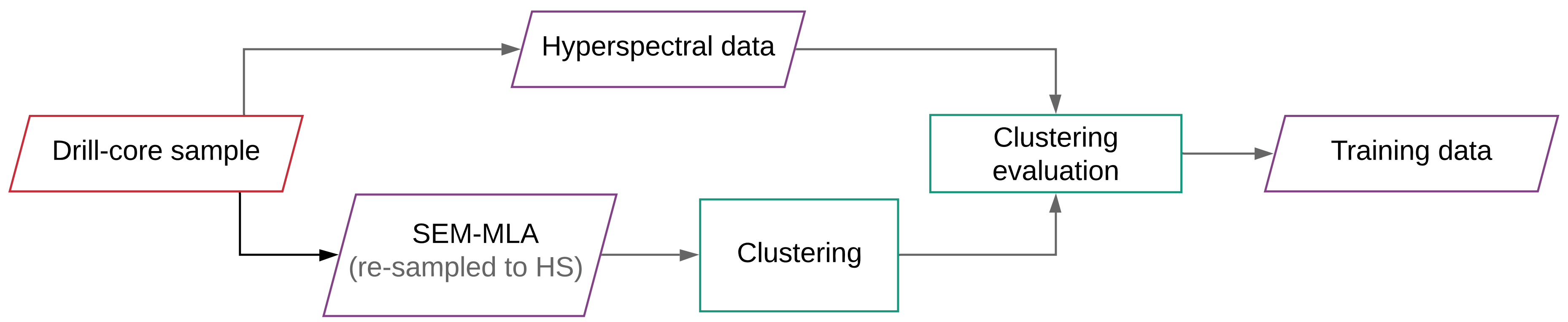
Cecilia Contreras, Mahdi Khodadadzadeh, Laura Tusa, and Richard Gloaguen

Helmholtz-Zentrum Dresden-Rossendorf, Helmholtz Institute Freiberg for Resource Technology, Germany (i.contreras@hzdr.de)

HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF

HIF HELMHOLTZ INSTITUTE FREIBERG FOR RESOURCE TECHNOLOGY

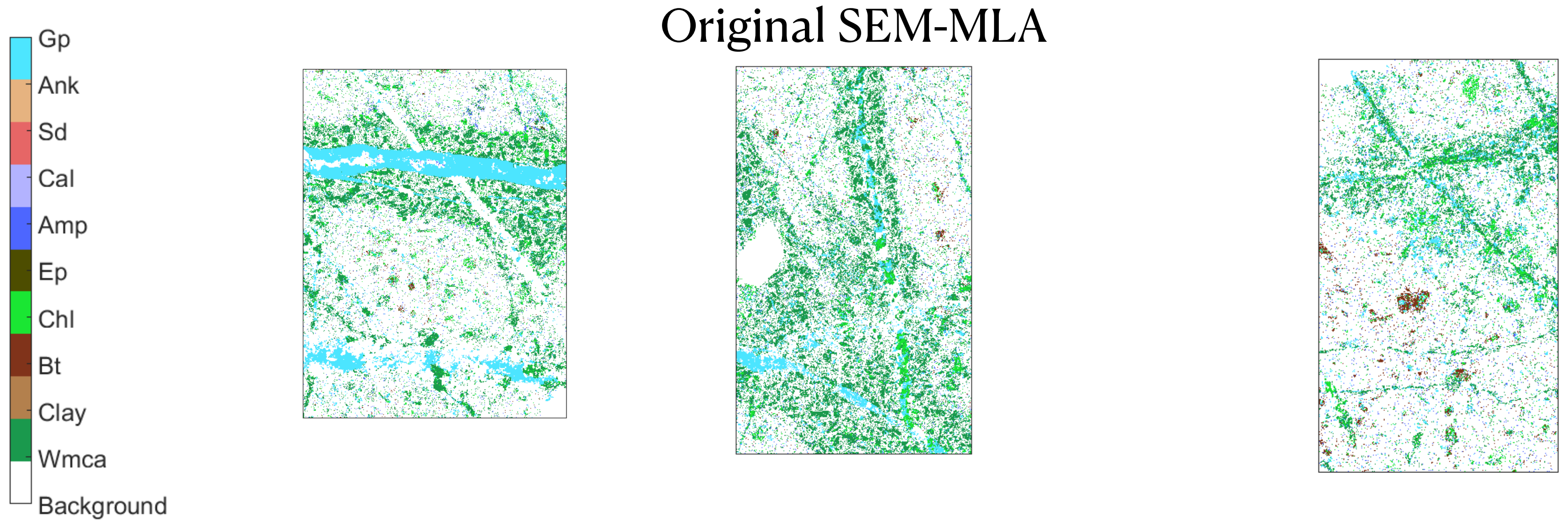
PROPOSED APPROACH



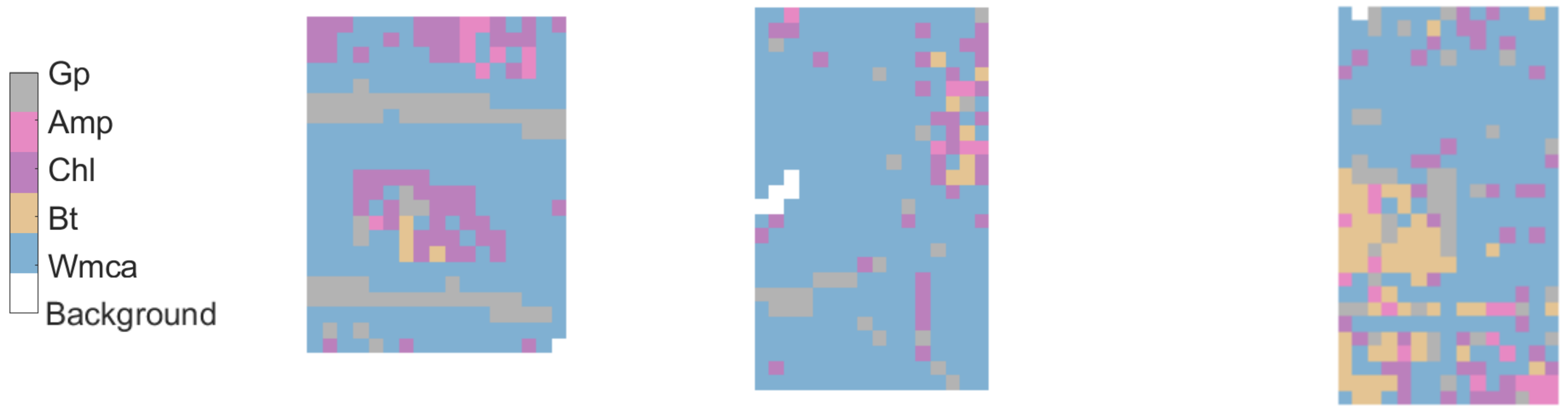
DATASET

RGB of drill-core sample

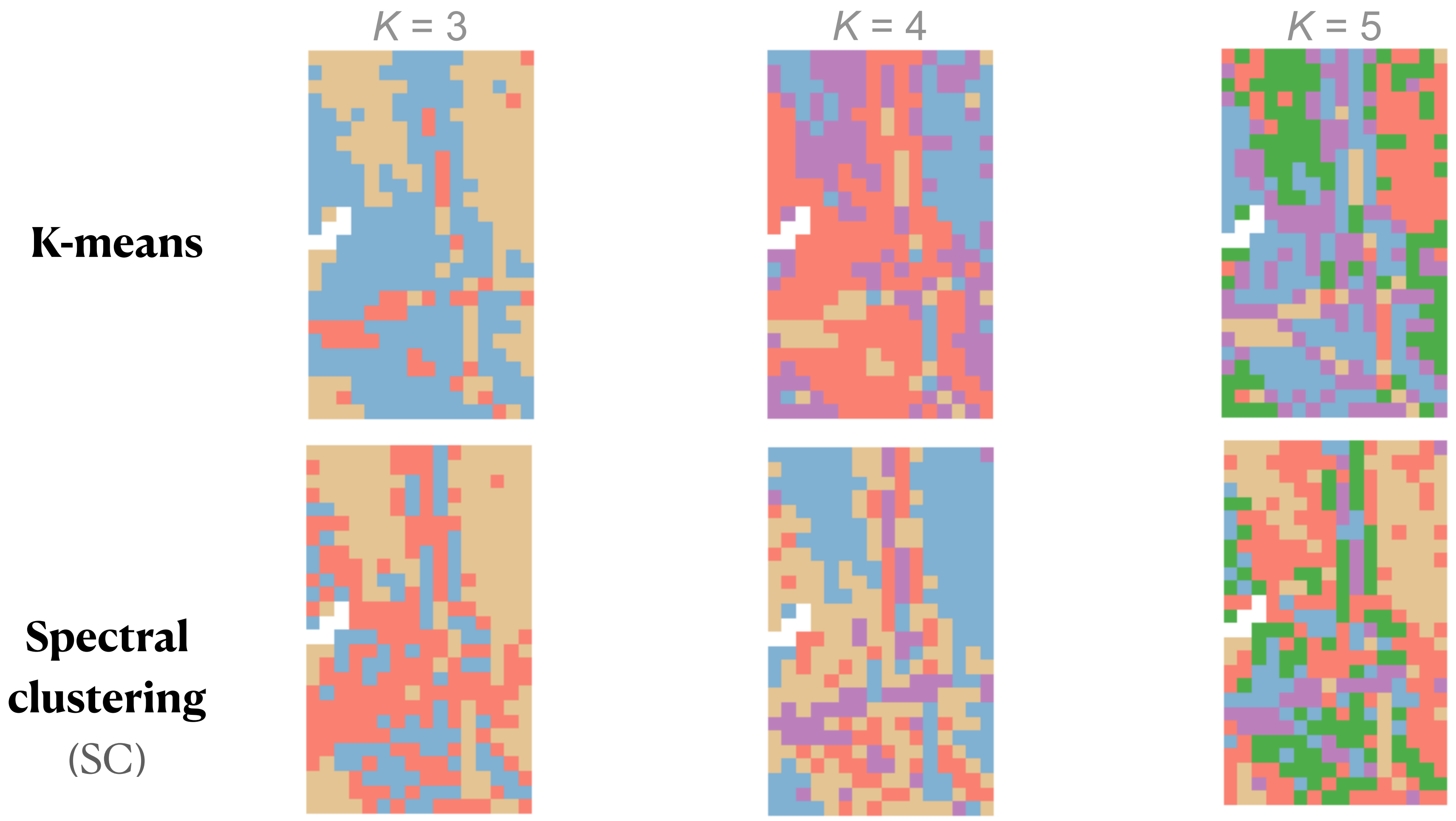
Original SEM-MLA



Re-sampled SEM-MLA considering Max abundances



CLUSTERING RESULTS



Please keep in mind that colours amongst the maps do NOT relate

Silhouette Coefficient (S)

Clustering approach	S
K-means 3	0.44
K-means 4	0.35
K-means 5	0.33
SC 3	0.33
SC 4	0.27
SC 5	0.28

SUMMARY AND CONCLUSIONS

- Scanning-Electron Microscopy-based Mineral Liberation Analysis (SEM-MLA) data are used to generate training data needed for the use of supervised machine learning algorithms
- We evaluated the use of K-means and Spectral Clustering methods over the model mineralogy available in the re-sample SEM-MLA data
- In general clustering improves the mapping of structures: veins and alteration halos are mapped whereas when considering only the most dominant minerals (*Max abundance maps)* these are not always captured
- The Silhouette Coefficient (S) was used to evaluate how well-assigned the pixels are allocated to their corresponding clusters, hence, to evaluate the clustering performance.
- Values of S show that K-means with 3 clusters performed the best. Thus, using the maps obtained by K-means with 3 clusters as training data for a supervised machine learning algorithm is expected to produce more detailed mineral maps in this drill-core hyperspectral dataset

For more details on the use of SEM-MLA data as training data for drill-core hyperspectral mineral mapping please refer to:
- I. C. C. Acosta, M. Khodadadzadeh, L. Tusa, P. Ghamisi and R. Gloaguen, "A Machine Learning Framework for Drill-Core Mineral Mapping Using Hyperspectral and High-Resolution Mineralogical Data Fusion," in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 12, no. 12, pp. 4829-4842, Dec. 2019, doi: 10.1109/JSTARS.2019.2924292.
- Tuşa, L.; Khodadadzadeh, M.; Contreras, C.; Rafiezadeh Shahi, K.; Fuchs, M.; Gloaguen, R.; Gutzmer, J. Drill-Core Mineral Abundance Estimation Using Hyperspectral and High-Resolution Mineralogical Data. Remote Sens. 2020, 12, 1218.