Image Enhancement Project: Mt. Vesuvius, Italy

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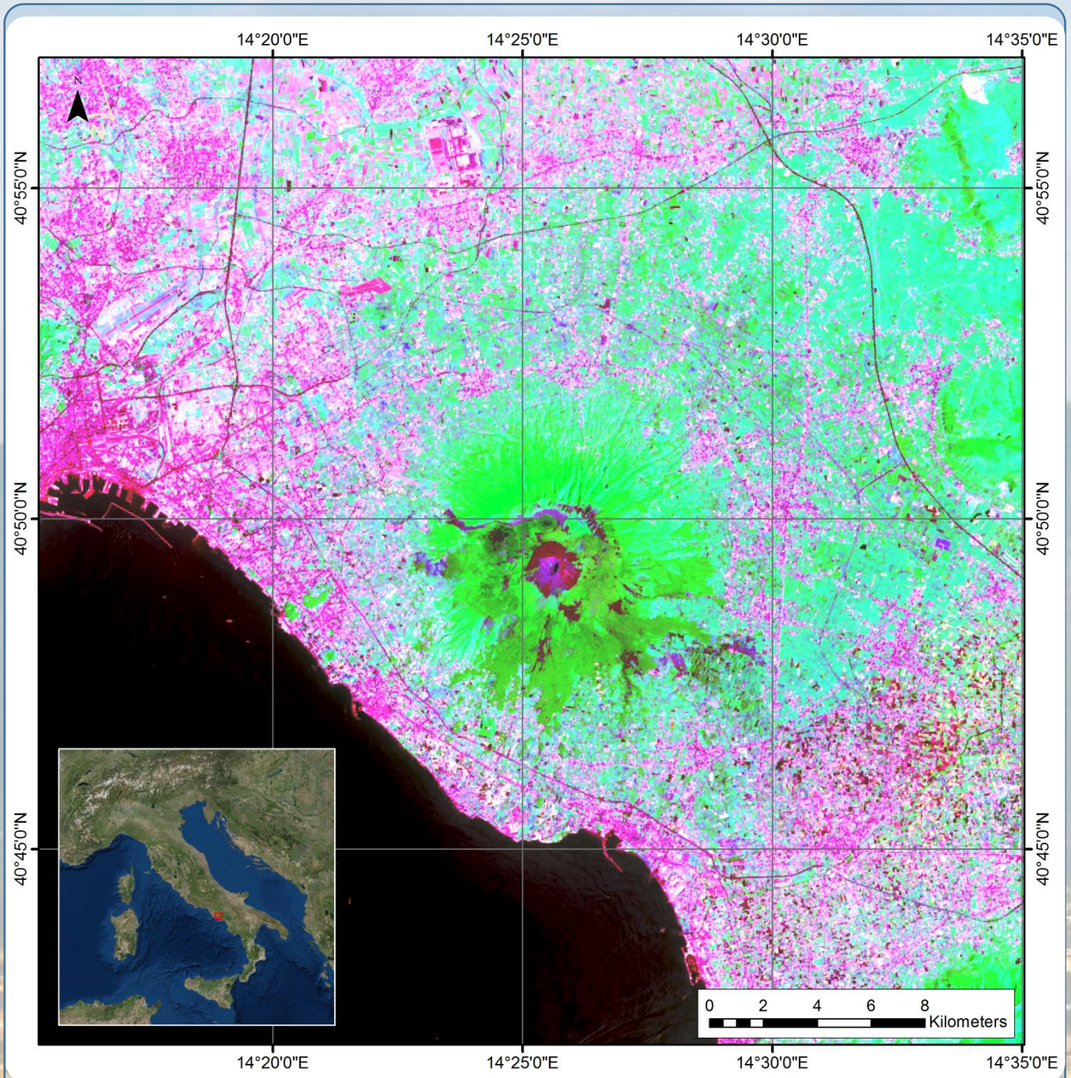

Enhanced Landsat 8 image of Mt. Vesuvius, Italy

Data Sources and Meta Data

The Landsat 8 image was obtained from USGS Earth Explorer
Collection Date: July 29, 2013 by Landsat 8 using Combined Sensor (both OLI and TIRS) with a path of 189 using start row 032.
Inset basemap obtained from ESRI World Imagery Basemap
Background image from Angie Away (http://angieaway.com)
Map Projection: WGS_1984_Web_Mercator_Auxiliary_Sphere

Overview and goals

The purpose of this project was to learn how to obtain and enhance a Landsat image from the United States Geological Survey's Earth Explorer program. The enhanced image produced is presented in this poster.

Description of study area

For my study area I selected Mt. Vesuvius, Italy. Mt Vesuvius is best known for the famous 79 AD eruption when it released an ash cloud 33 km into the air and spewed pulverized pumice at a rate of 1.5 Mt/s. This eruption destroyed the towns of Pompeii and Herculaneum and killed an estimated 16,000 people. This image is an excellent choice for image enhancement as it is contains natural, urban, and water features.

Discussion of processing performed

The image used for this analysis is a Landsat 8 image collected on July 29, 2013 over Mt. Vesuvius, Italy.
After examining the image I selected bands 4,5,6 (red, NIR, NIR) and created a new stacked .img file with just these bands. This band combination looks at the red and NIR range, and is excellent at differentiating the features present in the scene.
I first ran a sharpen filter which improved the edges of features. I tried manual breakpoints but did not like the results. I also attempted using a spectral plot but did not keep the results. The next image enhancement performed was histogram equalization. The effect of this process is to spread out the pixel number values more evenly and allows for higher contrast to be shown in the image. The shadows and highlights were then increased to 12, which again increased the contrast even more in the image. Through these enhancements separation of the natural, urban and water features was improved. Prior to the enhancements the image contained a lot of aqua colors which blended the urban and natural features together.

Discussion of Enhanced Imagery

The final enhanced image is presented in the poster. The enhancements selected made it very easy to differentiate between the major land types in this image, urban, natural and water.

Urban Features:

Urban features are highlighted as a distinct dark pink color and are visible throughout the image. The concentration of urban features along the coast and a buffer around Mt. Vesuvius (particularly on the northern slopes) is very well defined. The urban features have a similar reflectance across the IR bands which produces the pink color.

Natural Features:

The predominant natural features in this image are the vegetated slopes of Mt. Vesuvius. These are highlighted as a bright green color. The crater and the rockiest parts of the volcano are easily identified due to its lack of vegetation (pink on the slopes). The reason for the green color is the assignment of the near-IR bands to green. Vegetation has a strong IR response in the near-IR which decreases in the mid-IR. These key differences between the urban and natural features is what allows them to be differentiated so well in this image.

Water Features:

The water features in this image appear black. This is because only infrared bands are being displayed and water absorbs IR wavelengths.