WATER ICE DETECTED AT SECONDARY CRATERS ON PEARY FLOOR USING MINI-SAR & MINI-RF.

OPN Calla[1],Shubhra Mathur[1,2] and Monika Jangid[1,3] ,[1] International Center for Radio Science, Ranoji Ka Baag, Nayapura, Mandore, Jodhpur Rajasthan India [1]opnc06@gmail.com; [2]shubhra.icrs@gmail.com; [3]monika.jangid.icrs@gmail.com

Introduction: Images of the lunar poles obtained from Mini-SAR and Mini-RF, guide researchers to understand water ice detection phenomenon in better manner. In this paper shadowed and non-shadowed region of Peary crater has been studied using Mini-SAR of Chandrayaan-1 and Mini-RF of LRO.

Peary[1] is an irregularly-shaped impact crater centered at 88.5°N, 30°E having areas along its crater floor cast in permanent shadow, but it also has areas along its rim that are illuminated by the Sun.

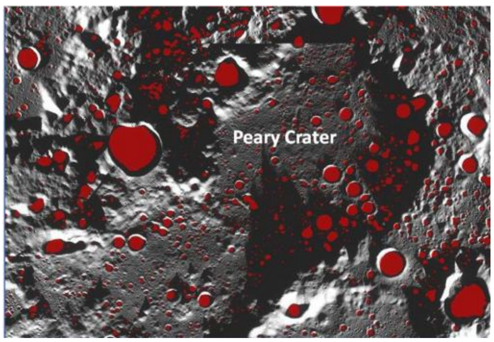

Fig. 1 This image is centered on the north pole of the Moon The red dots represent permanent shadow in Peary crater

Circular polarization ratio: The CPR is the most important derived parameter of Stokes vector, as it provides the indications for wavelength-scale complexity of the surface. The CPR, defined as the ratio between power reflected in the same sense of circular polarization (SC) as that transmitted and the echo in the opposite sense (OC) of circular polarization, is strongly modulated by roughness induced changes in scattering on or beneath a target surface[2]. Rough, rocky surface causes incident radar beams to bounce more than once, leading to more same sence signals and thus providing high CPR; therefore, rougher surfaces show higher mean CPR. Depending on the radar wavelength and the composition of the regolith, it is possible to observe features below the surface.CPR is used in study to find the evidence of subsurface scattering due to dielectric inhomogenity like water-ice. In the figure 1 we can see the peary crater on which the permanent shadowed data is overlaid.

Analysis: The analysis shows the variation in CPR values for inside and outside region of Peary crater. For inside crater permanantly shadowed secondary crater and for outside region non-shadowed secondary crater have been selected. From the graph shown in fig 2 and 3, CPR values are found to be high inside the crater but outside crater shows low CPR values. These higher values can be obtained from very rough surface like rock, lava deposits etc or due to scattering from volumetric ice particles.

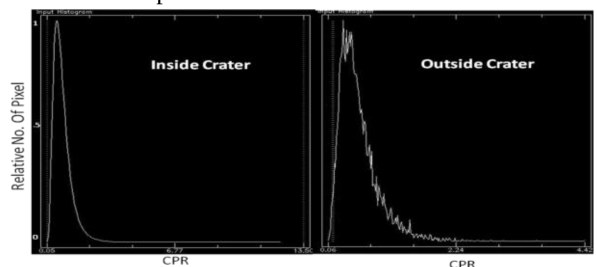

Fig. 2 Distribution of CPR inside and Outside of Peary Crater using Mini-RF Data

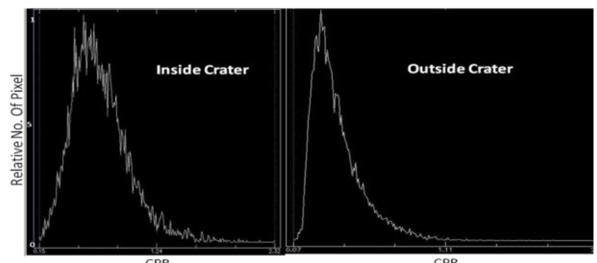

Fig. 3 Distribution of CPR inside and Outside of Peary Crater using Mini-SAR Data

	Mini-SAR		Mini-RF	
	Inside crater	Outside crater	Inside crater	Outside crater
CPR	.15-2.35	.07-1.6	.05-1.5	.06-2.27
DoP(m)	.3671	.6395	.4007	.4746
Delta	68.24°	73.97°	34.26°	60.160°

Table. 1 CPR,DoP & Delta (Relative phase LH-LV) range for inside and Outside of Peary Crater using Mini-SAR and Mini-RF data

Conclusion: From the table 1 high values of DoP and delta with high CPR range indicates the surface roughness on outside crater floor. While contrary results are obtained for inside region. It can observed that inside region of crater shows large variation in CPR range for Mini-SAR when compared with Mini-RF data. High CPR values together with low values of degree of Polarization (m) and relative phase of LH-LV (δ) signify presence of water ice in the secondary craters of Peary.

References:[1]http://www.nasa.gov/mission_pages/LRO/multimedia/lroimages/lroc-20091224pearycrater.html [2]BruceA. Campbell" High circular polarization ratios in radar scattering from geologic targets" JGR, VOL. 117, E06008, doi:10.1029/2012JE004061, 2012