GSA DATA REPOSITORY 2010238

METHODS

All isotopic measurements were performed at the University of Wisconsin Madison. Whole-rock U and Th isotope compositions were measured using a Micromass *IsoProbe* MC-ICP-MS. Sample dissolution, chemical separation, and analytical procedures follow Jicha et al. (2009). External precision, reproducibility, and accuracy of Th and U isotope measurements were evaluated through repeated analyses of spiked rock standards (ATHO, AGV-1, BCR-1) and thorium reference solutions (IRMM-035 and IRMM-036), whose isotopic compositions span the range of the Santa María samples. IRMM-035 yielded $^{232}Th/^{230}Th$ = 87,814 ± 0.98% (n = 17) and IRMM-036 = 326,768 ± 1.32% (n = 14). U and Th concentrations and ($^{238}U/^{232}Th$) and ($^{230}Th/^{232}Th$) activity ratios for the rock standards are given in the table. ($^{230}Th/^{232}Th$) activity ratios are corrected to values corresponding to those at the time of eruption using $^{40}Ar/^{39}Ar$ ages in Table DR1. Strontium isotope compositions were determined on unspiked whole-rock samples using a VG Instruments *Sector 54* thermal ionization mass spectrometer (TIMS) following the procedures of Johnson and Thompson (1991). $^{87}Sr/^{86}Sr$ data for whole-rock samples and NBS 987 standard are provided in Table DR1.

Table DR1. Isotopic data for Santa Maria/Santiaguito lavas and 1902 tephra

Sample #	Material	Age	$^{87}Sr/^{86}Sr$	2SE	$(^{238}U/^{232}Th)$	2 SE	$(^{230}Th/^{232}Th)$	2 SE	$(^{230}Th/^{232}Th)_0$	U (ppm)	Th (ppm)
Cone Lavas											
SM-05-01	wr	75 ka	0.703988	0.000011	1.300	0.008	1.197	0.007	1.095	0.440	1.026
SM-05-02	wr	71 ka	0.703996[a]	0.000020	1.298	0.008	1.186	0.007	1.084	0.434	1.013
SM-05-04	wr	75 ka	0.703997	0.000008	1.297	0.008	1.200	0.007	1.105	0.431	1.009
SM-05-05	wr	71 ka	0.703913	0.000008	1.337	0.008	1.203	0.006	1.079	0.390	0.886
SM-05-06	wr	60 ka	0.703986	0.000013	1.371	0.008	1.208	0.007	1.088	0.395	0.874
SM-05-07	wr	54 ka	0.703910	0.000010	1.347	0.008	1.207	0.007	1.117	0.391	0.879
SM-05-09	wr	46 ka	0.703913	0.000010	1.335	0.008	1.198	0.007	1.126	0.414	0.941
SM-05-13	wr	35 ka	0.703903	0.000011	1.354	0.008	1.208	0.007	1.148	0.383	0.859
SM-05-15	wr	35 ka	0.703920[a]	0.000020	1.353	0.008	1.195	0.007	1.135	0.492	1.104
SM-05-20	wr	35 ka	0.703948	0.000008	1.264	0.008	1.141	0.007	1.098	0.631	1.513
SM-05-22	wr	35 ka	0.703960	0.000010	1.274	0.008	1.126	0.006	1.067	0.644	1.533
SM-07-01	wr	35 ka	0.703793	0.000010	1.216	0.007	1.188	0.007	1.176	0.940	2.347
Santiaguito Dome Lavas											
SM-07-04	wr	1939	0.703859[a]	0.000017	1.258	0.008	1.166	0.007	1.166	0.871	2.101
SM-07-04i	enclave	1939	0.703870[a]	0.000010	1.247	0.007	1.141	0.007	1.141	0.560	1.362
SM-07-06	wr	1972	0.703858	0.000010	1.264	0.008	1.162	0.007	1.162	0.905	2.172
SG-05-02	wr	1972	0.703847	0.000008	1.258	0.008	1.172	0.007	1.172	0.882	2.127
SM-07-03	wr	1975	0.703949	0.000010	1.262	0.008	1.167	0.007	1.167	0.914	2.196
1902 deposit											
SM-07-09B	pumice	1902	0.703851	0.000011	1.277	0.008	1.155	0.007	1.155	1.304	3.098
SM-07-09E	scoria	1902	0.703873	0.000010	1.193	0.007	1.143	0.007	1.143	0.559	1.420
Rock standards											
BCR-1 (n=4)	wr				0.873	0.009	0.880	0.012		1.630	5.667
ATHO (n=3)	wr				0.921	0.004	1.014	0.006		2.156	7.103
AGV-1 (n=2)	wr				0.932	0.001	0.927	0.017		1.839	5.987

$(^{230}Th/^{232}Th)$ & $(^{238}U/^{232}Th)$ uncertainties for samples reported as internal 2 SE. Uncertainites for standards reported as 2SD

$(^{230}Th/^{232}Th)_0$ represent age-corrected ratios

NBS-987 was measured in two separate analytical campaigns and gave $^{87}Sr/^{86}Sr$ ratios of 0.710282 ± 0.000018 (n =14) and 0.710253 ± 0.000016 (n =11), respectively. All data is normalized to NBS- 987 equals $^{87}Sr/^{86}Sr$ = 0.710253.

[a] Denotes samples analyzed during analytical campaign with NBS 987 equals $^{87}Sr/^{86}Sr$ = 0.710253.