



## ERRATUM: “SPECTRAL PROPERTIES OF LARGE GRADUAL SOLAR ENERGETIC PARTICLE EVENTS. I. FE, O, AND SEED MATERIAL” (2016, ApJ, 816, 68)

M. I. DESAI<sup>1,2</sup>, G. M. MASON<sup>3</sup>, M. A. DAYEH<sup>1</sup>, R. W. EBERT<sup>1</sup>, D. J. MCCOMAS<sup>1,2</sup>, G. LI<sup>4</sup>, C. M. S. COHEN<sup>5</sup>, R. A. MEWALDT<sup>5</sup>,  
N. A. SCHWADRON<sup>1,6</sup>, AND C. W. SMITH<sup>6</sup>

<sup>1</sup> Southwest Research Institute, 6220 Culebra Road, San Antonio, TX 78238, USA

<sup>2</sup> Department of Physics and Astronomy, University of Texas at San Antonio, San Antonio, TX 78249, USA

<sup>3</sup> Johns Hopkins University/Applied Physics Laboratory, Laurel, MD 20723, USA

<sup>4</sup> CSPAR, University of Alabama in Huntsville, Huntsville, AL 35756, USA

<sup>5</sup> California Institute of Technology, Pasadena, CA 91125, USA

<sup>6</sup> Department of Physics and Space Science Center, University of New Hampshire, Durham, NH 03824, USA

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Due to an error at the publisher, in the published article multiple values were incorrect in Table 1 and in the text. Accordingly, Table 1 has been reproduced below, and the values in the text should be cited as follows.

In the final paragraph of Section 3.2, the final sentence should read, “correlation coefficient  $r \sim 0.103$  for  $N = 36$  has a  $>55\%$  probability of being exceeded by two uncorrelated quantities.”

In the first paragraph of Section 3.5, the third sentence should read, “We used the technique described in Desai et al. (2003, 2006) to subtract the background and contributions to spill-over from the more abundant  $^4\text{He}$  peak to the  $^3\text{He}$  mass range between 2.8 and 3.2 AMU.”

In the first paragraph of Section 3.7, the second sentence should read, “We identify a new set of variables by eliminating those that do not contribute significantly to the overall variability in the data set through a multivariate, principal component analysis (PCA) that uses the Karhunen—Loeve Transform method (see Murtagh & Heck 1987) for 25 SEP events using the following 8 variables: O low-energy and high-energy SEP Band-parameters,  $\Theta$ ,  $\gamma_a$ , and  $\gamma_b$ ; O break energy  $E_B$ ; CME speed  $V_{\text{CME}}$ ; flare longitude; peak proton flux  $P_p$ ; the Fe/O ratios at  $\sim 15$ – $21$  and  $\sim 0.16$ – $0.23$  MeV nucleon $^{-1}$  Fe/O $_{18}$  and Fe/O $_{0.2}$ .”

IOP Publishing sincerely regrets these errors.

**Table 1**

Sampling Intervals, 0.5–2 MeV Nucleon $^{-1}$   $^3\text{He}/^4\text{He}$  and Fe/O Ratios at  $\sim 0.193$  and  $\sim 18$  MeV Nucleon $^{-1}$ ,  $\gamma_a$ ,  $\gamma_b$ , and Break Energies  $E_B$  from the Band Function Fits, and the Low-energy Spectral Index  $\gamma_{\text{Lo}}$ , and Intersection Energy  $E_I$  from Double Power-law Fits to the  $\sim 0.1$ – $100$  MeV Nucleon $^{-1}$  O Spectra

Event No. (1)	Year (2)	Sampling Interval DOY, HHHM in UT (3)	$^3\text{He}/^4\text{He}$ ( $\times 10^{-2}$ ) (4)	Fe/O ratio (@MeV nucleon $^{-1}$ )		Spectral Fit Parameters for Oxygen <sup>a</sup>				
				0.16–0.23 (5)	15–21 (6)	$\gamma_a$ (7)	$\gamma_b$ (8)	$E_B$ (9)	$\gamma_{\text{Lo}}$ (10)	$E_I$ (11)
1 <sup>b</sup>	1998	110, 1253–116, 0054	<0.049	0.151 ± 0.003	0.010 ± 0.001	...	7.46 ± 5.15	6.45 ± 1.29	0.083 ± 0.004	18.327
2 <sup>b</sup>	1998	126, 0908–129, 0000	0.605 ± 0.053	1.068 ± 0.027	0.501 ± 0.043	1.94 ± 0.04	3.11 ± 0.16	14.97 ± 2.51	1.961 ± 0.002	7.068
3	1998	129, 0548–133, 0000	<0.063	0.200 ± 0.018	0.301 ± 0.031	0.91 ± 0.05	2.60 ± 0.05	4.01 ± 0.37	1.001 ± 0.006	2.974
4	1998	310, 0012–316, 0000	0.853 ± 0.049	0.214 ± 0.003	0.112 ± 0.023	0.24 ± 0.15	4.11 ± 0.10	0.31 ± 0.03	1.408 ± 0.073	0.814
5	1999	21, 0117–22, 1439	0.118 ± 0.048	0.178 ± 0.007	0.392 ± 0.076	0.14 ± 0.09	3.28 ± 0.04	0.35 ± 0.03	1.178 ± 0.065	0.776
6	1999	114, 1718–116, 1550	<0.056	0.146 ± 0.007	0.084 ± 0.017	0.92 ± 0.05	3.16 ± 0.06	1.40 ± 0.11	1.182 ± 0.016	1.569
7	1999	152, 2018–155, 0839	3.521 ± 0.186	0.461 ± 0.019	0.384 ± 0.034	1.45 ± 0.03	2.60 ± 0.11	11.04 ± 1.50	1.482 ± 0.002	5.217
8	1999	155, 0838–159, 1920	0.402 ± 0.044	1.042 ± 0.014	0.160 ± 0.015	0.97 ± 0.05	3.58 ± 0.07	1.18 ± 0.09	1.279 ± 0.019	1.550
9	2000	204, 1408–205, 2015	0.615 ± 0.090	0.172 ± 0.007	0.054 ± 0.019	0.99 ± 0.33	2.82 ± 0.07	0.42 ± 0.16	1.840 ± 0.052	0.669
10	2000	256, 1432–260, 1359	<0.034	0.319 ± 0.004	0.115 ± 0.012	1.06 ± 0.02	4.96 ± 0.14	2.16 ± 0.08	1.228 ± 0.011	3.602
11	2000	290, 0923–294, 1739	0.730 ± 0.102	0.641 ± 0.038	0.526 ± 0.047	0.77 ± 0.06	2.79 ± 0.10	2.85 ± 0.38	0.900 ± 0.008	2.588
12	2000	299, 1347–302, 0229	0.692 ± 0.074	0.326 ± 0.006	0.199 ± 0.036	3.12 ± 0.11	4.15 ± 1.03	26.05 ± 12.80	3.136 ± 0.001	10.493
13	2001	28, 2213–32, 0445	<0.034	0.350 ± 0.005	0.401 ± 0.040	0.47 ± 0.07	3.79 ± 0.06	0.47 ± 0.03	1.239 ± 0.048	0.955
14 <sup>b</sup>	2001	105, 1432–108, 0400	<0.051	1.447 ± 0.039	0.449 ± 0.034	0.78 ± 0.07	2.66 ± 0.05	1.42 ± 0.20	1.033 ± 0.016	1.392
15 <sup>b</sup>	2001	108, 0318–111, 2150	<0.050	0.239 ± 0.008	0.165 ± 0.013	1.51 ± 0.04	3.54 ± 0.22	6.41 ± 0.85	1.563 ± 0.004	5.335
16 <sup>b</sup>	2001	360, 0548–362, 1800	<0.032	0.937 ± 0.015	0.393 ± 0.029	0.66 ± 0.09	2.72 ± 0.08	1.22 ± 0.22	0.959 ± 0.019	1.327
17	2001	364, 2245–7, 2329	0.140 ± 0.027	0.162 ± 0.003	0.027 ± 0.003	1.54 ± 0.05	5.95 ± 1.67	5.58 ± 0.61	1.607 ± 0.004	9.672
18	2002	10, 1920–14, 0020	<0.036	0.094 ± 0.002	...	1.72 ± 0.02	6.71 ± 0.82	3.49 ± 0.12	1.826 ± 0.007	6.978
19	2002	51, 0648–55, 1200	2.505 ± 0.132	1.539 ± 0.033	0.661 ± 0.081	2.15 ± 0.04	3.20 ± 0.18	12.72 ± 2.18	2.178 ± 0.002	5.463
20	2002	188, 1243–191, 1214	0.346 ± 0.081	0.061 ± 0.002	0.145 ± 0.030	2.75 ± 0.10	...	...	...	0.000
21	2002	226, 0213–228, 1200	1.682 ± 0.094	0.323 ± 0.007	0.123 ± 0.023	1.24 ± 0.06	3.95 ± 0.11	1.15 ± 0.14	1.553 ± 0.020	1.565
22 <sup>b</sup>	2002	235, 2351–240, 2200	1.403 ± 0.056	0.458 ± 0.007	0.217 ± 0.017	1.19 ± 0.03	3.77 ± 0.14	3.27 ± 0.27	1.303 ± 0.007	3.599
23	2003	151, 0523–153, 0205	<0.055	0.266 ± 0.006	0.367 ± 0.062	1.68 ± 0.03	3.60 ± 0.06	1.37 ± 0.13	1.946 ± 0.016	1.378
24	2003	169, 0308–174, 2319	0.061 ± 0.025	0.129 ± 0.002	0.018 ± 0.009	1.20 ± 0.04	5.07 ± 0.34	1.85 ± 0.16	1.399 ± 0.012	3.123
25 <sup>b</sup>	2003	308, 2102–313, 1524	<0.034	1.425 ± 0.019	0.031 ± 0.003	1.01 ± 0.08	3.73 ± 0.17	1.80 ± 0.31	1.213 ± 0.013	2.259
26	2003	336, 1208–340, 0300	0.212 ± 0.037	1.125 ± 0.017	0.027 ± 0.008	0.51 ± 0.04	5.01 ± 0.14	1.12 ± 0.06	0.828 ± 0.020	2.322
27	2004	257, 1200–262, 1200	0.107 ± 0.030	0.165 ± 0.004	0.002 ± 0.001	1.20 ± 0.04	5.19 ± 0.23	1.99 ± 0.13	1.385 ± 0.011	3.425
28	2004	263, 2128–268, 1314	0.208 ± 0.047	0.244 ± 0.005	0.109 ± 0.045	1.74 ± 0.11	3.40 ± 0.04	0.49 ± 0.08	2.469 ± 0.045	0.686
29	2004	306, 0430–309, 1200	7.823 ± 0.502	0.791 ± 0.030	0.451 ± 0.069	2.18 ± 0.05	...	...	...	...
30	2005	167, 2048–170, 0000	0.344 ± 0.107	0.151 ± 0.010	0.365 ± 0.047	2.09 ± 0.02	...	...	...	...
31	2010	226, 1148–230, 0000	<0.196	0.270 ± 0.018	...	2.41 ± 0.05	1.52 ± 0.18	13.17 ± 4.87	...	...

**Table 1**  
(Continued)

Event No. (1)	Year (2)	Sampling Interval DOY, HHMM in UT (3)	${}^3\text{He}/{}^4\text{He} (\times 10^{-2})$ (4)	Fe/O ratio (@MeV nucleon $^{-1}$ )		Spectral Fit Parameters for Oxygen <sup>a</sup>				
				0.16–0.23 (5)	15–21 (6)	$\gamma_a$ (7)	$\gamma_b$ (8)	$E_b$ (9)	$\gamma_{Lo}$ (10)	$E_l$ (11)
32	2010	230, 0848–236, 0000	<0.054	0.140 $\pm$ 0.004	0.053 $\pm$ 0.039	0.91 $\pm$ 0.09	3.39 $\pm$ 0.05	0.26 $\pm$ 0.02	2.231 $\pm$ 0.076	0.636
33	2011	66, 2112–72, 0000	0.211 $\pm$ 0.034	0.243 $\pm$ 0.005	0.012 $\pm$ 0.003	1.21 $\pm$ 0.08	3.89 $\pm$ 0.27	2.13 $\pm$ 0.38	1.382 $\pm$ 0.011	2.562
34	2011	158, 0747–162, 1800	<0.042	0.350 $\pm$ 0.006	0.261 $\pm$ 0.026	2.83 $\pm$ 0.07	...	...	2.826 $\pm$ 0.000	36.940
35	2011	221, 0848–224, 0000	0.539 $\pm$ 0.063	0.423 $\pm$ 0.008	0.551 $\pm$ 0.065	0.70 $\pm$ 0.08	3.37 $\pm$ 0.07	0.58 $\pm$ 0.05	1.325 $\pm$ 0.039	0.949
36	2011	330, 0948–335, 1200	<0.036	0.517 $\pm$ 0.008	0.040 $\pm$ 0.007	0.95 $\pm$ 0.06	3.65 $\pm$ 0.10	1.07 $\pm$ 0.11	1.289 $\pm$ 0.021	1.481
37	2012	73, 1611–77, 1800	0.171 $\pm$ 0.043	0.234 $\pm$ 0.005	0.252 $\pm$ 0.024	1.54 $\pm$ 0.03	3.58 $\pm$ 0.15	4.26 $\pm$ 0.42	1.620 $\pm$ 0.005	3.710
38	2012	138, 0318–143, 1000	0.205 $\pm$ 0.040	0.335 $\pm$ 0.005	0.227 $\pm$ 0.021	1.01 $\pm$ 0.04	3.18 $\pm$ 0.03	0.83 $\pm$ 0.06	1.443 $\pm$ 0.027	1.051
39	2012	147, 2247–151, 1200	0.287 $\pm$ 0.060	0.361 $\pm$ 0.011	0.053 $\pm$ 0.039	0.71 $\pm$ 0.07	4.56 $\pm$ 0.33	1.24 $\pm$ 0.13	1.002 $\pm$ 0.018	2.213
40	2012	205, 0618–210, 0000	<0.061	0.126 $\pm$ 0.006	0.025 $\pm$ 0.003	1.84 $\pm$ 0.07	...	58.71 $\pm$ 30.09	...	...
41	2013	101, 0848–105, 1200	<0.055	0.110 $\pm$ 0.002	0.467 $\pm$ 0.047	2.73 $\pm$ 0.07	...	...	2.731 $\pm$ 0.001	36.610
42	2013	179, 0348–184, 0000	<0.062	0.112 $\pm$ 0.004	0.281 $\pm$ 0.133	1.56 $\pm$ 0.04	3.70 $\pm$ 0.06	0.69 $\pm$ 0.05	2.084 $\pm$ 0.033	0.920
43	2013	229, 1948–232, 2259	<0.073	0.104 $\pm$ 0.003	...	...	3.57 $\pm$ 0.05	0.14 $\pm$ 0.01	2.403 $\pm$ 0.108	0.588
44	2013	362, 1400–365, 0000	0.578 $\pm$ 0.148	0.197 $\pm$ 0.008	0.728 $\pm$ 0.116	2.35 $\pm$ 0.03	...	104.82 $\pm$ 98.69	...	...
45	2014	4, 2100–7, 1200	0.174 $\pm$ 0.054	0.572 $\pm$ 0.014	1.004 $\pm$ 0.103	2.56 $\pm$ 0.02	...	...	...	...
46	2014	50, 0100–54, 0000	0.232 $\pm$ 0.079	0.265 $\pm$ 0.007	0.351 $\pm$ 0.189	1.47 $\pm$ 0.09	4.15 $\pm$ 0.12	0.62 $\pm$ 0.09	2.058 $\pm$ 0.037	0.992

**Notes.**<sup>a</sup> Fit parameters with relative uncertainties >100% indicate poor fits to the data and have been eliminated from this table and the analyses.<sup>b</sup> Accompanied by Ground Level Enhancements (see Mewaldt et al. 2012).