Analyzing the Surface of Mercury in Three-Dimensions

Mitchell, Elena

The MESSENGER mission has been journeying to Mercury for ten years, but has only been orbiting less than four. It has been able to collect data that is new and exciting for Mercury researchers. There are several different instruments on the spacecraft, and each collects different data. As a MESSENGER Student Planetary Investigator, I focused on the MDIS (Mercury Dual Imaging System), and the MLA (Mercury Laser Altimeter), but I compared my results to data from the XRS (X-ray Fluorescence Spectrometer). The MDIS has taken many images of Mercury at eight wavelengths and the MLA measures its surface elevation in 3D. As the surface of Mercury is relatively unexplored, I wanted to see if features on its surface resulted from volcanism or impact. I accessed the MDIS images and MLA 3D altitude data on the MESSENGER website, and combined three wavelengths into representative color images. I looked specifically at 672.4 nanometer wavelength; the wavelength at which sulfur is detected, indicating volcanism. I took each of the eight narrow band MDIS filters and combined them three at a time into Red Green Blue channels using Adobe Photoshop. The red being the longest wavelength, and blue being the shortest. I enhanced the contrast of each channel and saturated colors to bring out differences in surface composition. Using this method, I was able to isolate the sulfur wavelength and I used Photoshop’s eyedropper tool to find the exact RGB color values of suspected sulfur-rich areas. I used Quick Maps to analyze these areas on Mercury’s surface in 3D to find signs of volcanism. I found that using these methods, volcanism on Mercury can be discovered. Many of the MESSENGER mission researchers' conclusions on volcanism on Mercury were identical to my independent conclusions.

Awards Won:

NASA: Intel ISEF Best of Category Award of $5,000