Solar wind proton reflection at Reiner Gamma Anomaly observed by SELENE

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We study interaction between the solar wind and lunar crustal fields observed by SELENE (Kaguya), focusing on Reiner Gamma Anomaly (RGA) region on the near side. Recent studies revealed that lunar crustal fields are strong enough to reflect/deflect incident solar wind protons, and that proton reflection ratio can be as high as 50 percent. However, these observations focused on strong and wide crustal fields on the lunar farside, and no direct measurement of proton reflection on the near side has been reported. Here we report observations of solar wind proton reflection around the RGA-SW (southwest) region whose crustal magnetic field can be well approximated by a dipole moment. We concentrate on one-day observation when the solar zenith angle (SZA) of the RGA region is lower than 20 degrees and the height of the spacecraft above RGA is 47 km. We find that solar wind protons are reflected above the RGA-SW, and that the proton beam at times goes back toward the Sun. The ratio of the reflected proton density to the incident solar wind proton density is about 0.1, and it becomes higher around the modestly upstream region of the strong crustal fields. This reflection ratio is smaller than that of widely magnetized region on the lunar farside reported in previous studies (up to 50 percent). On the other hand, the magnetic field along the spacecraft orbit shows a peak in the downstream region of the crustal field, while no clear magnetic enhancement was observed right above the strongest crustal field of RGA-SW. These results mean that the solar wind proton reflection does take place even at a single-dipole moment but far below the spacecraft orbit, and that the crustal field is deformed toward the downstream region by the solar wind dynamic pressure.