



Supplement of

Nine years of warming and nitrogen addition in the Tibetan grassland promoted loss of soil organic carbon but did not alter the bulk change in chemical structure

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Table S1 Basic chemical and physical properties in soils (0-10 cm) under different N enrichment levels and warming treatment (mean \pm SD, n = 6)

Treatment	Bulk density (g cm ⁻³)		pH		AGB (g m ⁻²)		SOC stock (Mg ha ⁻¹)		C/N		MBC (mg g ⁻¹)		EnC (nmol activity g ⁻¹ dry soil h ⁻¹)	
	C	W	C	W	C	W	C	W	C	W	C	W	C	W
N0	0.9 \pm 0.1	0.9 \pm 0.1	6.1 \pm 0.1	6.2 \pm 0.3	442.3 \pm 53.1	446.7 \pm 141.7	78.5 \pm 10.7	65.6 \pm 7.1	12.8 \pm 0.2	13.1 \pm 0.4	2.1 \pm 0.2	1.2 \pm 0.2	334.5 \pm 13.3	275.8 \pm 27.1
N1	1.1 \pm 0.1	1.0 \pm 0.2	6.1 \pm 0.1	6 \pm 0.1	505 \pm 43.7	367.2 \pm 78.5	95.7 \pm 4.3	69.3 \pm 18.8	12.7 \pm 0.4	11.5 \pm 1	1.7 \pm 0.4	1.6 \pm 0.2	676.2 \pm 63.4	392.2 \pm 42.7
N2	1.2 \pm 0.1	1.0 \pm 0.1	5.7 \pm 0.2	5.3 \pm 0.2	457.3 \pm 55	329.4 \pm 74.9	93.2 \pm 6.6	69.0 \pm 7.3	12.4 \pm 0.1	12.2 \pm 0.2	1.9 \pm 0.2	1.3 \pm 0.4	575.9 \pm 64.2	453.9 \pm 50
N3	1.1 \pm 0.1	0.9 \pm 0.2	5.6 \pm 0.2	5.3 \pm 0.2	440.6 \pm 118.6	420.5 \pm 119.1	78.8 \pm 5.9	68.0 \pm 13.1	11.9 \pm 0.3	11.9 \pm 0.4	1.3 \pm 0.3	1.2 \pm 0.2	472.7 \pm 37.5	316.3 \pm 29.8
ANOVA <i>P</i> -values														
N input	0.039		0.000		0.000		0.000		0.000		0.000		0.000	
Warming	0.001		0.001		0.000		0.000		0.026		0.005		0.000	
N input \times Warming	0.180		0.003		0.000		0.000		0.003		0.385		0.000	

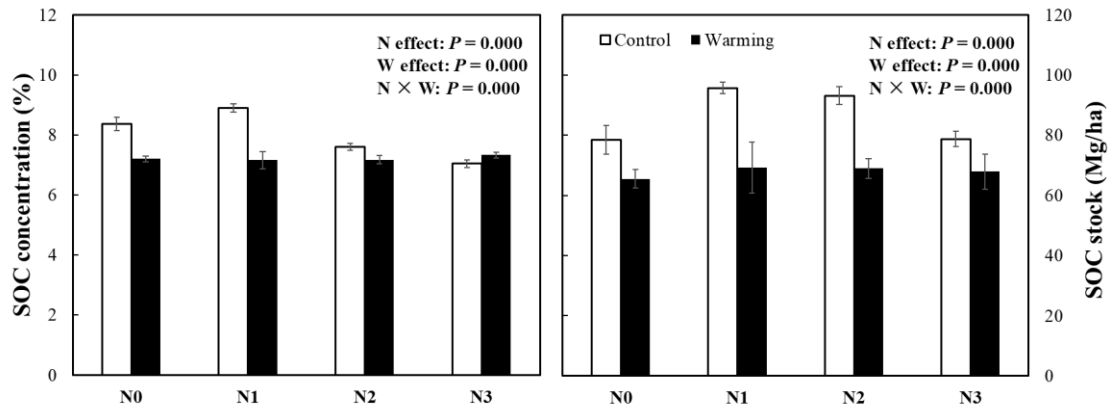


Figure S1 SOC concentration and SOC stock (0-10 cm) under different N enrichment levels and warming treatment (mean \pm SD, n = 6)

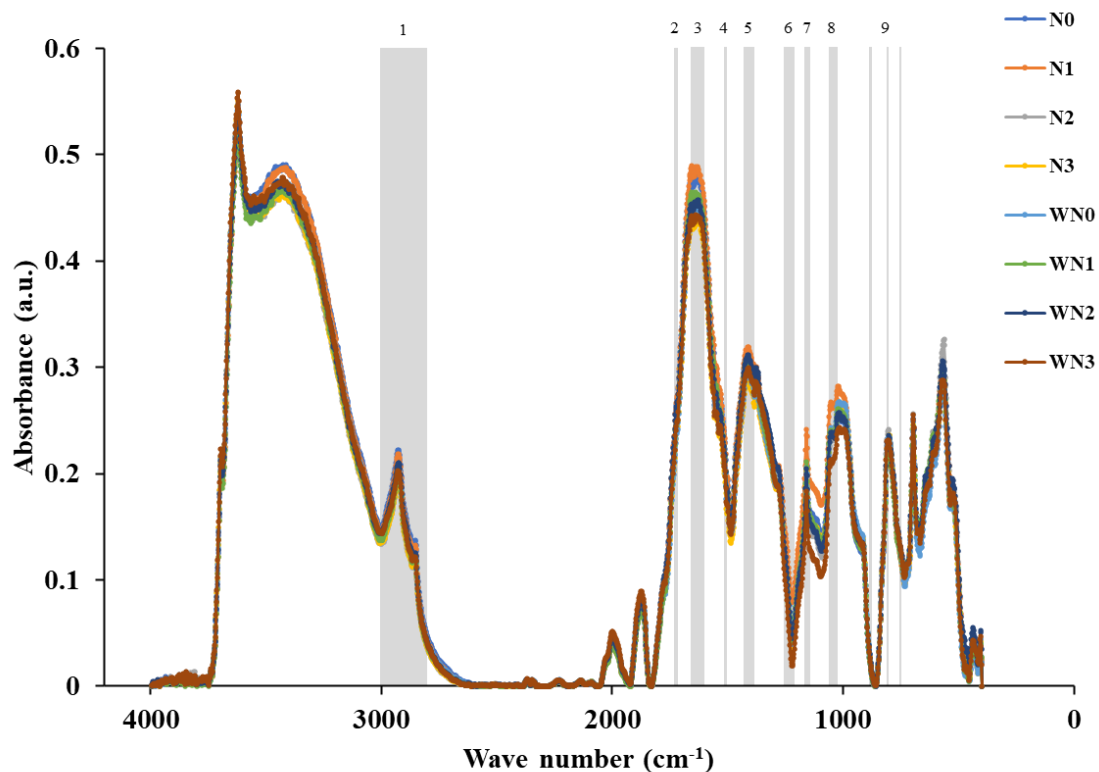


Figure S2 The absorption bands identifiable by diffuse reflectance infrared Fourier transform (DRIFT) spectroscopy (0-10 cm, mean, n = 6)

Note: 1: 3000–2800 cm⁻¹ aliphatic C–H, 2: 1735–1720 cm⁻¹ aromatic esters, carbonyl/carboxyl C=O, 3: 1660–1600 cm⁻¹ aromatic C=C, 4: 1515–1500 cm⁻¹ lignin like residues, 5: 1430–1380 cm⁻¹ aromatic C=C, 6: 1260–1210 cm⁻¹ phenolic/cellulose, 7: 1170–1148 cm⁻¹, C–O bonds of poly-alcoholic and ether groups, 8: 1060–1020 cm⁻¹ aliphatic C–O – and alcohol C–O, 9: 880, 805, 745 cm⁻¹ C–H aromatic.

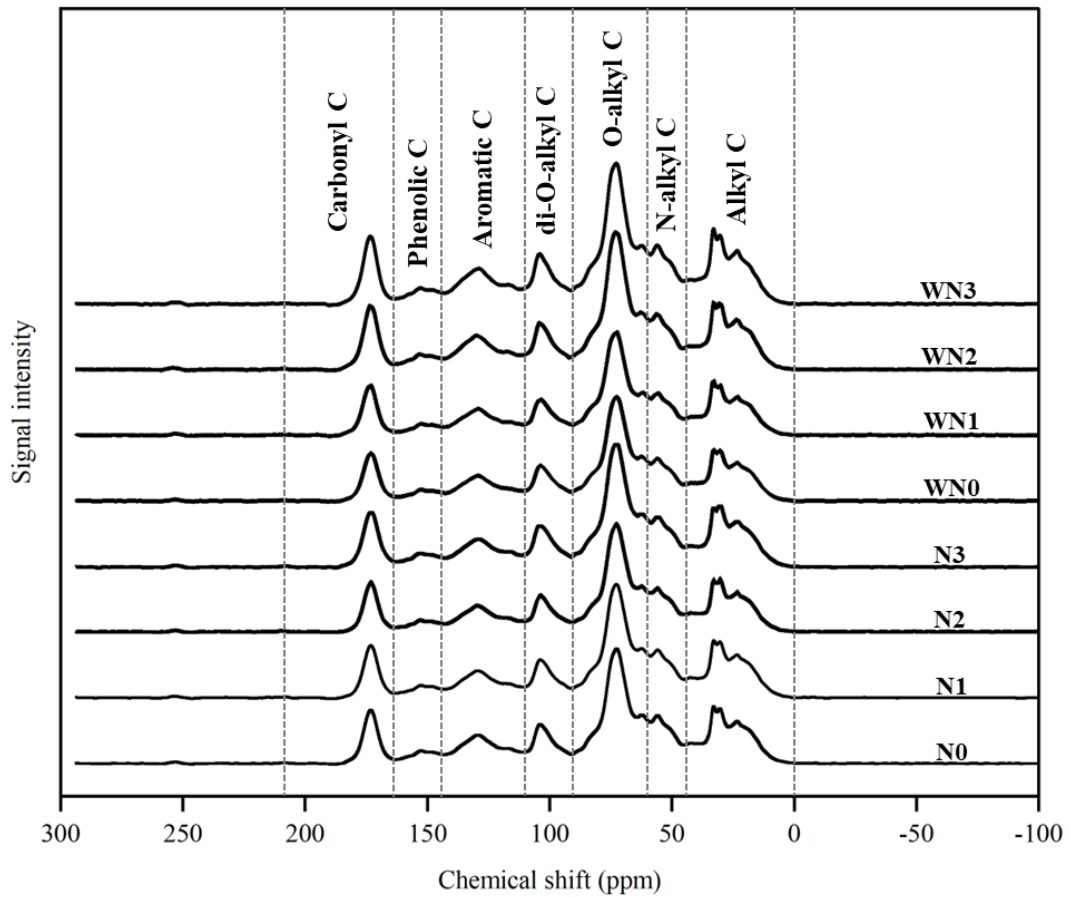


Figure S3 Carbon-13 CPMAS NMR spectra of HF-treated soils (0–10 cm) under N enrichment and warming in the Tibetan grassland (mean, n = 6)

Note: alkyl C (0–45 ppm); N-alkyl C (45–60 ppm); O-alkyl C (60–90 ppm); di-O-alkyl C (90–110 ppm); aromatic C (110–145 ppm); phenolic C (145–165 ppm); carbonyl C (165–210 ppm).