Supplement S. Result tables

Table S1: Results for fluid inclusion samples analysed different distances from top (dft) including released water volume, water content and measured stable isotope composition $\delta^{18}O$ and $\delta^{2}H$ (in ‰ VSMOW) of each sample at the respective depths. Single measurements marked with (*) are not taken into account for paleo-temperature calculation due to released water volume of <0.2 µl or poor reproducibility (see text for more details).

Sample ID	dft (total) [mm]	dft (Error) [mm]	sample volume [µl]	water content [µl/g]	$\delta^{18}O$ [‰]	$\delta^{18}O$ (Error) [‰]	$\delta^{2}H$ [‰]	$\delta^{2}H$ (Error) [‰]
1_A	9.00	3.00	0.33	0.66	1.95	0.50	34.39	1.50
1_B*	9.00	3.00	0.28	0.67	3.97	0.50	32.32	1.50
5_A*	32.00	2.00	0.11	0.31	8.95	0.50	37.26	1.50
5_B*	32.00	2.00	0.14	0.30	6.25	0.50	41.57	1.50
5b_A	38.00	2.00	0.45	0.42	0.88	0.50	24.00	1.50
5b_B	38.00	2.00	0.37	0.36	-1.32	0.50	16.91	1.50
7_A*	112.75	0.75	0.04	0.12	10.77	0.50	39.40	1.50
7_B*	112.75	0.75	0.02	0.08	12.03	0.50	42.96	1.50
7b_A	160.00	2.00	0.47	0.64	-0.71	0.50	11.20	1.50
7b_B*	160.00	2.00	2.98	2.21	4.68	0.50	19.34	1.50
8_A	212.00	2.00	0.20	0.57	-1.38	0.50	16.07	1.50
8_B	212.00	2.00	0.29	0.48	-2.07	0.50	20.99	1.50
9a_A*	293.00	1.50	0.10	0.31	4.81	0.50	18.81	1.50
9a_B*	293.00	1.50	0.11	0.45	3.25	0.50	15.89	1.50
9b_A*	291.50	1.50	0.22	0.54	1.70	0.50	13.18	1.50
9b_B	301.00	4.00	0.18	0.85	0.25	0.50	7.34	1.50
9c_A*	301.00	4.00	0.46	0.66	1.27	0.50	12.37	1.50
9c_B*	301.00	4.00	0.65	0.84	2.41	0.50	12.52	1.50
10_A	370.00	1.00	0.78	1.81	-0.21	0.50	6.81	1.50
10_B	370.00	1.00	0.60	1.56	-0.64	0.50	8.39	1.50
10_C	370.00	1.00	0.70	2.21	-0.88	0.50	5.90	1.50
12_A	482.50	2.50	0.34	0.71	1.02	0.50	13.29	1.50
12_B*	482.50	2.50	0.44	0.71	1.67	0.50	11.53	1.50
13_A	525.00	2.50	0.72	1.27	-2.64	0.50	6.38	1.50
13_B	525.00	2.50	1.06	2.07	-0.99	0.50	7.08	1.50
13_C	525.00	2.50	1.34	2.70	-1.98	0.50	7.10	1.50
14_A*	642.00	2.00	0.16	0.47	3.61	0.50	20.96	1.50
14_B*	642.00	2.00	0.08	0.35	2.25	0.50	19.76	1.50
15_A	689.50	19.50	0.84	1.49	-0.37	0.50	13.15	1.50
15_B*	667.50	2.50	0.17	0.33	1.52	0.50	19.80	1.50
15b_A*	689.50	19.50	0.26	0.62	1.60	0.50	12.67	1.50
15b_B	689.50	19.50	1.15	1.53	-0.81	0.50	11.27	1.50
15b_C	694.50	2.50	0.17	0.50	-0.78	0.50	20.41	1.50
15c_A	689.50	19.50	0.99	1.39	-0.04	0.50	12.47	1.50
15c_B	689.50	19.50	0.65	0.88	-0.40	0.50	17.18	1.50
16_A	745.00	2.00	0.74	3.05	0.02	0.50	10.59	1.50

16_B	745.00	2.00	0.93	2.83	-0.14	0.50	10.41	1.50
17_A*	827.50	1.50	0.12	0.27	5.15	0.50	30.45	1.50
17_B*	827.50	1.50	0.34	0.52	1.64	0.50	23.11	1.50
17b_A*	831.50	3.50	0.23	0.38	8.04	0.50	27.88	1.50
17b_B*	831.50	3.50	0.25	0.40	4.83	0.50	27.10	1.50
18_A	940.00	2.50	0.24	0.53	0.65	0.50	23.25	1.50
18_B*	940.00	2.50	0.14	0.45	2.98	0.50	27.29	1.50
18_C	940.00	2.50	0.29	0.77	1.20	0.50	18.26	1.50
19_A	1010.50	11.50	0.25	0.44	0.59	0.50	20.26	1.50
19_B	1010.50	11.50	0.43	0.74	-0.96	0.50	17.19	1.50
20_A	1010.50	11.50	1.21	2.24	-0.71	0.50	12.43	1.50
21b_A	1028.00	3.00	1.19	1.74	0.44	0.50	14.67	1.50
21b_B*	1028.00	3.00	0.39	0.53	4.43	0.50	22.73	1.50
22_A*	1045.50	1.50	0.08	0.18	8.21	0.50	43.40	1.50
22_B*	1045.50	1.50	0.07	0.15	8.28	0.50	37.87	1.50
23_A*	1052.00	2.00	0.17	0.55	3.50	0.50	25.21	1.50
23_B*	1052.00	2.00	0.13	0.53	3.30	0.50	25.75	1.50
24_A	1079.50	9.50	0.29	0.48	0.03	0.50	20.17	1.50
24_B	1079.50	9.50	0.22	0.39	0.64	0.50	30.49	1.50
24b_A*	1082.00	2.00	0.32	0.40	7.85	0.50	28.91	1.50
24b_B*	1082.00	2.00	0.06	0.08	11.27	0.50	33.31	1.50
24c_A	1079.50	9.50	0.83	1.30	0.53	0.50	14.53	1.50
24c_B	1079.50	9.50	0.76	1.10	-1.12	0.50	9.99	1.50
24c_C*	1088.00	2.00	0.24	0.48	10.74	0.50	35.12	1.50
25_A*	1235.00	1.50	0.12	0.27	9.29	0.50	47.60	1.50
25_B*	1235.00	1.50	0.27	0.42	4.68	0.50	27.75	1.50
27_A	1398.00	10.00	0.27	0.79	0.94	0.50	14.55	1.50
27_B	1398.00	10.00	0.27	0.38	-0.40	0.50	18.05	1.50
27b_A*	1407.00	3.00	0.20	0.37	2.13	0.50	19.65	1.50
27b_B*	1398.00	10.00	0.69	0.57	1.39	0.50	17.81	1.50
28_A	1441.00	2.00	0.58	1.21	0.16	0.50	15.53	1.50
28_B	1441.00	2.00	0.56	1.50	0.36	0.50	12.66	1.50
28_C	1441.00	2.00	1.11	2.24	0.09	0.50	12.49	1.50
30_A*	1463.00	2.00	0.18	0.36	11.88	0.50	45.26	1.50
30_B*	1463.00	2.00	0.11	0.24	8.83	0.50	44.63	1.50
31_A*	1504.50	2.50	0.12	0.42	4.04	0.50	25.07	1.50
31_B*	1504.50	2.50	0.37	0.50	5.61	0.50	29.62	1.50
32_A	1554.50	2.50	0.15	0.35	0.74	0.50	18.60	1.50
32_B	1554.50	2.50	0.31	0.55	0.81	0.50	20.03	1.50
32b_A*	1556.00	4.50	0.93	1.22	8.59	0.50	25.74	1.50
32b_B*	1556.00	4.50	0.50	0.82	8.35	0.50	28.68	1.50
32b_C*	1556.00	4.50	0.26	0.37	4.75	0.50	20.67	1.50
33_A	1637.50	2.50	0.18	0.47	0.36	0.50	10.61	1.50
33_B*	1637.50	2.50	0.22	0.30	6.19	0.50	22.94	1.50
34_A*	1725.00	2.00	0.32	0.68	13.48	0.50	28.18	1.50
34_B*	1725.00	2.00	0.37	0.46	2.67	0.50	23.45	1.50
34b_A*	1742.50	4.50	1.19	1.57	9.69	0.50	27.12	1.50

34b_B*	1742.50	4.50	0.66	0.92	3.73	0.50	18.67	1.50
35_A	1767.50	1.50	0.63	1.83	1.00	0.50	16.97	1.50
35_B	1767.50	1.50	0.58	1.84	0.17	0.50	17.27	1.50
35_C	1767.50	1.50	0.32	1.04	1.66	0.50	20.48	1.50
36_A	1819.50	3.50	0.25	0.60	-0.53	0.50	14.63	1.50
36_B*	1819.50	3.50	0.30	0.54	3.56	0.50	17.73	1.50

Table S2: Resume of stable isotope data and calculated paleo-temperatures from the mean values of replicate measurements, including the mean water content and measured stable isotope composition $\delta^{18}O_f$ and $\delta^{2}H_f$ (in ‰ VSMOW). The age and associated uncertainty for the individual depths integrated by each sample was calculated using the age model of Warken et al. (2020) (see text for more details). Temperatures are calculated using the parametrizations by Kim and O'Neil (1997) (T^a), Tremaine et al. (2011) (T^b), and Johnston et al. (2013) (T^c). Measurements with isotopic composition clearly off the MWL or poor reproducibility (marked with a *) are discarded from further paleo-climatic inferences from the temperature estimates (see text for more details).

Sample ID	No. of replic.	Age		water content	$\delta^{18}O_f$		$\delta^{2}H_f$		$\delta^{18}O_c$		T^a (Kim and O'Neil, (1997)		T^b (Tremaine et al., 2011)		T^c (Johnston et al., 2013)	
		[ka]	Δ	[µl/g]	[‰]	Δ	[‰]	Δ	[‰]	Δ	[°C]	Δ	[°C]	Δ	[°C]	Δ
1*	2	15.99	0.64	0.66	2.96	0.35	33.36	1.06	1.61	0.38						
5b*	2	17.77	0.30	0.30	7.60	0.35	39.41	1.06	-0.75	0.38						
5	2	18.00	0.31	0.40	-0.22	0.35	20.45	1.06	-0.85	0.44	16.6	1.6	22.7	1.9	21.3	1.7
7*	2	20.24	0.43	0.10	11.40	0.35	41.18	1.06	-0.02	0.38						
8	2	21.39	0.25	0.52	-1.72	0.35	18.53	1.06	-1.08	0.13	10.8	1.6	16.0	1.8	15.2	1.7
9b*	3	22.52	0.23	0.68	1.79	0.29	12.69	0.87	-1.16	0.15						
9*	2	22.63	0.21	0.38	4.03	0.35	17.35	1.06	-1.23	0.10						
10	3	23.54	0.17	1.86	-0.57	0.29	7.03	0.87	-1.22	0.15	16.6	1.3	22.8	1.6	21.4	1.4
12	2	24.25	0.22	0.71	1.34	0.35	12.41	1.06	0.48	0.21	17.7	1.7	24.0	1.9	22.5	1.7
13	3	24.63	0.26	2.01	-1.87	0.29	6.85	0.87	-1.50	0.16	12.0	1.3	17.4	1.5	16.5	1.4
14*	2	26.79	0.30	0.41	2.93	0.35	20.36	1.06	-0.62	0.28						
15	5	27.76	0.27	1.18	0.00	0.22	13.35	0.67	-0.85	0.37	17.6	1.0	23.9	1.2	22.4	1.1
16	2	28.18	0.55	2.94	-0.06	0.35	10.50	1.06	-0.30	0.14	14.8	1.6	20.7	1.9	19.5	1.7
17*	2	29.32	0.22	0.39	6.44	0.35	27.49	1.06	0.01	0.48						
18	2	30.01	0.24	0.65	0.92	0.35	20.76	1.06	1.06	0.54	13.0	1.6	18.6	1.9	17.6	1.7
19	3	30.59	0.73	0.59	-0.36	0.29	16.63	0.87	-0.45	0.32	14.1	1.3	19.8	1.5	18.7	1.4
22*	2	32.24	0.41	0.17	8.25	0.35	40.63	1.06	-0.76	0.52						
23*	2	32.50	0.66	0.54	3.40	0.35	25.48	1.06	-0.93	0.16						
24	4	33.52	0.52	0.82	0.02	0.25	18.79	0.75	-0.05	0.35	19.1	1.2	25.7	1.4	24.0	1.2
24b*	2	33.56	0.33	0.24	9.56	0.35	31.11	1.06	-1.14	0.46						
25*	2	34.05	0.49	0.34	6.98	0.35	37.67	1.06	-1.49	0.07						
27*	3	35.32	0.35	0.58	0.64	0.29	16.80	0.87	-0.03	0.13						
28	3	35.63	0.40	1.65	0.21	0.29	13.56	0.87	-1.58	0.20	15.0	1.3	20.9	1.6	19.6	1.4
30*	2	41.73	0.21	0.30	10.36	0.35	44.94	1.06	-0.08	0.33						
31*	1	41.90	0.28	0.50	5.61	0.50	29.62	1.50	-0.26	0.28						
32*	1	42.99	0.43	0.55	0.81	0.50	20.03	1.50	-0.79	0.24						
32b*	2	43.01	0.47	1.02	8.47	0.35	27.21	1.06	-1.52	0.18						
33*	1	43.54	0.45	0.30	6.19	0.50	22.94	1.50	-1.43	0.17						
35	3	45.26	1.19	1.57	0.95	0.29	18.24	0.87	-0.40	0.32	17.1	1.3	23.4	1.6	21.9	1.4
36*	2	45.96	0.85	0.57	1.52	0.35	16.18	1.06	-0.90	0.28						