CARTOGRAPHY AND DESIGN OF TRAVERSES FOR FUTURE SCIENTIFIC EXPEDITIONS TO MARE MOSCOVIENSE ROI. A. Calzada-Díaz¹ and S. C. Mest², ¹Department of Geology, University of Oviedo. Spain (abigailcalzada@gmail.com), ²Planetary Science Institute, Tucson, AZ. United States. (mest@psi.edu).

Introduction: 50 Regions of Interest (ROI) have been identified by NASA’s Constellation Program as high-value locations for an eventual return to the Moon [1]. These regions are geographically and geologically distributed to achieve a variety of goals and objectives such as described by LEAG [2].

A geologic and geomorphologic map of Mare Moscovienne (MMos) ROI was created to evaluate its scientific interest. The map was developed using ArcGIS™ v.10.1 software as well as digital images and data provided by NASA’s Clementine and Lunar Reconnaissance Orbiter (LRO) Missions.

The cartography and the input data were analyzed to propose three hypothetical traverses for future expeditions. These traverses have no contraints regarding schedule, distances or topography. Experiments proposed vary from petrologic and geochemical characterization such as samples and drill cores to geophysical experiments using gravimetry, magnetometry and seismic methods.

Regional Geology: The Moscovienne Basin (Figure 1) is a multiringed impact basin located on the northern hemisphere of the far side of the Moon (26.2°N, 150.5°E). The basin has a diameter of 445-Km and it covers an area of ~35,000 Km². It is located within highlands terrain and it was formed 3.85-3.92 Ga [3].

The shape of the basin has been the object of debate. Some authors suggested that the basin was created due to multiple impacts [4, 5] while others explain its shape due to a single oblique impact [6].

The basin was filled with mare basalts, which vary in composition. Previous mapping efforts identified 5 individual units were identified using Clementine and Selene data: Nectarian Highland Unit (Nbo), low Fellow Ti Imbrian mare (Im), a low Ti Imbrian mare (Ilm), high-Ti Erasistothenian mare (Ehtm) and an Imbrian mare associated with Komarov Crater (Ikm) [6,7,8].

Cartography: The cartography of the MMos ROI was built using ArcGIS™ v.10.1 developed by ESRI®. The raster images used were obtained during NASA’s Clementine and Lunar Reconnaissance Orbiter missions, and include:
- Clementine mineral ratio false color mosaic (200 meters/pixel resolution).
- LRO Wide Angle Camera (WAC) mosaic (100 meters/pixel resolution).
- LRO Narrow Angle Camera (NAC) mosaic (50 centimeters/pixel resolution).
- LRO LOLA DEM.

Figure 1 LRO WAC image from Mare Moscovienne basin. Credits: NASA/JPL/MSSS. Red box is the studied area.

Discrimination between materials in the input images was done based in their reflectance and absorption patterns over the UV/VIS spectrum. In the LRO WAC image, differences in maturity are reflected in variations in albedo, therefore, more mature materials that have suffered more impacts and longer exposure at the surface presents a higher albedo that more recent materials. Based on this and in differences in surface texture, a first discrimination among units could be done. Also, topography from LRO LOLA allowed greater accuracy in delimiting the contacts, and the mineral ratio mosaic from Clementine displays element content enabling unit characterization.

During the mapping of the MMos ROI, several thematic maps were created. In these layers several geologic and geomorphologic features were drawn (figure 2), which include:
- MMos_LocationFeatures representing the smaller craters with diameters less than 1 Km.
- MMos_Craters showing craters with diameters greater than 1 km.
- MMos_LinearFeatures. This layer shows rims from craters greater than 1 km in diameter, and wrinkle ridges in the mare.
- MMos_GeoContacts. It shows contacts among different geologic units. The contacts in the layer can be certain, approximated, concealed or inferred.
The experiments proposed include descriptions of the geologic context, photos and samples as well as the tools used to perform traditional geologic fieldwork such as shovels and hammers. There are other geophysical experiments proposed such as an and an absolute and a portable gravimeter, a magnetometer, perforation tools, seismometers and other experiments to measure electrical and thermal properties. The experiments proposed can be accomplished either by human or robotic explorers.

Experiments: The primary goal of traverse development is to address as many scientific goals as possible within 10, 20 and 40-Km-diameter circles centered on the landing site (figure 3). This type of traverse analysis could provide mission planners with a first order evaluation of the scientific “value” of this or similar potential landing site on the Moon.

The lack of returned samples from Mare Moscoeviense does not allow detailed geochemical studies that shed light about the original composition and evolution of Moon’s mantle. Geophysical in situ studies have not been done and there is no doubt about their importance of understanding the structure and depth of the crust beneath the basin. The three traverses proposed in this study were designed to analyze lithologies, impacts and other processes that allow us to elucidate the stratigraphy of the ROI and therefore a part of the basin history.