The Scottish way – getting results in soil spectroscopy without spending money

Matt Aitkenhead (1), Clare Cameron (1), Graham Gaskin (1), Bastien Choisy (2), Malcolm Coull (1), and Helaina Black (1)

(1) The James Hutton Institute, Aberdeen, United Kingdom (matt.aitkenhead@hutton.ac.uk), (2) Ecole d'Ingénieurs de Purpan, Toulouse, France (bastien.choisy@etudiants.purpan.fr)

Achieving soil characterisation using spectroscopy requires several things. These include soil data to develop or train a calibration model, a method of capturing spectra, the ability to actually develop a calibration model and also additional data to reinforce the model by introducing some form of stratification or site-specific information. Each of these steps requires investment in both time and money. Here we present an approach developed at the James Hutton Institute that achieves the end goal with minimal cost, by making as much use as possible of existing soil and environmental datasets for Scotland. The spectroscopy device that has been developed is PHYLIS (Prototype HYperspectral Low-cost Imaging System) that was constructed using inexpensive optical components, and uses a basic digital camera to produce visible-range spectra. The results show that for a large number of soil parameters, it is possible to estimate values either very well ($RSQ > 0.9$) (LOI, C, exchangeable H), well ($RSQ > 0.75$) (N, pH) or moderately ($RSQ > 0.5$) (Mg, Na, K, Fe, Al, sand, silt, clay). The methods used to achieve these results are described. A number of additional parameters were not well estimated (elemental concentrations), and we describe how work is ongoing to improve our ability to estimate these using similar technology and data.