A Concept for Small, Remotely Operated, Coronagraph located at Small Observatory to obtain Frequent Low-cost Remote Observations of the Lunar Exosphere and the Mercurian Tail

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The sodium in the lunar exosphere is a marker species for studying the lunar exosphere because the element possesses two strong resonance transitions from the ground state whose wavelengths fall in the visible spectrum near 590 nm. Emissions at these wavelengths are thus, observable from Earth. Observations have shown that the exosphere responds in a complex way to the external processes (impact vaporization, sputtering, and photon stimulated desorption) that weather the lunar regolith to produce the sodium. Unraveling the sodium production allows us to study the processes that weather the regolith. Obtaining the extensive time sequence of observations required to unravel the sources of sodium using conventional observatories is impractical, and too expensive. Effectively imaging the lunar sodium exosphere close to the Moon requires an off-axis rejection of scattered light that can only be obtained with a coronagraph. A related problem, the observation of the sodium tail of Mercury, can be addressed as well only by coronagraphic observations.
We present here a concept for a small, rugged coronagraph sited at an observatory dedicated to remote robotic observing (the Winer Observatory in Sonoita Arizona) that can obtain the quality and quantity of lunar sodium observations needed to answer these questions. The design uses Commercial Off the Shelf Technology (COTS). If this facility is operational by 2013, the observations will be concurrent with the Lunar Atmosphere and Dust Environment Explorer (LADEE) mission.