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Supplementary material for

Water in omphacite fingerprinting the thermal history of eclogite

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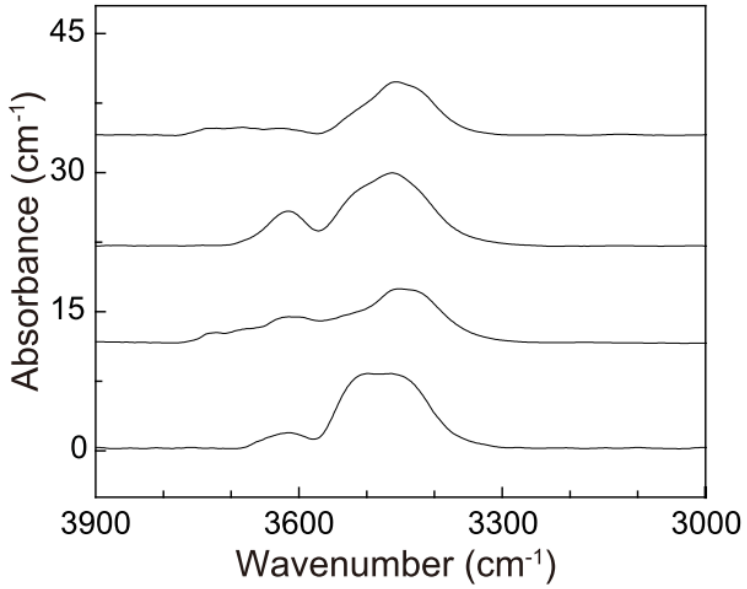

Fig. S1 Unpolarized FTIR spectra of starting omphacite. Spectra were not averaged so that variations in relative intensity are shown for different grains. OH distribution was zoned in some grains, due to fluid-rock interactions during sample exhumation (Sheng et al., 2007). Initial OH content was calculated by averaging all spectra.

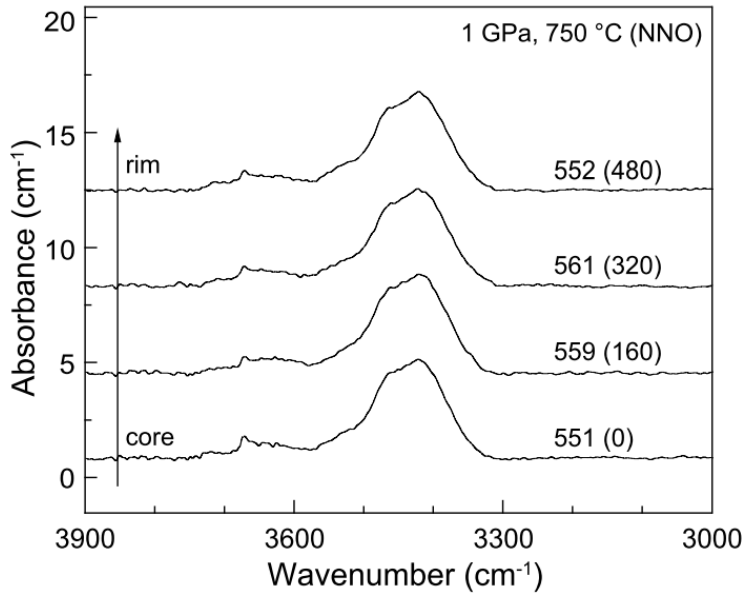

Fig. S2 Baseline-corrected unpolarized FTIR profile of a omphacite grain. Integral absorbance (cm^{-1}) and distance from grain center (μm, in parentheses) are shown.

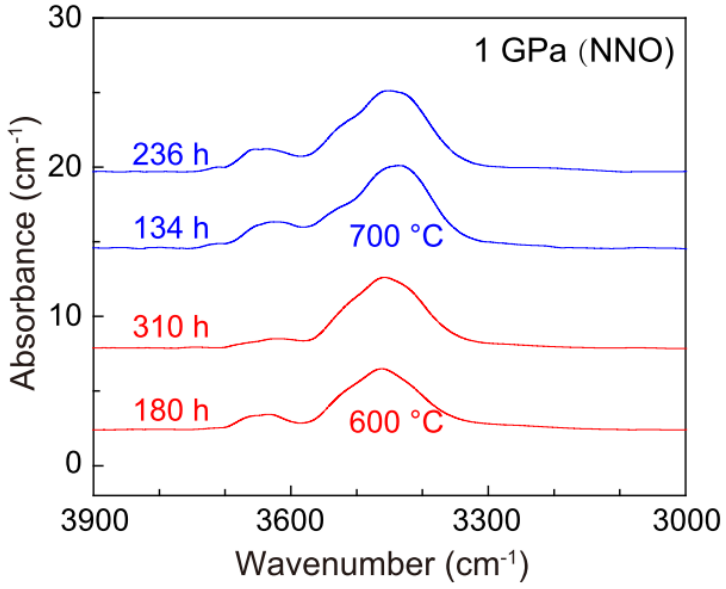

Fig. S3 Average unpolarized FTIR spectra of omphacite annealed with different durations. Shown are at 700 (blue) and 600 (red) °C under otherwise identical conditions.

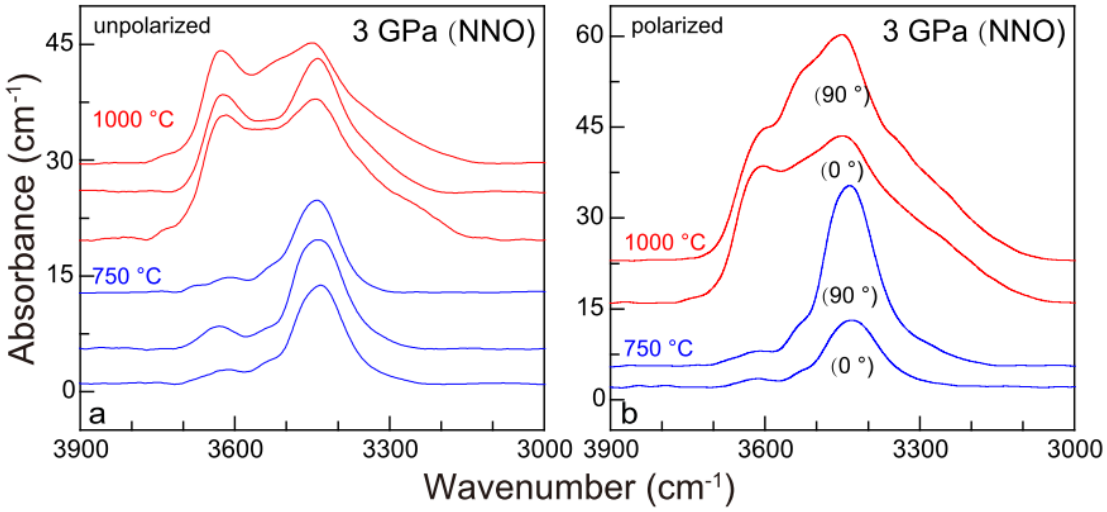

Fig. S4 FTIR spectra of omphacite annealed at different temperature. (a) unpolarized spectra from different grains (spectra were not averaged so that variations in relative intensity are shown for different grains), and (b) polarized spectra along two orthogonal directions (0 & 90 °) of unoriented grains.

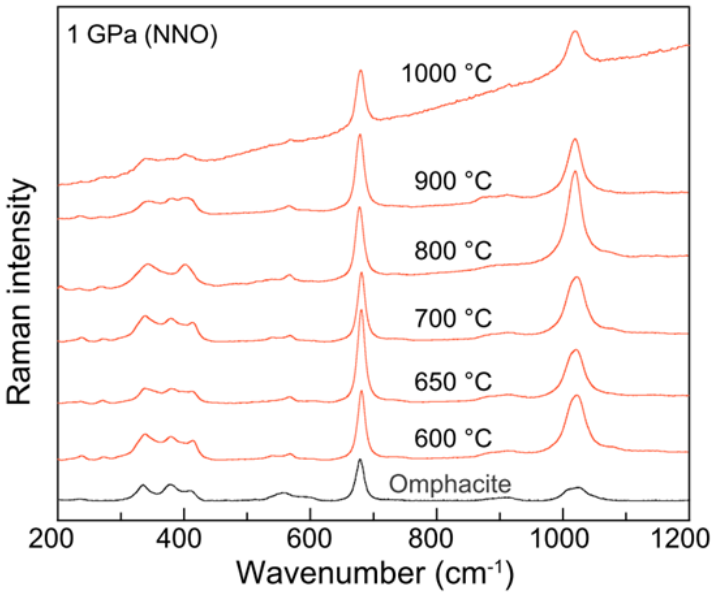

Fig. S5 Raman spectra of annealed omphacite. Raman modes are essentially the same between samples. The bottom is for a reference omphacite (from https://rruff.info).

Table S1 Chemical composition of starting and recovered omphacite (wt. %)

	SiO_2	*s.d.*	TiO_2	*s.d.*	Al_2O_3	*s.d.*	FeO	*s.d.*	MgO	*s.d.*	CaO	*s.d.*	Na_2O	*s.d.*	Total
Starting omphacite															
BXL	56.37	*0.52*	0.04	*0.03*	9.69	*0.09*	1.65	*0.04*	10.60	*0.37*	15.47	*0.11*	5.75	*0.04*	99.57
Recovered omphacite															
B137	56.86	*0.47*	0.02	*0.02*	9.91	*0.19*	1.60	*0.14*	10.89	*0.14*	15.30	*0.14*	6.03	*0.25*	100.61
A157	56.39	*0.68*	0.01	*0.01*	9.83	*0.03*	1.61	*0.02*	10.80	*0.02*	15.40	*0.07*	6.04	*0.06*	100.08
A113	56.27	*0.09*	0.03	*0.04*	9.77	*0.34*	1.62	*0.00*	10.78	*0.15*	15.66	*0.09*	5.86	*0.18*	99.99
A115	56.88	*0.12*	0.06	*0.02*	9.76	*0.08*	1.63	*0.05*	10.74	*0.09*	15.52	*0.17*	5.65	*0.10*	100.24
A158	56.97	*0.28*	0.03	*0.02*	10.11	*0.25*	1.53	*0.07*	10.54	*0.19*	15.28	*0.03*	5.98	*0.06*	100.44
B219	56.54	*0.29*	0.01	*0.01*	9.89	*0.06*	1.56	*0.02*	10.54	*0.01*	15.26	*0.06*	5.96	*0.22*	99.76
B157	56.05	*0.48*	0.07	*0.03*	9.51	*0.35*	1.56	*0.10*	10.85	*0.12*	15.82	*0.23*	5.51	*0.24*	99.35
B148	56.81	*0.27*	0.02	*0.01*	9.35	*0.03*	1.66	*0.08*	10.96	*0.10*	15.67	*0.02*	5.87	*0.02*	100.34
B160	55.98	*0.66*	0.02	*0.02*	9.93	*0.25*	1.58	*0.04*	10.49	*0.08*	15.40	*0.04*	5.74	*0.17*	99.14
B163	56.42	*0.62*	0.01	*0.03*	9.96	*0.29*	1.59	*0.42*	10.47	*0.21*	15.14	*0.66*	5.89	*0.33*	99.48
A133	56.34	*0.03*	0.02	*0.04*	9.28	*0.08*	1.67	*0.09*	11.06	*0.18*	15.62	*0.23*	5.96	*0.09*	99.95
A145	56.32	*0.15*	0.07	*0.02*	9.78	*0.25*	1.52	*0.05*	10.14	*0.30*	15.24	*0.12*	5.75	*0.11*	98.81
A147	56.03	*0.08*	0.03	*0.03*	10.10	*0.13*	1.55	*0.02*	10.40	*0.23*	15.10	*0.14*	5.93	*0.15*	99.14
A149	57.01	*0.35*	0.01	*0.01*	10.23	*0.15*	1.58	*0.08*	10.71	*0.31*	15.06	*0.06*	5.99	*0.06*	100.58
A150	56.67	*0.18*	0.09	*0.03*	10.35	*0.24*	1.61	*0.26*	10.89	*0.07*	15.22	*0.36*	6.23	*0.36*	101.07
A154	56.42	*0.15*	0.09	*0.02*	9.86	*0.24*	1.68	*0.15*	10.46	*0.09*	15.24	*0.23*	5.88	*0.22*	99.63
B209	56.14	*0.25*	0.01	*0.01*	9.65	*0.36*	1.57	*0.10*	10.87	*0.22*	15.55	*0.06*	5.88	*0.08*	99.67
A148	56.44	*0.32*	0.00	*0.02*	9.30	*0.07*	1.55	*0.05*	10.82	*0.12*	15.63	*0.26*	5.84	*0.15*	99.58
B210	55.64	*0.32*	0.03	*0.01*	9.50	*0.30*	1.58	*0.01*	10.83	*0.11*	15.80	*0.09*	5.68	*0.00*	99.06
B215	56.57	*0.19*	0.05	*0.03*	9.77	*0.31*	1.55	*0.11*	11.05	*0.15*	15.70	*0.13*	5.69	*0.11*	100.38
A159	56.10	*0.20*	0.06	*0.02*	10.07	*0.04*	1.56	*0.04*	10.49	*0.07*	14.91	*0.19*	6.09	*0.20*	99.28
A153	56.58	*0.39*	0.06	*0.04*	9.79	*0.20*	1.59	*0.16*	10.54	*0.20*	15.34	*0.06*	5.91	*0.16*	99.81
A155	56.61	*0.32*	0.05	*0.02*	9.80	*0.15*	1.52	*0.04*	10.70	*0.23*	15.46	*0.30*	5.92	*0.15*	100.06

Assuming all Fe as FeO. Shown are the average by analyzing multi points both within and between grains of each sample, and data in the italic (*s.d.*) are the standard deviation. MnO and K_2O contents are usually ~0.01% or lower, and are not shown.

Table S2 Average Abs_{3620}/Abs_{3450} of annealed omphacite

(°C)	1 GPa		2 GPa		3 GPa	
	Abs_{3620}/Abs_{3450}	*s.d.*	Abs_{3620}/Abs_{3450}	*s.d.*	Abs_{3620}/Abs_{3450}	*s.d.*
600	0.10	*0.02*				
650	0.15	*0.09*				
700	0.19	*0.07*	0.16	*0.09*	0.15	*0.04*
750	0.22	*0.07*	0.22	*0.09*	0.23	*0.06*
800	1.05	*0.21*	0.31	*0.15*	0.34	*0.06*
850			0.32	*0.16*		
900	0.69	*0.24*	0.62	*0.18*	0.38	*0.12*
950					1.01	*0.15*
1000	0.67	*0.28*	0.71	*0.14*	0.95	*0.28*
1100					1.11	*0.27*

Shown are the average of unpolarized spectra for each sample, and data in the italic (*s.d.*) are the standard deviation from multi-grain analyses.

Table S3 Composition of garnet and omphacite in the Hongan eclogites (wt. %)

Sample	Mineral	SiO_2	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	Total
09WD21 (2.9 GPa, 693 °C)	grt	38.69	0.00	20.98	-	26.40	0.30	4.21	9.31	-	99.88
		0.30	*0.00*	*0.52*	-	*0.97*	*0.17*	*0.83*	*0.74*	-	
	omp	54.79	0.07	8.96	0.12	7.36	0.00	7.77	13.50	6.52	99.10
		0.40	*0.03*	*0.20*	*0.04*	*0.24*	*0.01*	*0.12*	*0.20*	*0.13*	
09WD22 (2.7 GPa, 627 °C)	grt	38.43	0.05	22.56	-	22.67	0.78	6.20	9.27	-	99.95
		0.27	*0.02*	*0.21*	-	*0.33*	*0.41*	*0.47*	*0.47*	-	
	omp	55.99	0.13	11.15	0.06	3.82	0.01	8.08	12.84	6.50	98.58
		0.22	*0.04*	*0.21*	*0.05*	*0.55*	*0.02*	*0.22*	*0.26*	*0.21*	
09WD25 (2.6 GPa, 666 °C)	grt	38.45	0.05	22.28	-	22.57	0.74	5.70	9.88	-	99.66
		0.22	0.05	0.16	-	0.22	0.16	0.14	0.31	-	
	omp	55.33	0.16	10.50	0.09	4.38	0.01	8.51	13.94	6.12	99.05
		0.34	*0.05*	*0.32*	*0.04*	*0.19*	*0.01*	*0.21*	*0.13*	*0.12*	
09WD26 (3.2 GPa, 714 °C)	grt	37.95	0.04	21.87	-	24.80	0.94	5.07	8.80	-	99.47
		0.22	*0.03*	*0.18*	-	*0.16*	*0.09*	*0.19*	*0.09*	-	
	omp	55.18	0.05	10.18	0.27	6.60	0.03	7.60	12.66	6.97	99.54
		0.42	*0.06*	*0.22*	*0.10*	*0.46*	*0.02*	*0.40*	*0.32*	*0.13*	

Assuming all Fe as FeO, and data in the italic are the standard deviation. -, below 0.01%. grt, garnet; omp, omphacite.

Equilibrium *P* and *T* were estimated by the eclogite-facies grt-cpx barometer (Simakov and Taylor, 2000) and thermometer (Nakamura, 2009).

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