Ministry of Energy and Water resources
Geological Survey of Israel
30 Malkhe Israel St.
95501 Jerusalem, Israel

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ATT. Dennis Åsberg, Peter Lindberg
Ocean X Team

COMPARISON STUDY OF TWO SAMPLES

Four samples were provided by Mr. Leon Cherniaev as follows:
Sample 1 - Directly from a crack on the Anomaly
Sample 2 - Directly from a crack on the Anomaly
Sample 3 - Directly from a crack on the Anomaly
Sample 4 - Stone on top of the Anomaly (Marine Basalt)
Sample 5 - Sediment from the top of the anomaly

An extensive and detailed study using a scanning electron microscope (SEM) combined with EDS was aimed at characterizing the above samples in terms of morphology and chemical composition.

INSTRUMENT DATA

Surface topology is obtained using a Scanning Electron Microscope (SEM); FEI Quanta 450 with the Everhart Thornley detector (secondary electrons). The compositional distribution is obtained using the backscattered electron detector (BSED). The SEM is equipped with Energy-dispersive X-ray spectroscopy (EDS); Oxford Instruments X-max 20 SDD for elemental analysis or chemical characterization.

RESULTS SCANNING ELECTRON MICROSCOPE + EDS STUDY

The following are the results for each sample. Note that the marked letter on the backscatter images marks the area where the spectrum was taken.

Sample 1

This sample consists of unsorted small grains. The following are images and spectra taken from this sample.

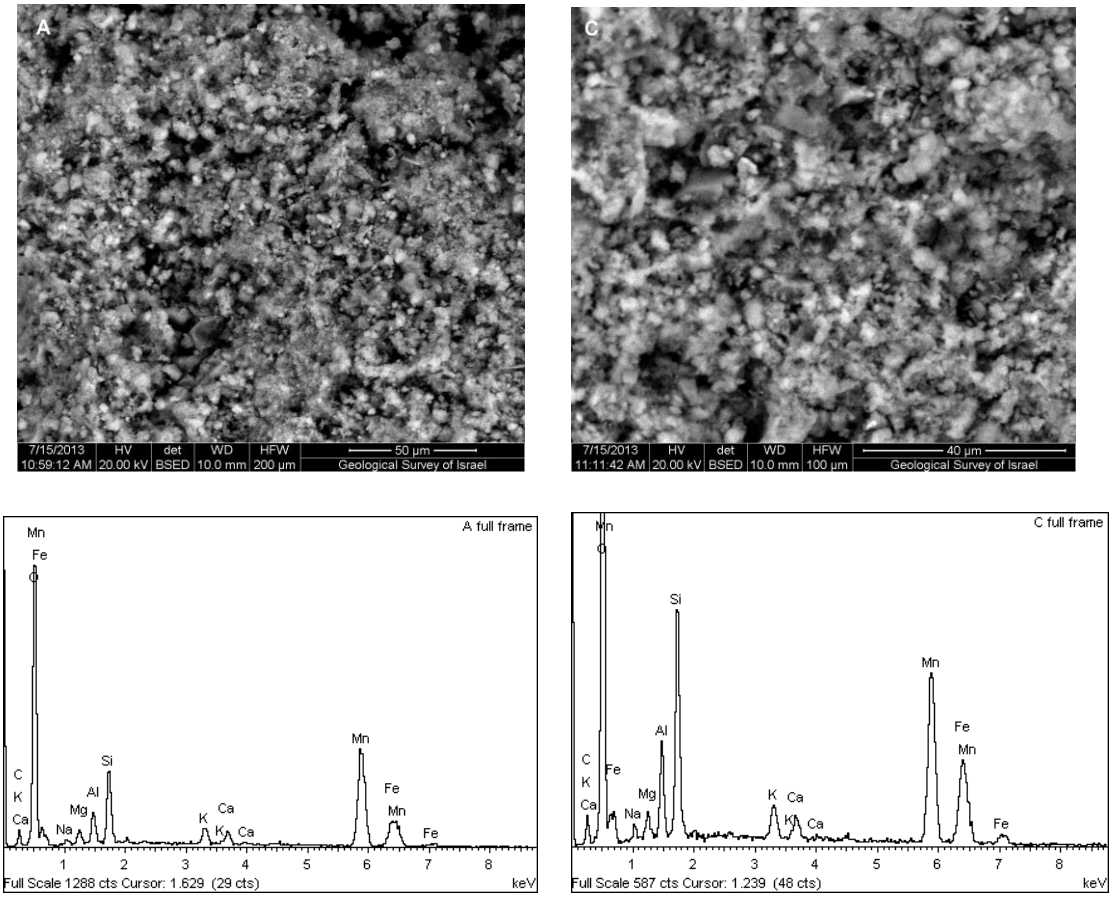

FIGURE 1: Full frame Backscatter electrons images from sample 1 along with full frame spectra (A and C). In general, the elemental distribution indicates Al-Silicate rock probably Mn and Fe enriched basalt (see attached EDS report).

Within this sample, several grains were examined because of their morphology. These bright grains are Fe-Mn enriched Al-silicates as can be seen in figure 2.

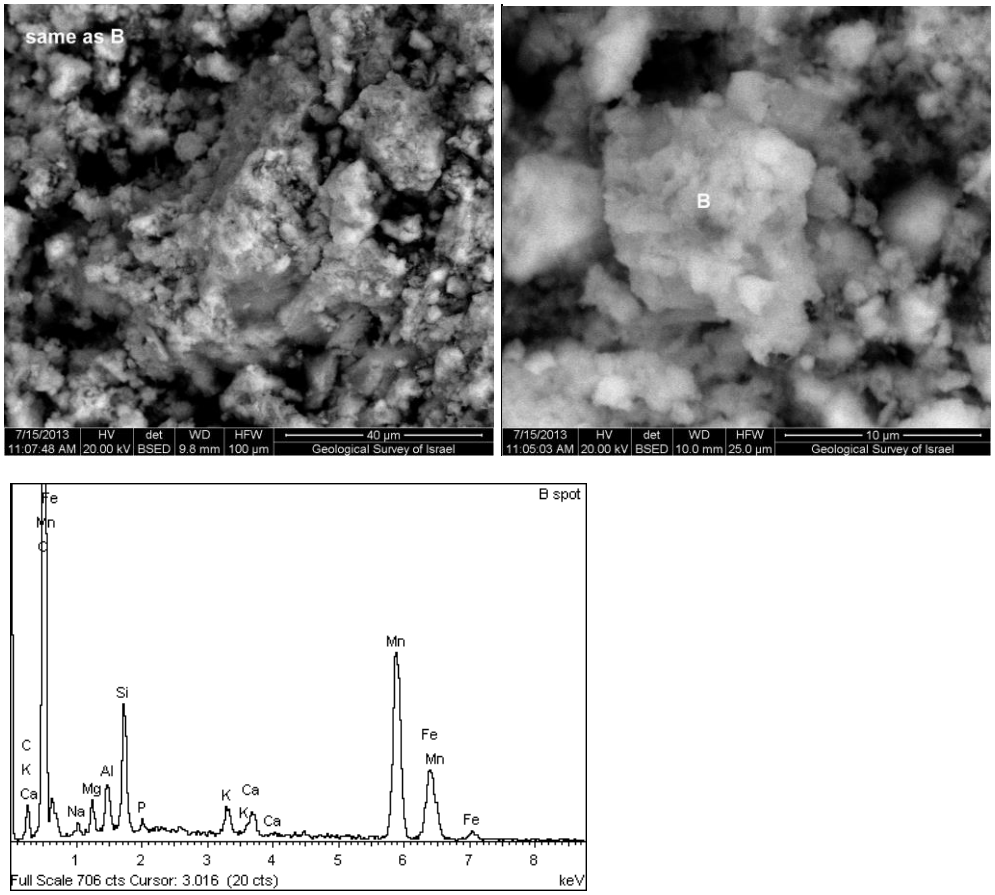

FIGURE 2: Backscatter electron image of grain (B) located in sample 1; B spot location, magnification of grain B and EDS spectra.

Comparing the analyzed sites reveals a high degree of similarity (Figure 3).

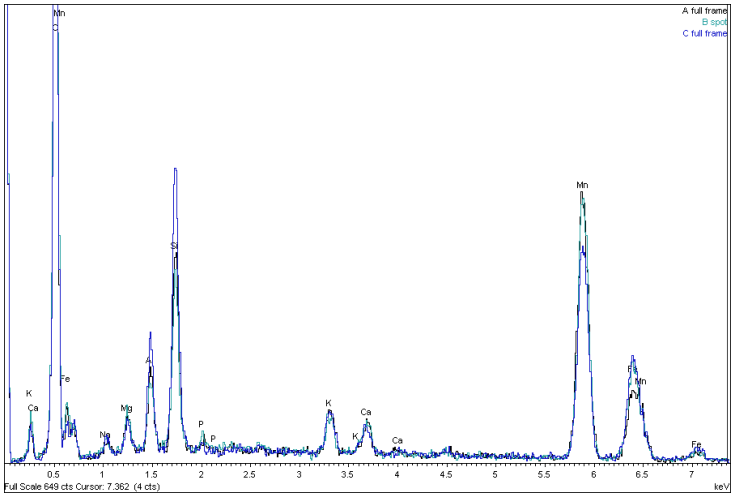

FIGURE 3: A combined EDS spectra of all three sites in sample 1. As can be observed, the two full frame spectra and that of B spot are identical and thus indicate that B shows no distinct feature compared to the overall rock.

Sample 2

This sample was also taken from the same crack as sample 1. The morphology in some places shows "mud" like behavior with cracks (Figure 4). However, the elemental composition of three sites shows no significant difference (Figure 5).

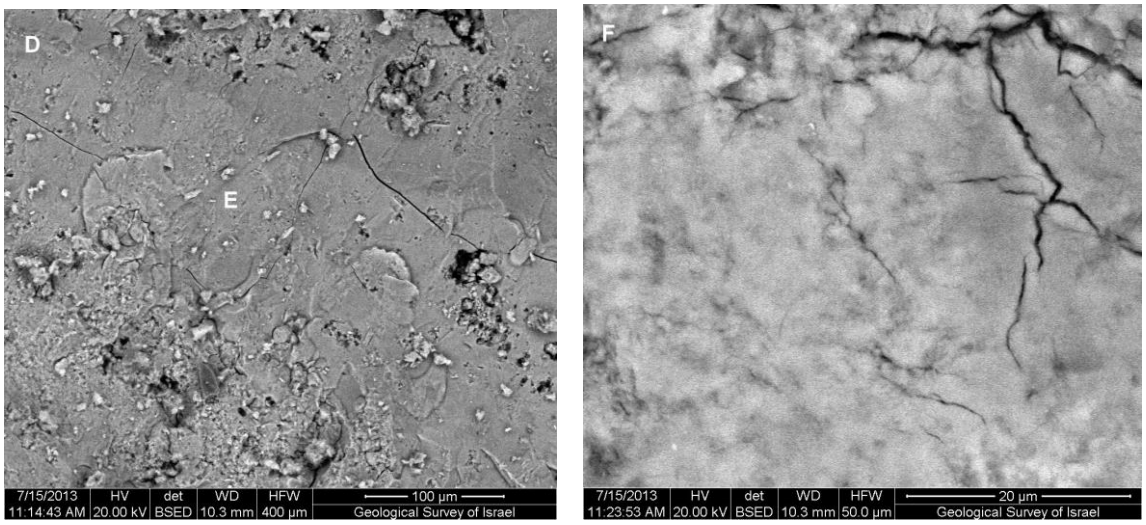

FIGURE 4: Backscatter electrons image of two spots D, E and F in sample 2.

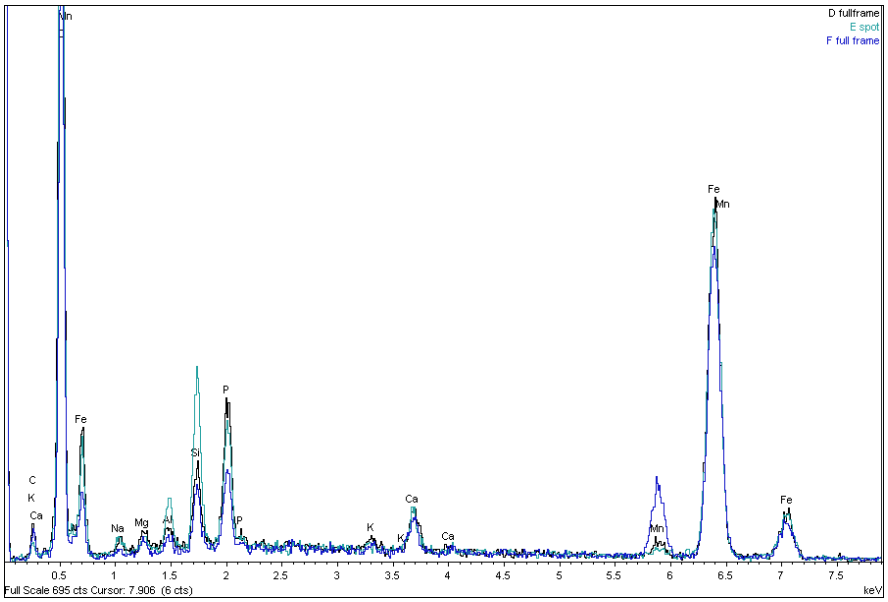

FIGURE 5: Combined spectra of all three spots shown in figure 4.

When comparing samples 1 and 2 the main difference is the Mn, Fe and P concentrations and to a lesser extent that of C. These differences could be attributed to the alteration degree and to the presence of organic matter.

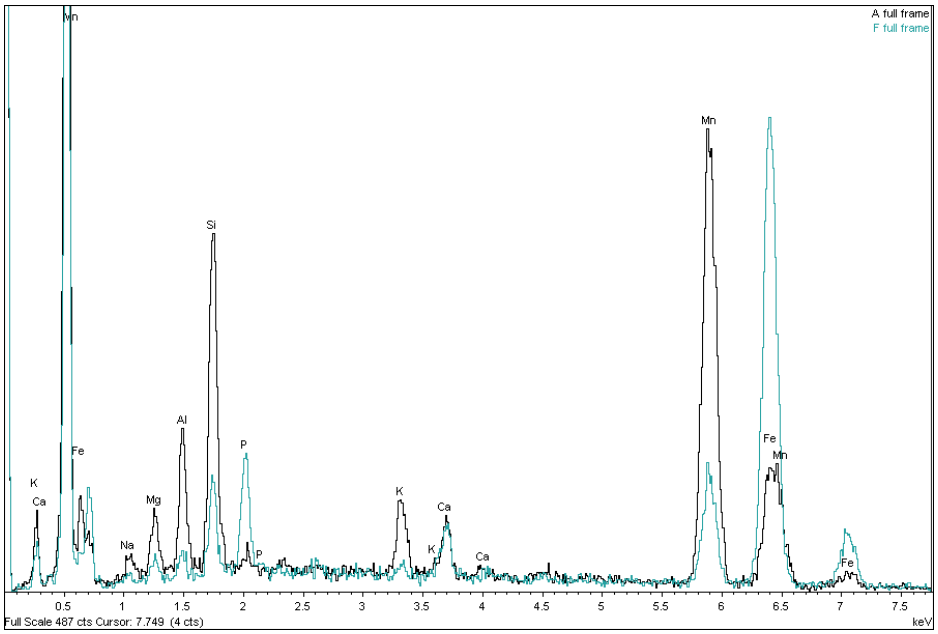

FIGURE 6: Combined full frame spectra of sample 1 and 2. No significant difference is observed.

Sample 3

The third sample taken was also taken directly from the crack of the anomaly and it was examined as well. The chemical composition was examined in three locations and is presented in Figure 7.

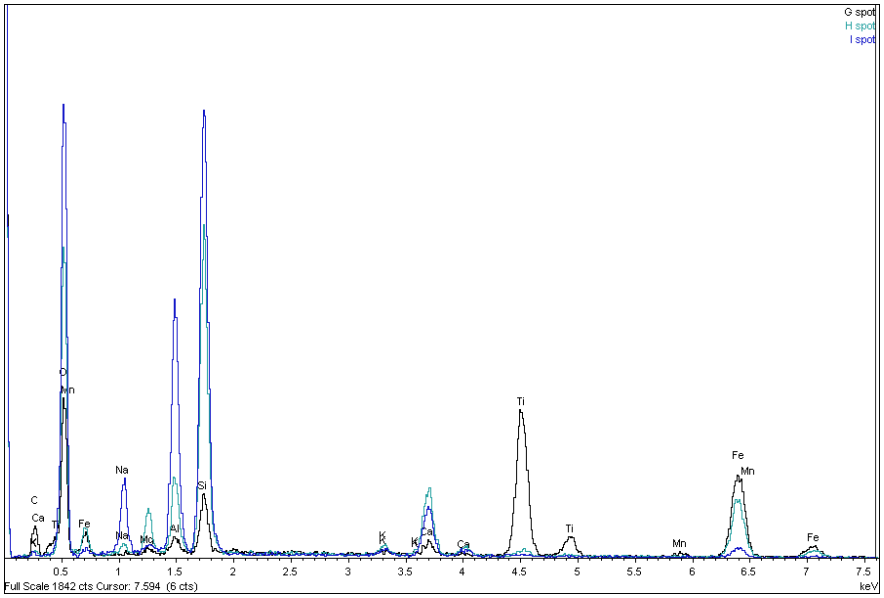

FIGURE 7: Combined spectra of all three spots from sample 3.The major difference is in the Ti concentrations where highest concentration is observed in spot G.

Sample 4

This sample is a stone collected on top of the anomaly. The analysis shows that it's a basalt (Figure 8).

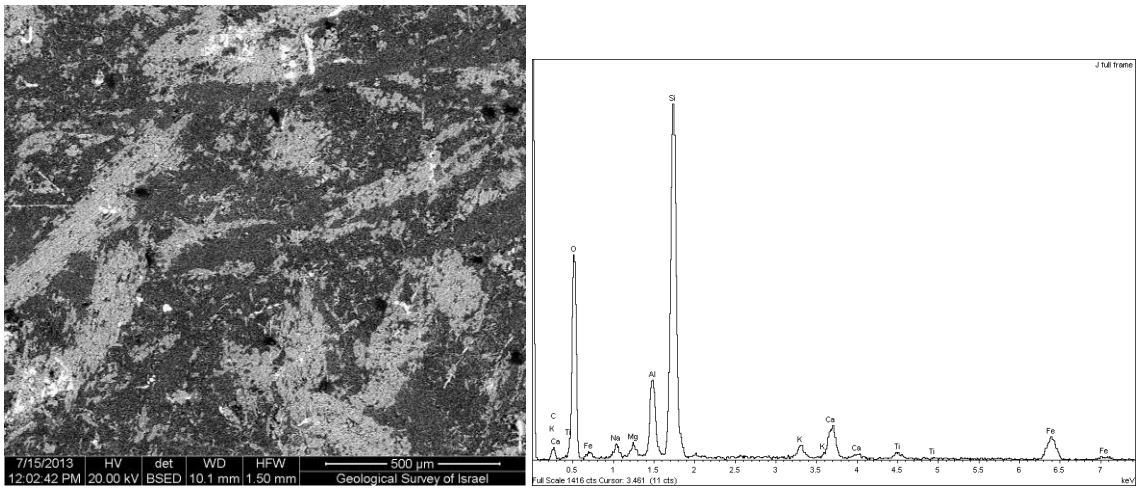

FIGURE 8: Backscatter electron image and full frame spectra. This is a basalt rock.

Sample 5

This sample is sediment collected on top of the anomaly. Observations show that its composition is similar to that of basalt.

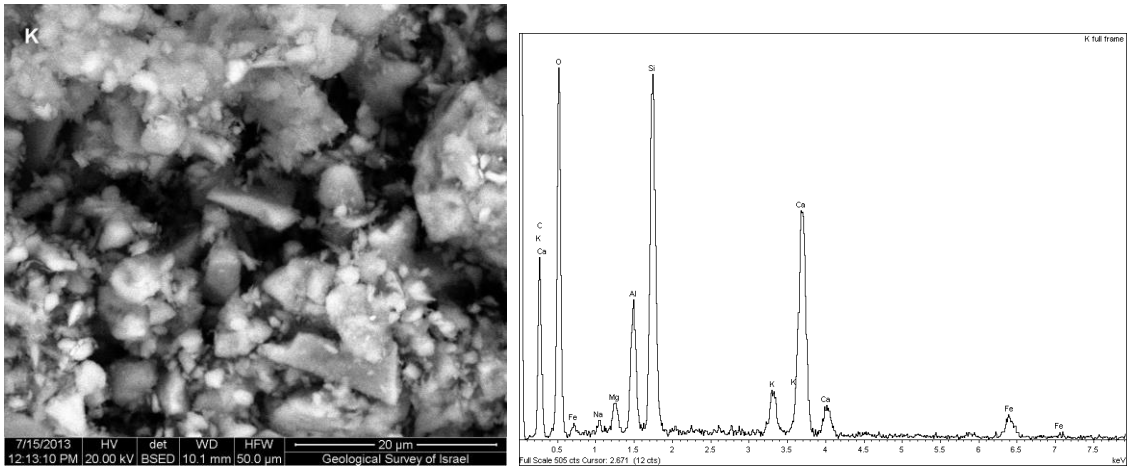

FIGURE 9: Backscatter electron image and full frame spectra of sediment sample. Though some grains are below 20um and seem to be composed of clay minerals.

Comparing the two spectra basalt (K) and sediment (J) spectra indicates (Figure 10) no significant difference except for relative high concentration of Ti in the sediments compare with the basalt sample.

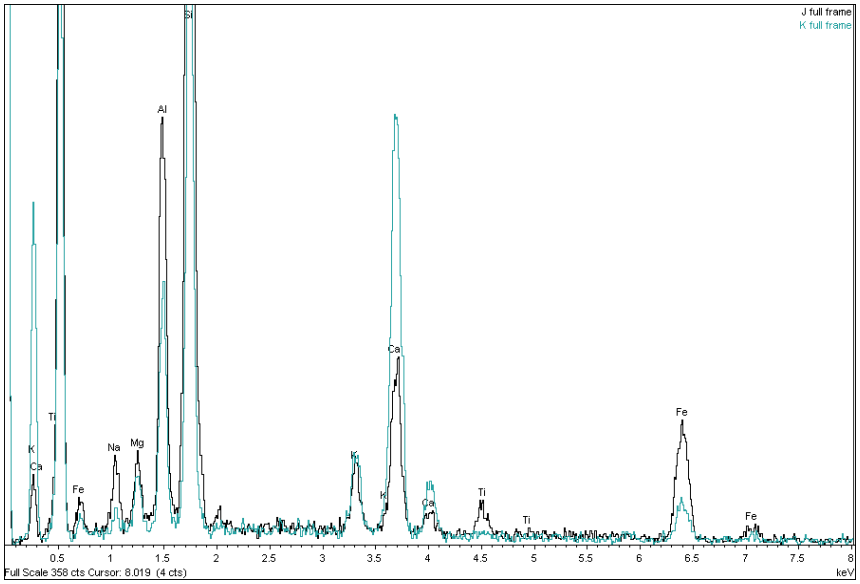

FIGURE 10: Combine full frame spectra of basalt (K) and sediment (J).

SUMMARY AND CONCLUSION

All examined samples are similar in their elemental composition. The only differences observed are the Fe, Mn and C concentrations where the first two can be attributed to later formation of Fe and Mn oxides while the last one is attributed to the presence organic matter.