Precise Xenon Analyses of the Solar Wind: Implications for Indigenous Lunar Xenon

A. MESHIK* AND O. PRAVDIVTSEVA

Physics Department and McDonnell Center for the Space Sciences, Washington Univ. St. Louis, MO 63130, USA (*correspondence: ameshik@physics.wustl.edu)

Genesis NASA mission collected Solar Wind (SW) at L1 point for 853 days. One mm^2 of Genesis SW-targets captured only about 10000 Xe atoms. Therefore the precision of Xe isotopic measurements is limited mainly by counting statistics. Since reporting the first complete SW-Xe isotope data [1] we continue refining the SW measurements to improve the statistics [2, this work]. The right column in Table 1 includes our new results and represents the best current estimate of SW-Xe collected by Genesis mission.

year, ref.	2014 [1]	2015 [2]	(this work)
^{136}Xe	1.819 (6)	1.822 (5)	1.818 (4)
^{134}Xe	2.237 (7)	2.244 (6)	2.242 (5)
^{132}Xe	6.061 (15)	6.068 (11)	6.063 (10)
^{131}Xe	5.004 (14)	5.010 (12)	5.010 (12)
^{129}Xe	6.306 (16)	6.314 (13)	6.314 (13)
^{128}Xe	0.510 (2)	0.511 (2)	0.510 (1)
^{126}Xe	0.0252 (6)	0.0255 (4)	0.0256 (4)
^{124}Xe	0.0298 (4)	0.0297 (4)	0.0292 (3)

Table 1.Solar Wind Xe normalized to ^{130}Xe (1σ errors).

Isotopic composition of SW-Xe implanted into lunar regolith [3] exhibits small deficit in ^{136,134}Xe relative to the contemporary SW-Xe captured by Genesis (this work). This subtle (~2σ) difference could result either from temporal variations in SW-Xe, or from possible cometary addition [4] to the Moon. Similar isotopic effect is observed in some lunar anorthosites [5, 6]. Alternatively the observed difference could be attributed to the implantation of the early Earth's atmosphere into the lunar crust [7].

Supported by NASA grant NNX13AD14G.

[1] Meshik *et al* (2014) *GCA* **127**, 324–347. [2] Meshik *et al* (2015) *LPSC46*, # 2640. [3] Pepin et al. (1995) *GCA*, **59**, 4997–5022. [4] Marty et al. (2017) *Science*, **356**, 1069–1072. [5] Bekaert et al (2017) *GCA* **218**, 114 –131. [6] Pernet-Fisher & Joy (2018) *LPSC49*, #2083. [7] Ozima et al (2005) *Nature* **436**, 655–659.