

Helium in the Moon's Exosphere Measured by Three Different Spacecraft Show Remarkable Agreement

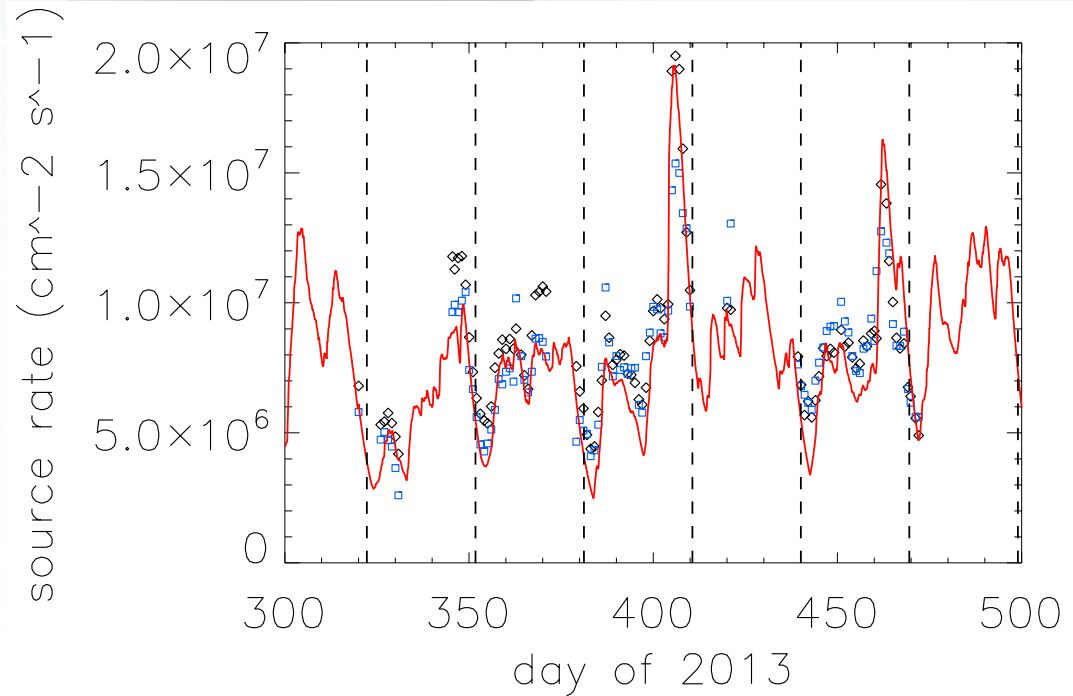
Helium observations from three different missions were made in conjunction with each other for a period of 200 days:

- LADEE Neutral Mass Spectrometer (NMS) detected helium atoms in situ at spacecraft altitude.
- LRO Lyman Alpha Mapping Project (LAMP) detects the column density of helium below the spacecraft.
- ARTEMIS detects the incoming alpha (He^{++}) particle flux through the electrostatic analyzer.

- By modeling the lunar helium exosphere, polar observations from the LAMP instrument could be compared to the LADEE equatorial observations. Then, using the flux from ARTEMIS in the Monte Carlo model reproduces the temporal variations that were observed in helium density.

- By analyzing the results from these three complementary measurements, it was determined that Helium in the Moon's atmosphere is primarily derived directly from helium ions in the solar wind (64%). The remainder is temporally disassociated from the solar wind flux and either comes from outgassing of radiogenic helium from the Moon itself or slow diffusion of implanted solar wind helium in the soil.

- These results give confidence that scientists understand how the lunar atmosphere operates.



LAMP (blue), LADEE (black), and ARTEMIS (red) data displayed as helium source rate as a function of time over the entire LADEE mission agree in magnitude and in variability. These are three very different observation techniques with remarkable agreement.