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Selecting the geology filter wavelengths for the ExoMars Panoramic Camera Instrument

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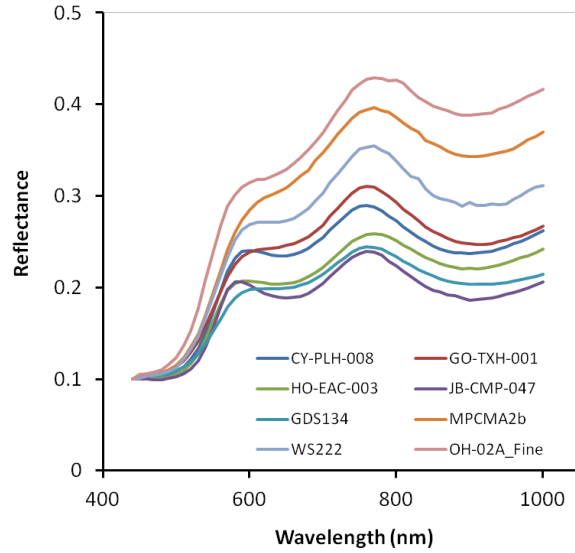
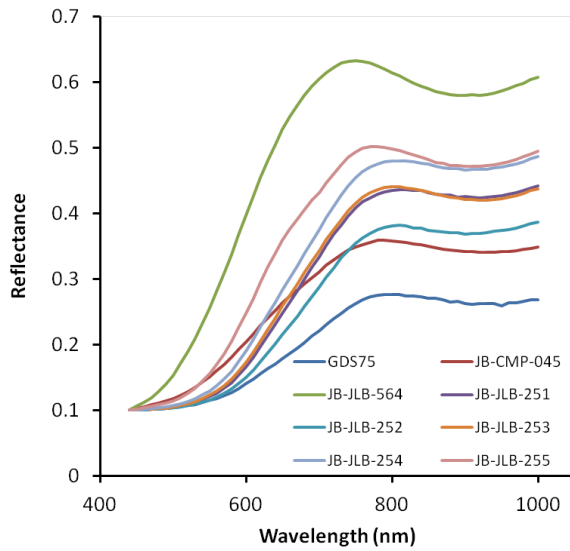
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Supplementary Material 1

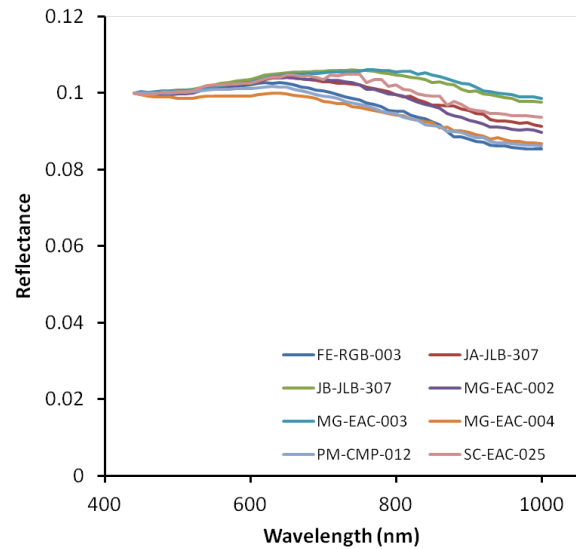
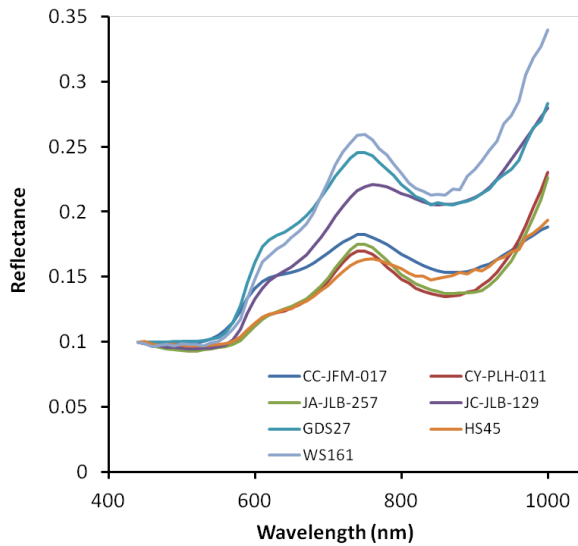
Individual reflectance spectra for the input mineral data acquired from RELAB, JPL, and USGS spectral databases. All spectra have been normalised to 0.1 to show differences in spectral morphology.

1. FERRIC OXIDES

1.1 Ferrihydrite (left) and Goethite (right)

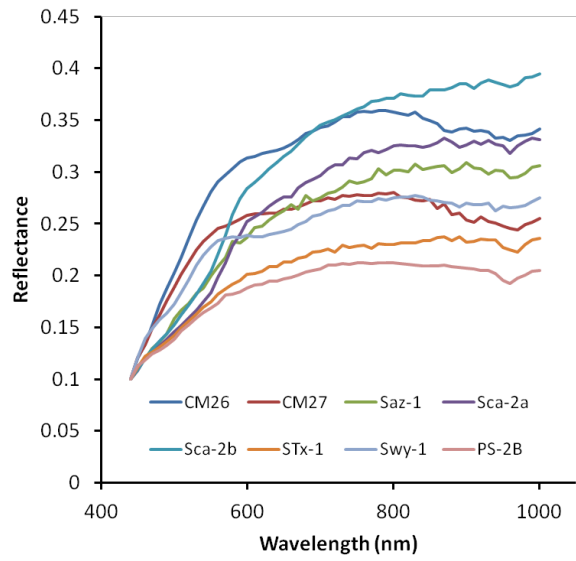
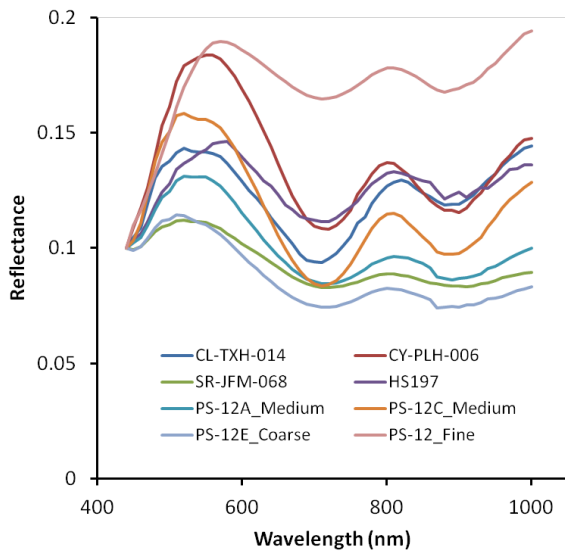


1.2 Hematite (left) and Magnetite (right)

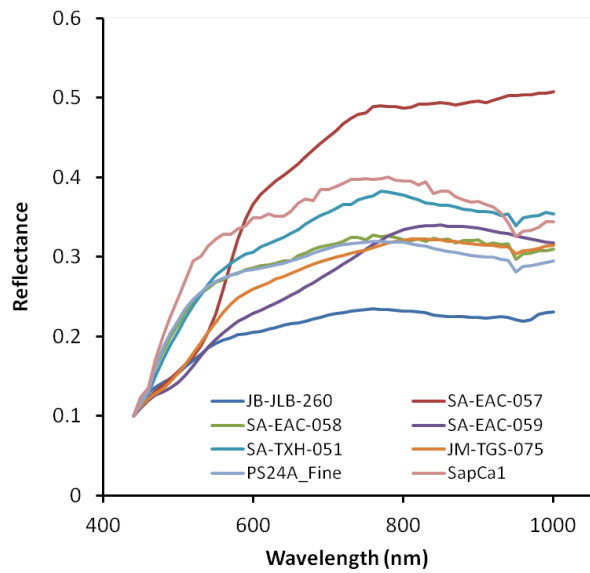
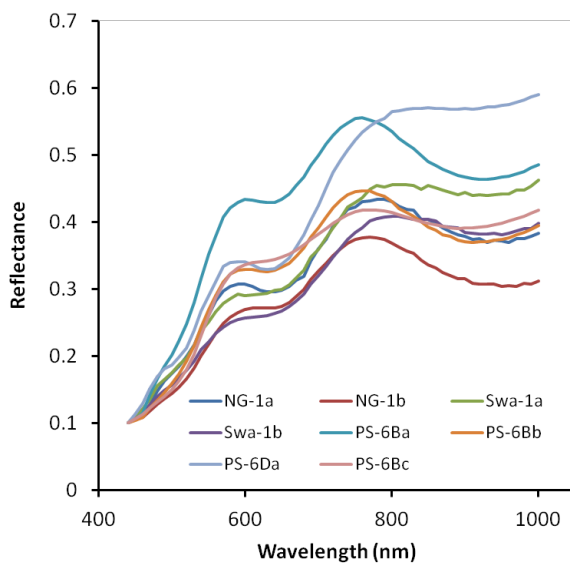


2. PHYLLOSILICATES

2.1 Chlorite (left) and Montmorillonite (right)

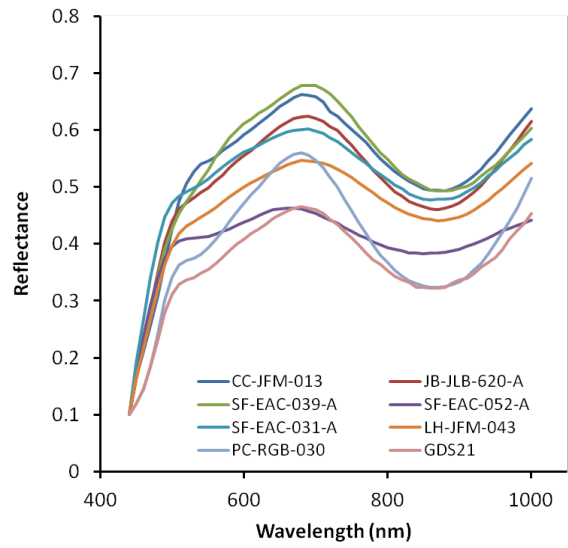
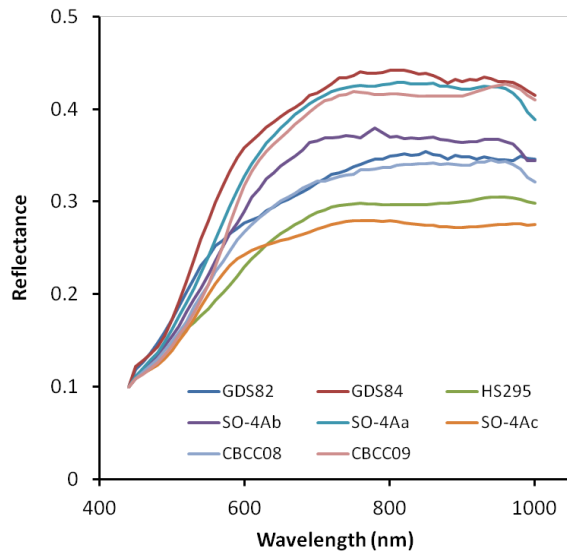


2.2 Nontronite (left) and Saponite (right)

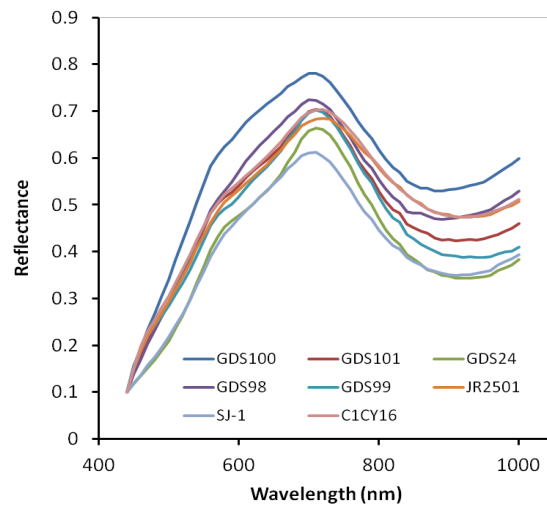


3. SULPHATES

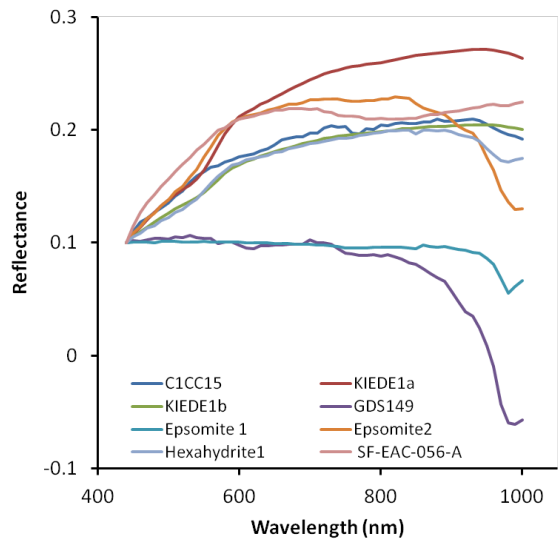
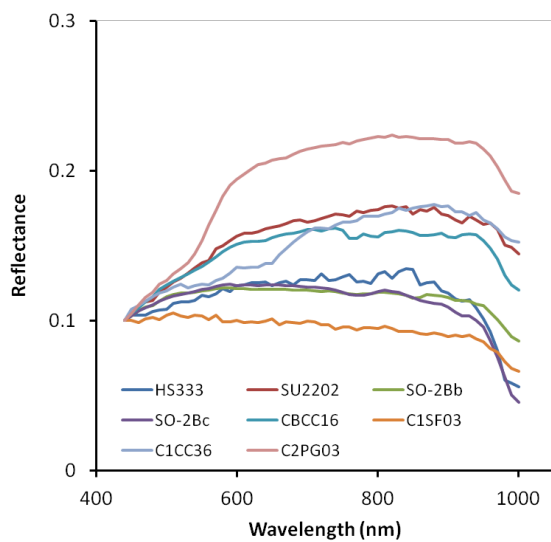
3.1 Alunite (left) and Copiapite (right)



3.2 Jarosite

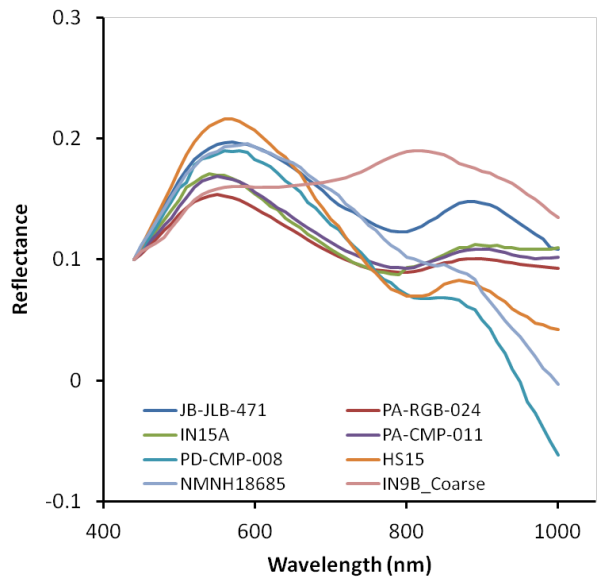
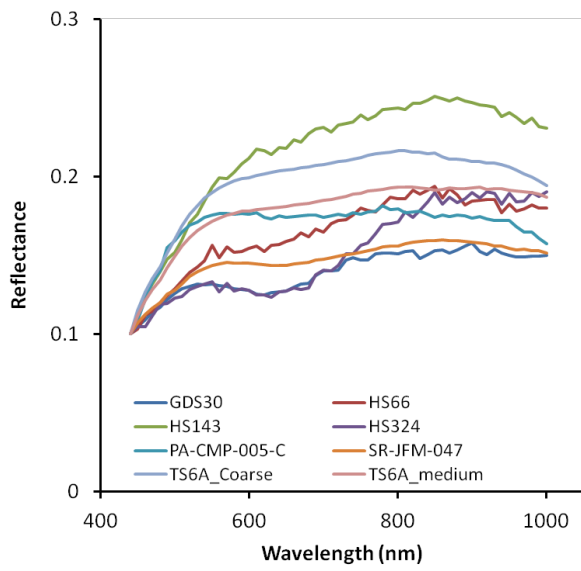


3.3 Gypsum (left) and Magnesium Sulphate (right)

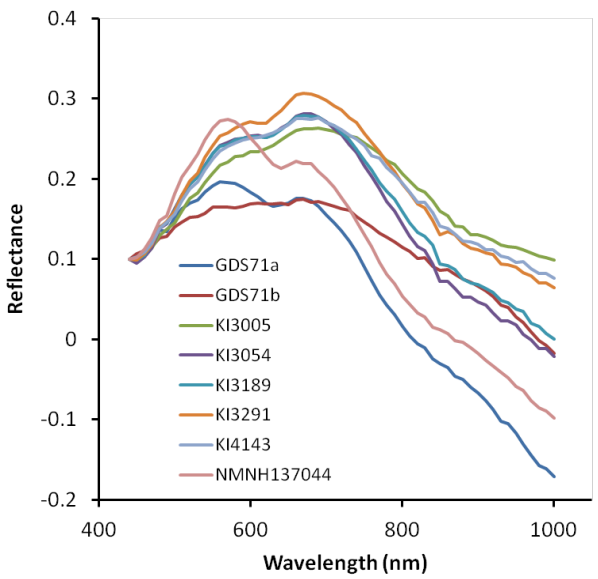
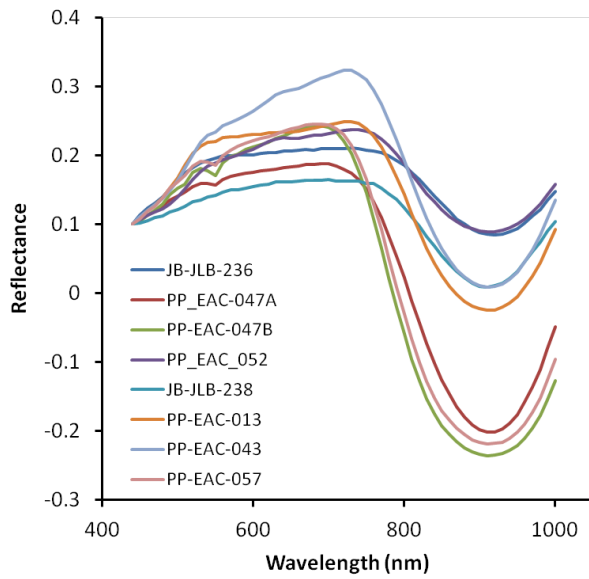


4. MAFIC SILICATES

4.1 Albite (left) and Clinopyroxene (right)



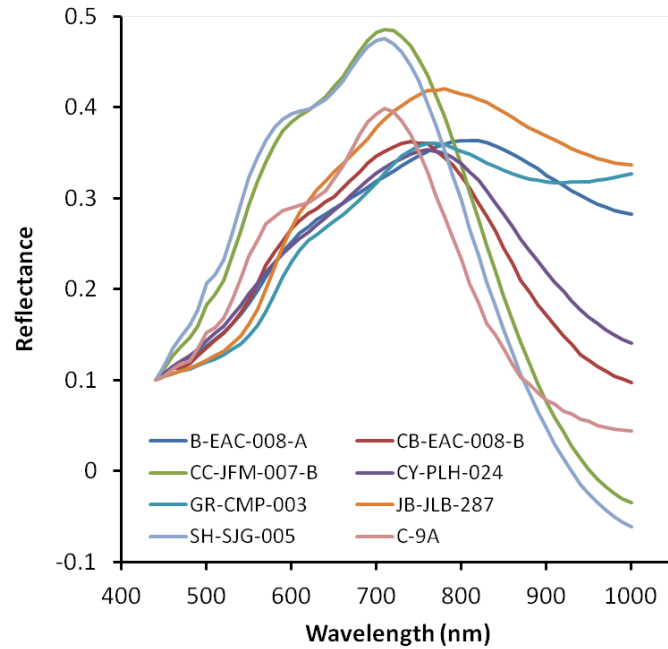
4.2 Orthopyroxene (left) and Olivine (right)



5. CARBONATE

As discussed in Table 2, carbonates were not used in the filter selection process due to a lack of spectral features in the PanCam range. The exception to this is the iron carbonate Siderite. This mineral was used only in the generation of filter set "ALL_Fe" due to its well defined absorption bands in the Vis-NIR.

5.1 Siderite



Supplementary Material 2

K means classification based on the following spectral parameters: 440 - 700nm Slope, 950 - 1000nm Slope, 900nm Band Depth, 950nm Band Depth, and 600nm Band Depth; based on 100 iterations and 3 centroids. Three groups were selected to represent the following: 1- Fe-containing minerals and those with Fe absorptions (black); 2- non-Fe containing hydrated minerals and those with a hydration signature (blue, italic), 3 - all other samples which were neither (grey, underlined). Those minerals and samples marked with an * do not fit the group they have been assigned to by the K means classification for each filter set. Those in bold are consistently grouped together across all filter sets.

Group	PHYL	SULPH	MAFIC	FERRIC	ALLFe	HYDRA
1	SVER2_ROI4 SVER2_ROI5 Chlorite Copiapite Jarosite Olivine Goethite Haematite Siderite	SVER2_ROI4 SVER2_ROI5 <u>SKAFTA_ROI2</u> HYALO_ROI6 Chlorite Copiapite Jarosite Olivine Goethite Haematite Siderite	SVER2_ROI4 SVER2_ROI5 <u>SKAFTA_ROI2</u> NAL_ROI2 HYALO_ROI6 HH <u>KRAF_ROI1</u> Chlorite Nontronite <i>Saponite*</i> Copiapite Jarosite Ferrihydrite Goethite Haematite Siderite	SVER2_ROI4 SVER2_ROI5 <u>SKAFTA_ROI2</u> NAL_ROI2 HYALO_ROI6 HH <u>KRAF_ROI1</u> Chlorite Copiapite Jarosite Ferrihydrite Goethite Haematite Siderite	SVER2_ROI4 SVER2_ROI5 <u>SKAFTA_ROI2</u> NBO NAL_ROI2 HYALO_ROI6 HH Copiapite Jarosite Goethite Haematite Siderite	SVER2_ROI4 SVER2_ROI5 Chlorite Copiapite Jarosite Olivine Goethite Haematite Siderite
2	<u>SKAFTA_ROI2</u> SKAFTA_ROI3* NBO* NAL_ROI2* MAG HYALO_ROI6* KH TRONA HH* <u>KRAF_ROI1</u> KRAF_ROI3* KRAF_ROI4 KRAF_ROI5 Mont. Nontronite* Saponite Alunite Gypsum MgSO4 Ferrihydrite* Magnetite* Calcite Magnesite Opal-a	SKAFTA_ROI3* MAG TRONA HH* <u>KRAF_ROI1</u> KRAF_ROI3* Mont. Nontronite* Saponite Alunite Gypsum MgSO4 Ferrihydrite* Magnetite* Calcite Magnesite Opal-a	SKAFTA_ROI3* SKAFTA_ROI5* NBO* NAL_ROI1* MAG HYALO_ROI1 GY2 KH TRONA KRAF_ROI3* Mont. Nontronite* Saponite Alunite Gypsum MgSO4 Magnetite* Mont. Alunite Gypsum MgSO4 Magnetite* Calcite Magnesite Opal-a	SKAFTA_ROI3* MAG GY2 TRONA KRAF_ROI3* Mont. Nontronite* Saponite Alunite Gypsum MgSO4 Magnetite* Calcite Magnesite Opal-a	SKAFTA_ROI3* SKAFTA_ROI5* MAG HYALO_ROI1 GY2 KH TRONA <u>KRAF_ROI1</u> KRAF_ROI3* KRAF_ROI4 KRAF_ROI5 Chlorite* Mont. Nontronite* Saponite Alunite Gypsum MgSO4 Olivine* Ferrihydrite* Magnetite* Calcite Magnesite Opal-a	SKAFTA_ROI3* MAG GY2 KH TRONA KRAF_ROI3* KRAF_ROI5 Mont. Saponite Alunite Gypsum MgSO4 Magnetite* Calcite Magnesite Opal-a
3	SKAFTA_ROI5 NAL_ROI1 HYALO_ROI1 GY2	SKAFTA_ROI5 NBO_ROI1 NAL_ROI1 NAL_ROI2 HYALO_ROI1 GY2 KH KRAF_ROI4 KRAF_ROI5	Olivine	SKAFTA_ROI5 NBO NAL_ROI1 HYALO_ROI1 KH KRAF_ROI4 KRAF_ROI5 Olivine	NAL_ROI1	<u>SKAFTA_ROI2</u> SKAFTA_ROI5 NBO NAL_ROI1 NAL_ROI2 HYALO_ROI1 HYALO_ROI6 HH <u>KRAF_ROI1</u> KRAF_ROI4 Nontronite Ferrihydrite