INVESTIGATION OF HIGHLAND LITHOLOGIES IN FINSEN AND KOVALEVSKAYA CRATERS ON THE FAR SIDE OF THE MOON . A.Karthi[1] and S.Arivazhagan[2]. Centre for Applied Geology, The Gandhigram Rural Institute – Deemed to be University, Gandhigram, Dindigul, Tamilnadu, India, karthiatkj@gmail.com[1] , arivusv@gmail.com[2].

Introduction: The comprehensive study of composition, nature of crystalline structure, geologic setting, and diversity of primary anorthositic crust which were exposed at the lunar surface will reveal the better understanding of evolution history of the lunar crust [1,2]. The primary crust of anorthositic highlands of the Moon formed by the crystallization and flotation of plagioclase in the late stages of lunar magma ocean due to the density difference between plagioclase and the remaining mafic liquids [3,4,5]. The compositional variations in the lunar highlands indicate the two different broad group of rock units i.e., 1). The rocks are mostly anorthosites which termed as ferroan anorthosites that contain strong typical calcic plagioclase, 2). the magnesium rich rock units of noritic, troctolite, and dunite etc., The most of the impact craters and basins were filled by the mare deposits however the remnant of the primary crust materials (anorthositic) were still present at the those regions, which could help us to understand the contrast between mare and highland associated materials. The Moon Mineralogy Mapper (M^3) data was used to study the lunar anorthositic composition and its mixtures such as gabbroic, noritic, and troctolite anorthosites etc., to reveal the crustal diversity of highlands rocks [6,7]. In the present study, distribution of lunar anorthosites and their associated mixtures were studied in the mare emplaced Finsen and kovalevskaya craters on the far side of the moon.

Study Area: Kovalevskaya crater is a complex impact crater located (31^0N, 230^0E, 113 km in diameter) on the lunar farside highlands with a central peak. The crater is located~85 km northwest of the Cordillera mountains within the Orientale basin [8]. The floor of inner crater is filled with smooth plain materials and ejecta materials are superimposed nearby older craters. Finsen impact crater (42°S 178°W, D - 73km) is a central peak crater (3.5 Ga age) on the far side of the moon which is directly north to Alder crater [9].

Datasets and methods: The Chandrayaan – 1 – M^3 global mode photometrically calibrated reflectance data which was truncated from 540-2500 nm to avoid stretching noises due to thermal emission [10] used to study the compositional variations. The reflectance experiment laboratory (RELAB) and [12] rocks and minerals spectral database have been used to validate the compositional spectra obtained from Ch-1 - M^3. In the present study, the [11] spectral parameter is used to specifically highlight plagioclase prominent zones in the finsen and kovalevskya craters.

The 1.25 μm integrated band (IBD) depth has been adopted to map the prominent plagioclse regions. By removing a continuum between 1.03 and 1.55 μm to calculating the band depth over 27 spectral bands across the broad 1.25 μm absorption.

$$\sum_{n=0}^{26} 1 - R(1029 + 20n)/Rc(1029 + 20nm)$$

R is the reflectance value at the given wavelength, and Rc is the continuum reflectance at the same given wavelength.

The end points of the continuum and spectral bands in the 1.25IBD calculations were chosen in a portion of the spectrum that would maximize contribution of the crystalline plagioclase band whereas limiting the contribution from pyroxene and olivine bands [11].

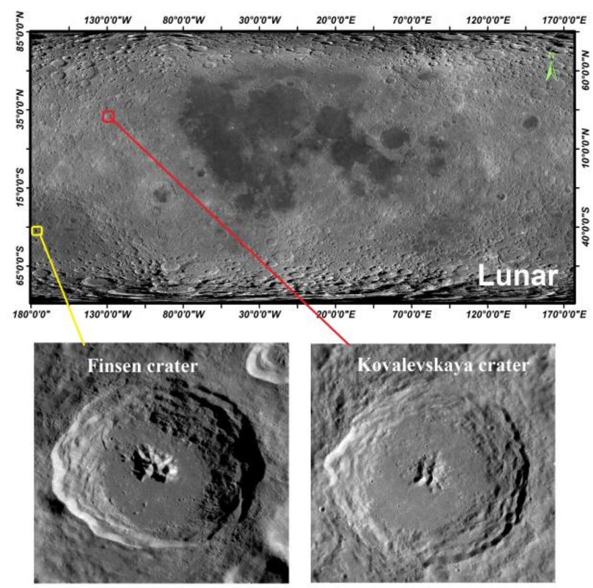

Fig.1. The location map of far side Finsen and Kovalevskaya craters.

Results and Discussion: By using IBD technique in each target area, Fe^{2+} bearing crystalline plagioclase (anorthosite) is identified along with mixtures of anorthsitic rocks have distinctly been observed through spectral invetigation. The crystalline anorthosite (5) shows the broad dominant plagioclase absorption near 1250 nm. The crystalline plagioclase feldspar which contains more than 0.1% FeO exhibits a broad electronic transition absorption centered near 1250 nm – 1300, therefore the absorption band, band depth and center position of the diagnostic 1.25 μm band will vary with Fe abundance [7, 13]. The identification of Fe-bearing crystalline plagioclase in the NIR is based on a broad absorption band at approximately 1.25 μm due to minor to intermediate amounts of Fe being incorporated into the crystal structure [13]. The gabbroic anorthosite (2) is showing the asymmetrical and broad clino pyroxene absorptions in 970nm and 2177nm along with dominant strong broad plagioclase absorption near 1289 nm. The troctolite anorthosite (1) is showing the prominent asymmetrical olivine absorption at 1050 nm, broad plagioclase absorption near 1250 nm along with moderate Ti^{3+} absorption at 1489 nm. The anorthosite norite (3) and noritic anorthosite (4) are showing the asymmetrical Ortho pyroxene absorptions near 910 - 930 nm and 1950 nm, the predominant broad plagioclase absorption near 1289 nm. The plagioclase-dominated rocks (Fe^{2+} bearing) specifically anorthosites and their mixtures of the highland lithologies are unambiguously identified and distinguished along with minor trace amounts of mafic minerals [7,12,13].

Conclusion: Finsen and Kovalevskaya craters are still having primary originative highlands material where the regions of mafic materials dominant existence. It is depicted that these observations which may substantiate the crustal formation complexities during lunar magma ocean scenario to allow for multiple generations of anorthositic formation in the lunar surface [14]. In future, the finsen and kovalevskaya craters can be taken as targeted sites for the mafic associated anorthositic regions to the terrestrial akin studies.

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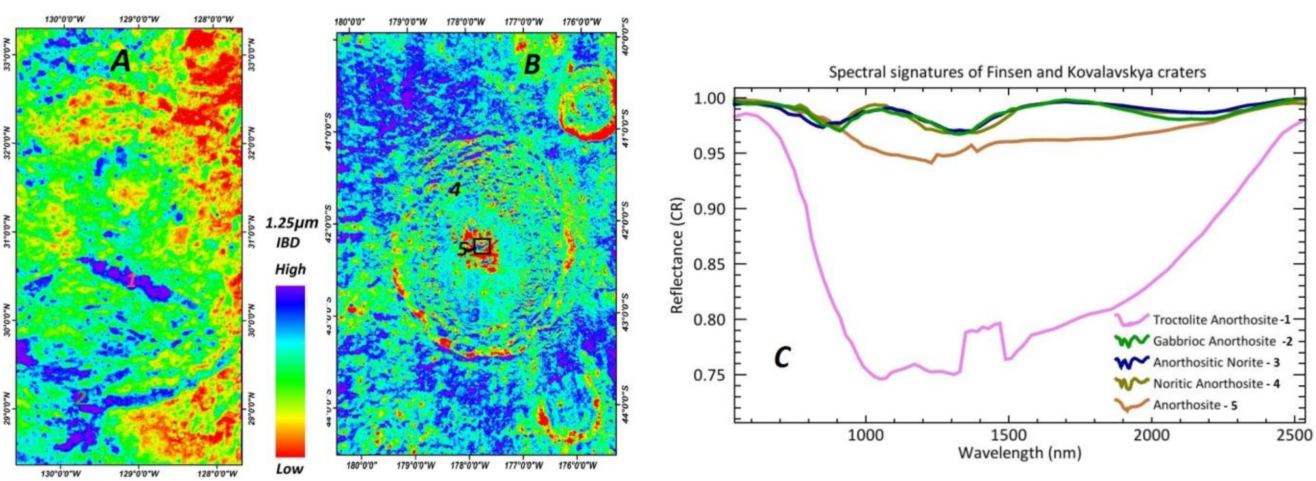

Fig.2. The 1.25 μm integrated band depth map of Finsen (A) and Kovalevskaya craters (B) and the spectral plots of finsen and Kovalevskaya craters (C).