Wendt, K.A., Pythoud, M., Moseley, G.E.,. Dublyansky, Y.V, Edwards, R.L., and Spötl, C., 2019, Paleohydrology of southwest Nevada (USA) based on groundwater $^{234}U/^{238}U$ over the past 450 k.y.: GSA Bulletin, https://doi.org/10.1130/B35168.1.

Data Repository

DR1.1: Testing the $\delta^{18}O$ groundwater-source hypothesis

The DH2 $\delta^{234}U_0$ time-series may provide new information on the interpretation of DH and DH2 calcite $\delta^{18}O$, which remains heavily debated (Ingraham et al 1991; Davisson et al., 1999; Winograd et al., 2006; Moseley et al., 2016). Groundwater sources to the AMGFS discharge area are likely a mixture of Spring Mountain and Sheep Range recharge (modern $\delta^{18}O$= -14 ‰) with regional flow from the lower carbonate aquifer (modern $\delta^{18}O$= -16 ‰) and minor inputs from northerly regions (modern $\delta^{18}O$= -17‰) (Winograd and Friedman, 1972; Davisson et al., 1999). Possible northern regions that contribute depleted $\delta^{18}O$ groundwaters to the AMGFS (indicated in Figure 1) include (1) Pahute Mesa recharge that flows south through volcanic complexes, (2) Emigrant Valley recharge that flows south beneath the eastern Yucca Flat and (3) the White River groundwater flow system (Davisson et al., 1999; Winograd and Thordson 1975). Previous studies have proposed that changes in the volume of groundwater contribution from these northerly regions may have contributed to the depletion of DH and DH2 $\delta^{18}O$ during glacial periods (Davisson et al. 1999). Due to the evidence presented in section 2.1, we argue against a significant contribution of groundwater sourced from northerly volcanic terrains during glacial periods. This includes inputs from groundwaters sourced from or flowing through the Yucca Mountain region and the western Yucca Flat. The DH2 $\delta^{234}U$ data cannot exclude past changes to the input of depleted $\delta^{18}O$ groundwaters sourced from the White River flow system and/or eastern Yucca Flats, as both regions contain baseline $\delta^{234}U$ signatures similar to Spring and Sheep Mountain ranges (Paces et al., 2002). Additional groundwater geochemical modeling and analysis are needed in order to differentiate potential changes in inputs over time. This distinction is important, as the isotopic composition of each mixing end-member depends heavily on the altitude, latitude, and past changes to the local climatic conditions at recharge sources (Davisson et al. 1999). Understanding these climatological and geographical parameters of possible recharge sources is critical for the interpretation of past DH2 and DH $\delta^{18}O$ variations.

Table DR1: **Measurement results (this study).** Analytical errors are 2σ. U decay constants: $\lambda_{238} = 1.55125\times10^{-10}$, $\lambda_{230} = 9.1705\times10^{-6}$, and $\lambda_{234} = 2.82206\times10^{-6}$ (Cheng et al., 2013 and references therein). Age corrections were calculated using an average crustal $^{230}Th/^{232}Th$ atomic ratio of 4.4 x $10^{-6} \pm 2.2 \times 10^{-6}$, which represents material at secular equilibrium with the crustal $^{232}Th/^{238}U$ value of 3.8. *$\delta^{234}U = ([^{234}U/^{238}U]_{ACT} - 1) \times 1000$. **B.P. stands for "Before Present" where the "Present" is defined as the year 1950 A.D. *** $\delta^{234}U_0$ are back-calculated to initial values based on respective U-Th corrected age. [1] = Replicate.

Depth (mm from top)	^{238}U (ppb)	^{232}Th (ppt)	^{230}Th / ^{232}Th (atomic x10-6)	$\delta^{234}U$* (measured)	^{230}Th / ^{238}U (activity)	^{230}Th Age (yr) (uncorrected)	^{230}Th Age (yr) (corrected)	^{230}Th Age (yr BP)*** (corrected BP)	$\delta^{234}U_{Initial}$** (corrected)
192.6	424.7±0.5	1979±40	6721.8±136.7	957.2±1.9	1.9002±0.0040	217856 ±1307	217806 ±1307	217738±1307	1770±7
203.6	521.1±0.7	7272±146	2232±45	939.2±2.1	1.8889±0.0051	220263 ±1678	220115 ±1680	220047±1680	1748±9
208.6	407.6±0.5	3180±64	3992±81	921.7±2.2	1.8891±0.0044	226235 ±1571	226151 ±1571	226083±1571	1745±9
230	506.4±0.6	2367±48	6666±136	889.0±2.0	1.8893±0.0043	238447 ±1711	238397 ±1711	238329±1711	1742±9
231.2	484±0.6	2942±59	5115±104	877.1±1.9	1.8859±0.0041	242064 ±1704	241999 ±1704	241931±1704	1736±9
231.6	498.7±0.6	4419±89	3497.6±70.5	878.3± 2.0	1.8797±0.0036	239347 ±1541	239252 ±1541	239184±1541	1725±8
233.4	551±0.6	9039±181	1906.7±38.2	872.3± 2.1	1.8972±0.0029	248412 ±1476	248238 ±1479	248170±1479	1757±9
233.40 [1]	573.9±0.7	8824±177	2038.5±41.1	873.2± 2.0	1.9008±0.0041	249399 ±1829	249236 ±1830	249168±1830	1764±10
237	484.3±0.6	2792±56	5445.3±110.2	863.9± 2.0	1.9037±0.0042	254806 ±1957	254745 ±1956	254677±1956	1773±11
239.6	512.1±0.6	6432±129	2512.4±50.6	842.4± 1.9	1.9139±0.0039	270149 ±2109	270018 ±2109	269950±2109	1805±12
246.2	487±0.6	1758±36	8788.5±180.2	837.6± 2.1	1.9247±0.0042	277989 ±2409	277951 ±2409	277883±2409	1835±13
248.4	418.1±0.5	3099±63	4242.4±86.2	826.7± 2.1	1.9075±0.0046	275960 ±2567	275882 ±2566	275814±2566	1801±14
254.2	443.3±0.5	2300±46	6042.5±122.2	800.9± 1.9	1.9017±0.0039	289058 ±2482	289003 ±2481	288935±2481	1810±13
263.8	436.3±0.5	5357±107	2526.5±50.8	768.7± 2.0	1.8814±0.0035	300111 ±2605	299981 ±2603	299913±2603	1792±14
271.8	390.8±0.4	1104±23	10870±226	742.5± 1.8	1.8631±0.0034	309070 ±2748	309039 ±2747	308971±2747	1776±14
281.8	399.8±0.4	13709±275	888.2±17.8	717.2± 1.8	1.8470±0.0033	320007 ±2984	319645 ±2987	319577±2987	1768±16
287.4	408.3±0.6	7518±361	1644.7±79.0	707.7± 2.9	1.8370±0.0060	321469 ±5290	321272 ±5284	321204±5284	1752±27
291.8	458±0.5	3237±65	4256.6±85.8	695.3± 1.8	1.8245±0.0035	323866 ±3218	323790 ±3217	323722±3217	1734±16
300	153.9±0.1	276±8	16777±512	692.4± 1.8	1.8259±0.0041	327802 ±3779	327781 ±3778	327713±3778	1746±19
325	1083.5±1.7	580±12	55708±1203	668.7± 1.9	1.8100±0.0044	339887 ±4494	339880 ±4494	339812±4494	1745±23
328.4	570.7±0.6	658±13	25613±517	666.1± 1.7	1.7921±0.0023	327348 ±2606	327334 ±2606	327266±2606	1678±13
329.4	569.9±0.7	1754±35	9617.4±193.5	660.0± 2.0	1.7949±0.0032	336407 ±3596	336373 ±3596	336305±3596	1705±18
330.6	561±0.7	2360±47	7057.2±142.4	659.3±2.0	1.8004±0.0040	342057 ±4321	342011 ±4319	341943±4319	1731±22
331.6	645±1.0	12060±242	1606.6±32.5	671.1±1.9	1.8218±0.0052	347921 ±5500	347724 ±5494	347656±5494	1790±28
333	642.1±0.7	997±20	19263±388	659.8±1.8	1.8143±0.0025	354762 ±3406	354745 ±3405	354677±3405	1796±18
333.6	668±0.9	2999±60	6697±136	677.2±1.8	1.8237±0.0049	342437 ±4866	342388 ±4864	342320±4864	1780±25
335.4	643.9±1.0	2649±54	7284±149	672.3±2.2	1.8177±0.0065	342672 ±6480	342627 ±6478	342559±6478	1768±33
337.2	586.9±0.8	3286±66	5376±109	675.5±1.9	1.8254±0.0052	345951 ±5366	345891 ±5364	345823±5364	1793±28
344	573.2±0.8	1122±23	15300±311	663.6±1.9	1.8158±0.0042	351472 ±4778	351450 ±4777	351382±4777	1789±25
347.2	526.4±0.5	641±13	24552±496	651.9±1.7	1.8140±0.0026	365414 ±3752	365400 ±3751	365332±3751	1828±20
354	504.3±0.8	398±9	37892±853	648.8±2.2	1.8144±0.0050	370428 ±6623	370418 ±6623	370350±6623	1845±35
355	502.2±0.7	248±6	60475±1412	644.7±1.7	1.8121±0.0045	373772 ±5975	373765 ±5975	373697±5975	1851±32
356.8	488±0.7	332±7	43637±985	638.3±1.9	1.7997±0.0049	369202 ±6292	369193 ±6291	369125±6291	1809±33
365.8	453.4±0.6	292±7	45708±1037	620.2±1.9	1.7860±0.0039	381296 ±5899	381288 ±5899	381220±5899	1819±31
374.8	483.9±0.6	81.6±3	173203±7173	604.2±1.8	1.7725±0.0042	391522 ±6781	391518 ±6782	391450±6782	1824±35
377.2	502.7±2.5	33.8±0.2	1.750±0.003	598.3±1.5	1.7536±0.0028	376686 ±4346	376690 ±4346	376622±4346	1732±22
385.4	506.8±2.1	64.2±0.3	1.740±0.002	579.8±1.3	1.7414±0.0025	393350 ±4346	393355 ±4346	393287±4346	1759±22
390.4	505.9±0.6	20.2±2.7	715239±94501	578.7±1.8	1.7359±0.0039	387590 ±6349	387587 ±6349	387519±6349	1728±31
400.8	488.9±0.6	3888±78	3546±71	552.3±1.8	1.7104±0.0035	401751 ±6811	401664 ±6807	401596±6807	1716±33
405.4	514.4±2.8	810±4	1.710±0.002	553.3±0.9	1.7123±0.0021	402600 ±3887	402590 ±3887	402522±6808	1723±19
408.4	477.6±0.6	158±4	84839±2265	551.0±1.7	1.7074±0.0037	399744 ±6917	399738 ±6916	399670±6916	1702±34
417	481.3±0.6	631±13	21305±436	531.5±1.7	1.6940±0.0035	421530 ±7878	421513 ±7877	421445±7877	1746±39
420.8	537.9±0.7	731±15	20415±420	519.9±1.6	1.6819±0.0037	428657 ±8693	428640 ±8692	428572±8692	1743±43
422.4	614.3±0.9	492±10	34482±724	514.1±1.9	1.6752±0.0036	430706 ±9227	430694 ±9226	430626±9226	1733±46
423.6	648.3±0.9	2083±42	8556±172	511.4±1.7	1.6673±0.0037	422222 ±8467	422184 ±8465	422116±8465	1683±41
424.6	645.4±0.8	1644±33	10784±216	515.0±1.9	1.6658±0.0025	410446 ±6331	410415 ±6330	410347±6330	1640±30
439	574.5±0.9	240±6	65955±1518	506.8±1.8	1.6736±0.0041	449250 ±11458	449242 ±11457	449174±11457	1801±59
465.2	489.4±2.3	50.7±0.2	1.650±0.003	487.0±1.1	1.6525±0.0031	464329 ±9519	464338 ±9519	464270±9519	1806±49
475	461±0.5	84.5±2.4	147030±4133	471.7± 1.9	1.6355±0.0026	476,009 ±11360	476002 ±11360	475934±11360	1808±58

Table DR2: **δ^{234}U measurements from Moseley et al. (2016) used in this study.** *$\delta^{234}U = ([^{234}U/^{238}U]_{ACT} - 1) \times 1000$. **B.P. stands for "Before Present" where the "Present" is defined as the year 1950 A.D. *** $\delta^{234}U_0$ are back-calculated to initial values based on respective U-Th corrected age. [1] = Replicate. Italics indicate $\delta^{234}U_0$ outlier (see main text).

Depth (mm from top)	^{238}U (ppb)	δ^{234}U* (measured)	^{230}Th Age (yr) (uncorrected)	^{230}Th Age (yr BP)** (corrected)	$\delta^{234}U_0$*** (corrected)
0.00	1906.5±2.0	1,716.9± 2.4	4961±45	4896±45	1741±2
0.90	1718.3±3.6	1,713.2± 2.4	8010±75	7945±75	1752±2
2.30	1502.4±1.6	1,707.5± 2.8	8091±84	8026±84	1747±3
2.60	1417.7±1.5	1,705.1± 2.3	8077±103	8012±103	1744±2
3.20	1427.8±1.4	1,706.3± 2.1	8873±38	8808±38	1750±2
3.80	1047.3±1.2	1,705.4± 2.5	12994±95	12929±95	1769±3
4.00	492.4±0.6	1,675.7± 2.9	26893±147	26833±147	1808±3
5.80	*467.4±0.4*	*1,714.5± 2.4*	*27106±143*	*27041±143*	*1851±3*
7.00	482.1±0.4	1,667.6± 2.2	29572±116	29507±116	1813±2
10.20	494.6±0.5	1,641.7± 2.5	34775±154	34710±154	1811±3
14.80	505.5±0.5	1,612.1± 2.6	43308±191	43243±191	1822±3
18.90	469.5±0.4	1,572.9± 2.2	50327±133	50262±133	1813±3
22.40	469.4±0.4	1,540.8± 2.3	54826±156	54761±156	1799±3
25.90	534.1±0.5	1,513.9± 2.4	59907±167	59842±167	1793±3
29.90	524.3±0.5	1,502.8± 2.2	63132±158	63067±158	1796±3
33.90	447.4±0.5	1,483.9± 2.3	68462±178	68397±178	1800±3
37.20	480.6±0.5	1,454.0± 2.4	73268±200	73203±200	1788±3
40.80	476.1±0.4	1,428.8± 2.3	77249±204	77184±204	1777±3
44.60	467.2±0.5	1,395.5± 2.3	83150±269	83085±269	1765±3
49.80	419.2±0.6	1,365.7± 2.7	88135±344	88070±344	1751±4
53.90	405.4±0.5	1,321.1± 2.4	94476±342	94411±342	1725±4
57.40	384.3±0.4	1,298.0± 2.1	100302±381	100237±381	1723±3
59.90	427.9±0.5	1,292.7± 2.5	100776±308	100716±308	1718±4
61.40	409.3±0.4	1,272.5± 1.9	104164±307	104099±307	1707±3
65.40	425.8±0.4	1,257.9± 2.1	107352±377	107287±377	1703±3
69.40	415.8±0.4	1,236.7± 2.0	111545±356	111480±356	1694±3
77.70	602.4±0.7	1,204.8± 2.2	116137±415	116072±415	1672±4
97.40	1054.4±1.3	1,153.2± 2.3	121464±411	121404±411	1625±4
99.40	511.3±0.4	1,163.2± 1.7	122926±304	122861±304	1646±3
101.40	564.0±0.6	1,123.2± 2.1	128816±421	128751±421	1616±4
102.90	540.4±0.5	1,163.1± 2.0	127356±369	127291±369	1666±3
104.40	530.8±0.5	1,180.7± 2.2	134821±418	134756±418	1727±4
105.90	525.9±0.5	1,170.6± 2.0	138533±476	138468±476	1731±4
107.40	522.0±0.5	1,167.5± 2.1	139804±443	139739±443	1732±4
108.90	500.6±0.5	1,161.6± 2.0	143087±451	143022±451	1739±4
109.90	518.3±0.5	1,150.4± 2.0	145480±547	145415±547	1734±4
114.40	546.0±0.5	1,130.4± 2.0	152704±537	152639±537	1739±4
117.40	524.5±0.5	1,127.8± 2.0	154125±517	154060±517	1742±4
117.40 [1]	545.7±0.5	1,141.0± 2.2	152581±550	152516±550	1755±4
119.40	510.5±0.5	1,128.9± 2.1	157877±675	157812±675	1763±5
124.40	534.2±0.5	1,115.4± 1.9	162665±607	162600±607	1765±4
128.40	485.3±0.5	1,096.3± 1.9	168378±703	168313±703	1763±5
132.40	585.1±0.6	1,078.6± 2.0	172898±679	172833±679	1757±5
137.80	555.6±0.5	1,091.3± 1.9	179009±676	178944±676	1809±5
141.80	442.2±0.4	1,084.0± 1.9	185127±745	185062±745	1828±5
145.80	362.8±0.3	1,062.9± 2.0	190252±853	190187±853	1818±6
150.40	378.9±0.3	1,050.4± 2.1	193949±904	193884±904	1816±6
153.00	363.0±0.4	1,050.0± 2.0	195432±834	195367±834	1823±6
153.00 [1]	383.1±0.3	1,045.9± 2.1	197271±968	197206±968	1825±6
155.40	407.6±0.4	1,024.8± 2.2	198497±937	198437±937	1794±6
158.40	430.3±0.3	1,012.1± 1.9	204366±918	204301±918	1802±6