Image Based Classification of Weathering Profile in Core Samples

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Motivation
Provide an objective and inexpensive means of quantitatively classifying degree of weathering based on color information as a surrogate for mineralogy.
Color Variation with Depth
Soil Profile

Jackson-Sherman Weathering Sequence

Early Stage
- Primary Silicates
- Gypsum
- Carbonate

Intermediate
- Quartz
- Mica
- Semctite/Vermiculite/chlorite

Advanced Stage
- Kaolinite
- Gibbsite
- Fe-Oxides

[SiO$_2$] decreases
Extracting Relevant Color Information

Original Image

Black and White Image

Region of Interest Identified

Color Information Extracted
RGB Color Scheme

Pros:
• Widely supported in image file formats
• Most common colorspace
• Easy to conceptualize

Cons:
• Not capable of producing all visible colors
• Represents intensity of colors rather than color value
CIE L*a*b* Color Scheme

Pros:
• Represents full spectrum of colors visible to humans
• Mimics the manner in which humans perceive color

Cons:
• Not as widely supported in image files
• Difficult to conceptualize

Colors can be converted to CIE L*a*b* using Matlab code by Pascal Getreur (UCLA).

CIE: International Commission on Illumination
Well 2
Well 5

Well 5 Color Sequence

Green<------>Red

Max Δ Volumetric Saturation

Blow/inch (hardness)
Well 10
Well 14
Well 15
Conclusion

• Color Information informs us about:
  – Mineralogy
  – Degree of Weathering
  – Potential Sites to Investigate
  – Potential Boundaries

• Future:
  – Correlate red color value with XRD data