Studies show evidence of water ice in permanently shaded regions of the moon. The aim of this study was to determine which regions of the lunar surface might have higher concentrations of both molecular water and water ice using imagery and topography data from the Lunar Reconnaissance Orbiter. Extracting water ice and water molecules from the lunar surface will enable scientists to expand lunar research and allow the moon to be used as a gateway for future deep space missions. Water molecules and ice can be extracted and broken down into their components of hydrogen and oxygen and used to refuel launch vehicles for missions into the deep solar system.

Two prominent features of impact craters are central peaks and ejecta blankets. The ratios between central peaks and their respective craters and ejecta blankets and their respective craters can be an indication of hydration on the surface of a celestial body. The region(s) of the moon determined to be most abundant in molecular and ice water was based on crustal strength by analyzing the ratios between central peak diameter to crater diameter and ejecta blanket radius to crater radius.

Four different regions of the moon were selected for analysis based on geologic formation and geographical features: the lunar North Pole, lunar South Pole, lunar maria, and lunar highlands. Cross sectional profiles were taken of craters within these regions and each craters diameter, central peak diameter, and ejecta blanket radius was measured. Results showed the lunar maria region had the highest average ratio between crater diameter and central peak diameter, 0.232, and crater radius and ejecta blanket radius, 1.998. There was a statistically significant difference in the crater radius to ejecta blanket radius between the lunar maria region to the three other regions. North Pole to maria had a p-value of 0.0003, South Pole to maria a p-value of 0.0035, and highlands to maria a p-value of 0.0009.

These ratios were then compared to the ejecta mobility ratios of other planetary bodies with known ice contents, Mars and Ceres, to draw further conclusions as to how likely it is that the regions analyzed have significant concentrations of ice and molecular water. This comparison further showed that the lunar maria region could have a significant ice content.