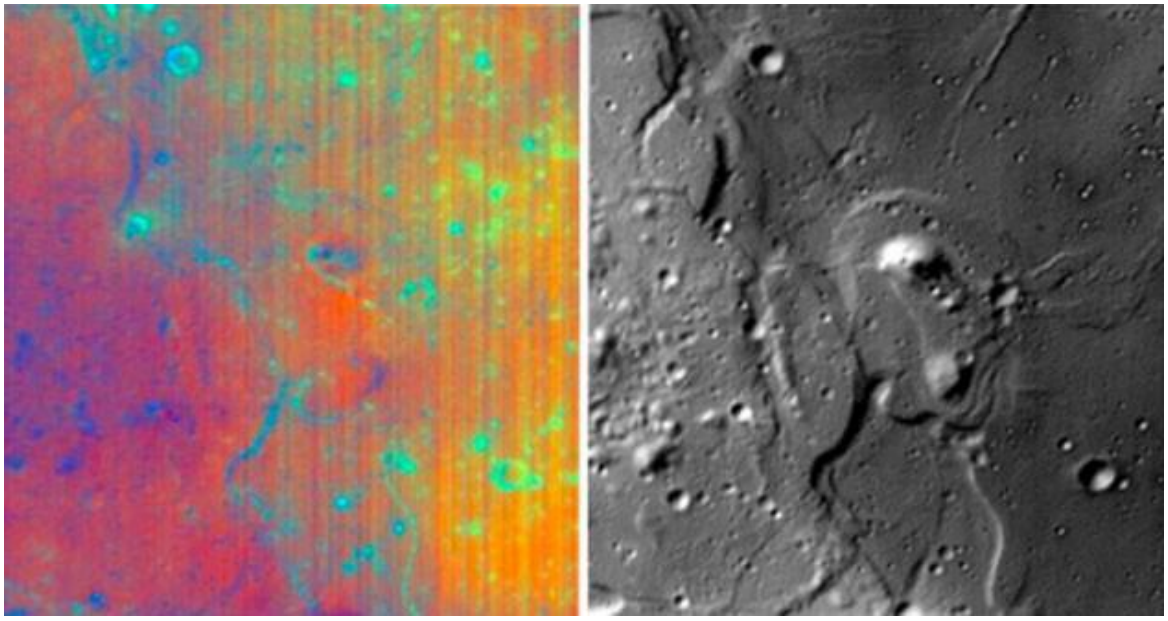

The Moon Mineralogy Mapper on India's Chandrayaan-1 satellite measures slight reflectivity changes within 261 wavelength bands from 430 to 3000 nanometers (0.43 to 3 microns) in the light reflected from the lunar surface. The images cover a small part of the Mare Orientale region, and are each 40 km wide. The left-hand image is a false-color, coded image based on 28 separate wavelengths of light reflected from the lunar surface. Green indicates iron-bearing minerals such as pyroxene (basaltic, lava-like material) commonly found in the mare regions. Blue indicates almost pure anorthosite rock commonly found in the lunar highlands.

Problem 1 - What is the scale of each image in meters/mm? What is the diameter of the smallest discernable crater in the right-hand image?

Problem 2 - What type of feature is pyroxene mostly associated with?

Problem 3 - The narrow, diagonal mountain escarpment that you see in the upper right corner of the right-hand image is not seen in the left-hand image. Why do you think this is the case?

Problem 4 - The visible-band reflectivity of pyroxene is about 25% and anorthosite is about 63%. How much sunlight will 5 square meters of each mineral absorb on the moon's surface if the sun delivers 1300 watts per square meter of energy?

Problem 1 - What is the scale of each image in kilometers/mm? What is the diameter of the smallest discernable crater in the right-hand image? Answer; The width of the images is 76 mm which corresponds to 40 kilometers, so the scale is 40,000 m/75 mm = **530 meters/mm.** The smallest craters are about 1mm across which corresponds to **530 meters.**

Problem 2 - What type of feature is pyroxene mostly associated with? Answer: Pyroxene shows up as green colors in the left-hand mineral map, and the green regions most commonly occur with craters in the right-hand image.

Problem 3 - The narrow, diagonal mountain escarpment that you see in the upper right corner of the right-hand image is not seen in the left-hand image. Why do you think this is the case?

Answer: One answer might be that the material that the escarpment is made from is the same as the surrounding material, so the mineral map on the left would not pick up the difference between the escarpment and the surrounding material.

Problem 4 - The visible-band reflectivity of pyroxene is about 25% and anorthosite is about 63%. How much sunlight will 5 square meters of each mineral absorb on the moon's surface if the sun delivers 1300 watts per square meter of energy?

Answer: The percentage of energy absorbed = 100% - the percentage reflected.

Pyroxene reflects 25% so it absorbs 75%, and so 5 square meters x 1300 watts/square meter x 0.75 = **4,900 watts.**

Anorthosite reflects 63% and absorbs 37% and so 5 square meters x 1300 watts/square meter x 0.37 = **2,400 watts.**