

Analysis of the High Latitude Region of the Moon with Spectral Profiler Data: Possible Presence of Water Ice

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Recently, space agencies such as NASA and JAXA are actively planning to explore the polar region of the Moon since its usability as lunar base and possible existence of volatile elements([1],[2]). Landing site selection should be taken into consideration of the sunshine rate, existence of volatile materials in the vicinity [3], and so on. Therefore, geological and geomorphological studies in the polar region of the Moon have become more important. In this paper, we focused on detecting of water ice in the polar region using Spectral Profiler(SP) data obtained by KAGUYA. Li et al.,(2018)[4] reported exposed water in the permanently shaded area by M³ data. It is possible to detect more distinct feature of water absorption by the SP data with high S/N ratio. Data analysis by the SP data in the polar region is still difficult due to the large solar incidence angle, however, we reported that the data could be handled with high-accuracy by estimation of insolation area for each spectrum using deep learning method [5]. Based on the SP data in the fully shaded area classified by the method above, we investigated the spectrum having absorption at 1260 nm and 1500 nm both of which are featured by ice and frost of water. As a result, we found about 300 spectrum data having distinct water absorption. One of the data with this absorption obtained in the middle of April, 2009 was located at around (lat. , lon.)=(-85, 50) at where Li et al., (2018) indicated the presence of water ice, but most of the data locations are not overlapped. Moreover, the solar incident angles of all selected data are too high to detect the direct nor the secondary reflected light from the surface of the target area. It is possible that the floating dust at a distance of several tens of kilometers the Moon originated from the impacts or levitation may have been detected[6].

References

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