Mini-RF Observations of Lunar Polar Craters and Implications for Ice Distribution

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The possibility that water ice could be present in lunar polar craters has long been postulated. More recently, measurements from instruments on a number of spacecraft have all pointed to the presence of water at the lunar poles; although whether that water exists as surficial frost or as extensive, competent ice deposits remains strongly debated. Water ice can exhibit a strong response at radar wavelengths in the form of a Coherent Backscatter Opposition Effect (CBOE) and the circular polarization ratio (CPR) of the returned data can be a useful indicator of such a response—i.e., measured CPRs for icy materials typically exceed unity. Mini-RF is currently operating as part of the Lunar Reconnaissance Orbiter (LRO) Cornerstone Extended Mission to address driving questions related to the form/abundance of water on the Moon and its vertical distribution. Using a combination of monostatic and bistatic observations of the lunar poles, we investigate the radar response of lunar polar craters. Continued analysis of monostatic radar data suggest little evidence for extensive ice signatures; however, initial analyses of bistatic data suggest that an ice signature may be observed within the crater Cabeus. These seemingly contradictory results could be related to the nature of the depth or distribution of ice. We will explore these possibilities, and the implications for lunar ISRU.