Environmental mapping and monitoring of Iceland by remote sensing (EMMIRS)

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Iceland is exposed to rapid and dynamic landscape changes caused by natural processes and man-made activities, which impact and challenge the country. Fast and reliable mapping and monitoring techniques are needed on a big spatial scale. However, currently there is lack of operational advanced information processing techniques, which are needed for end-users to incorporate remote sensing (RS) data from multiple data sources. Hence, the full potential of the recent RS data explosion is not being fully exploited.

The project Environmental Mapping and Monitoring of Iceland by Remote Sensing (EMMIRS) bridges the gap between advanced information processing capabilities and end-user mapping of the Icelandic environment. This is done by a multidisciplinary assessment of two selected remote sensing super sites, Hekla and Öræfajökull, which encompass many of the rapid natural and man-made landscape changes that Iceland is exposed to.

An open-access benchmark repository of the two remote sensing supersites is under construction, providing high-resolution LIDAR topography and hyperspectral data for land-cover and landform classification. Furthermore, a multi-temporal and multi-source archive stretching back to 1945 allows a decadal evaluation of landscape and ecological changes for the two remote sensing super sites by the development of automated change detection techniques.

The development of innovative pattern recognition and machine learning-based approaches to image classification and change detection is one of the main tasks of the EMMIRS project, aiming to extract and compute earth observation variables as automatically as possible. Ground reference data collected through a field campaign will be used to validate the implemented methods, which outputs are then inferred with geological and vegetation models. Here, preliminary results of an automatic land-cover classification based on hyperspectral image analysis are reported.

Furthermore, the EMMIRS project investigates the complex landscape dynamics between geological and ecological processes. This is done through cross-correlation of mapping results and implementation of modelling techniques that simulate geological and ecological processes in order to extrapolate the landscape evolution