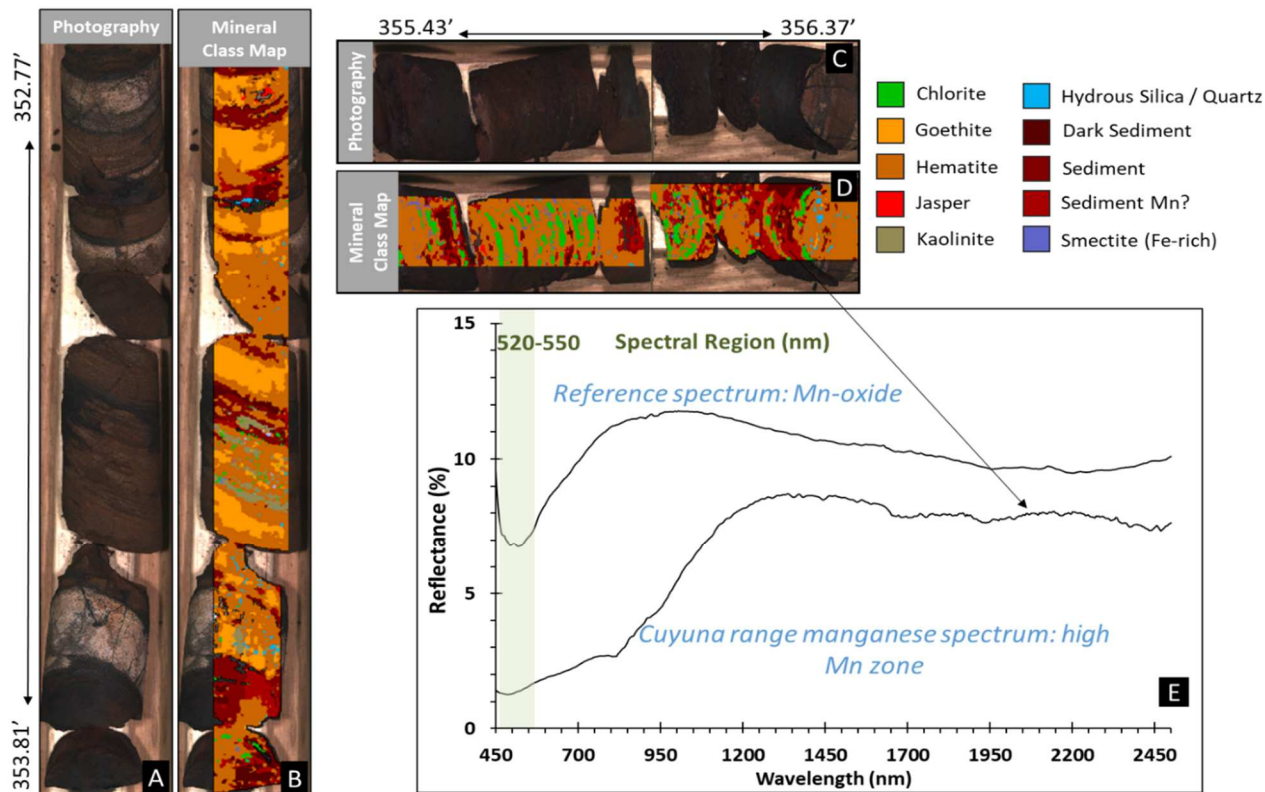


MnDNR Corescan Project

Cuyuna Manganese Core – Example Results



Photography (A,C) and mineral class maps (B,D) of DDH 18961. The section on the left (A,B) contains 4.93% Mn, and the section on the right (C,D) contains 17.85% Mn. The inset spectra (E) shows an example from the high Mn zone ("Sediment Mn") compared with Mn-oxide reference material. Note the low overall reflectance of both spectra, and lack of diagnostic absorptions in the SWIR. A weak feature ~520-550nm may be attributed to elevated Mn content (see Hargrove et al., 2014).

Hyperspectral-detected Mineralogy	<p>Archived drill core was sampled from the northern end of the Emily District's manganese iron formation. The core consists of Fe- and Mn-rich sedimentary layers with a range of VIS-SWIR active minerals including white micas (illite, muscovite), clays (kaolinite and several smectite varieties), and chlorite. Interbedded chert and jasper-rich layers are common. Carbonate (predominantly calcite, based on wavelength measurements; and Fe-rich carbonate) occurs locally. Ammoniated white micas are concentrated in the argillite unit at the base of drill hole 18715. See associated Mineral Key for full list of identified mineralogy with the Corescan HCl-3 system.</p>
Results	<p>The drill core included in this study exhibit significant mineralogical variability, even though spectra are dominated by low reflectance Fe- and Mn-rich material. White mica compositions (illite and muscovite) are dominated by high and low Al micas with phengite recognized locally (based on variations in the ~2200nm feature). Montmorillonite is the most common smectite-group mineral although nontronite and other Fe-rich smectites do occur. Manganese ore zones do not clearly exhibit any distinct SWIR features, although further work (with coherent core material) would be useful to link VIS absorptions (~520-550nm) to Mn abundance.</p>

Reference:

Hargrove, C.J., Lanza, N., Bell, J.F.III, Wiens, R.C., Johnson, J.R., Morris, R.V., 2014. Visible and near-infrared spectra of manganese oxides: Detecting high manganese phases in Curiosity Mastcam multispectral images. American Geophysical Union, Fall Meeting 2014.