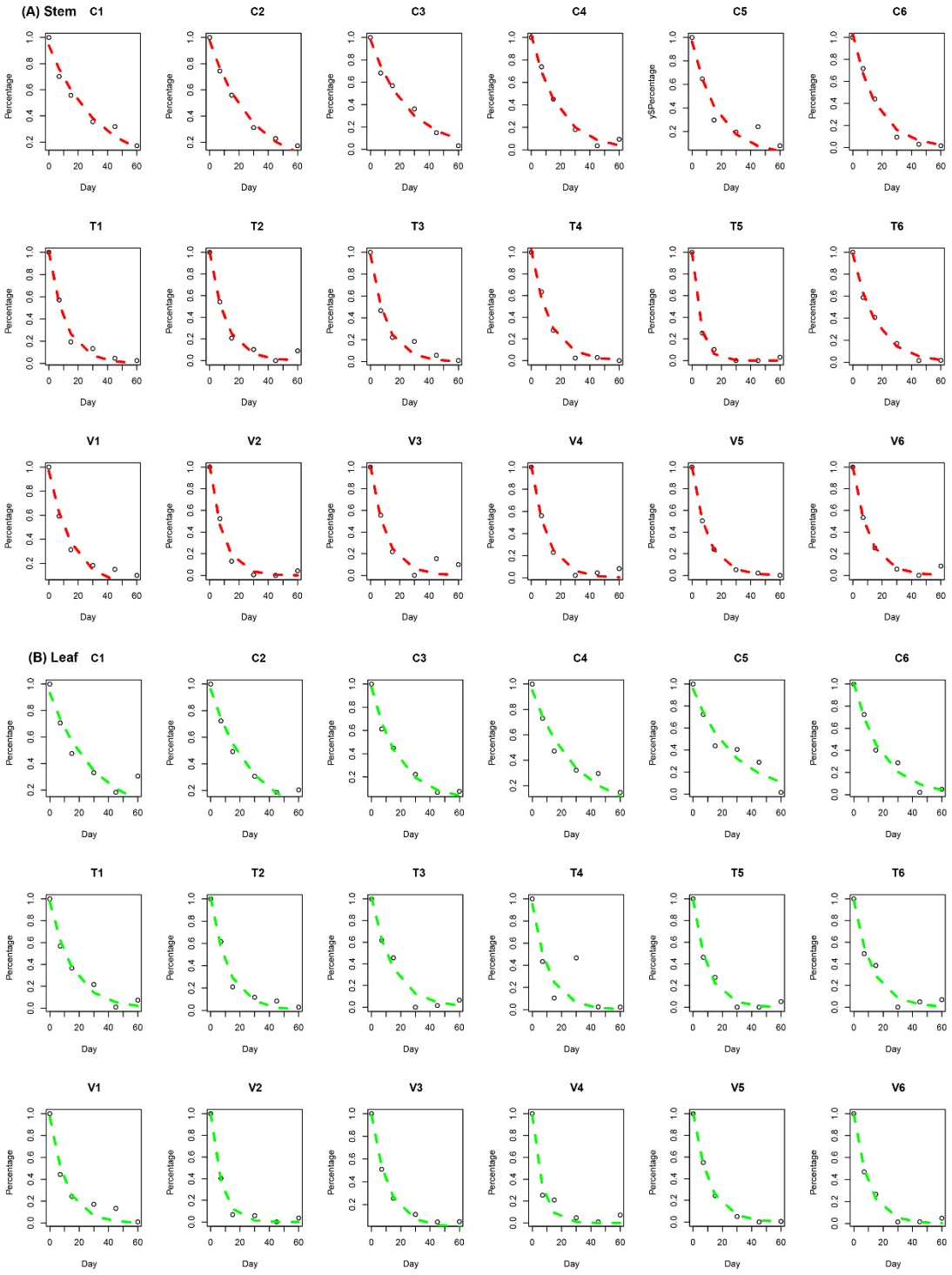
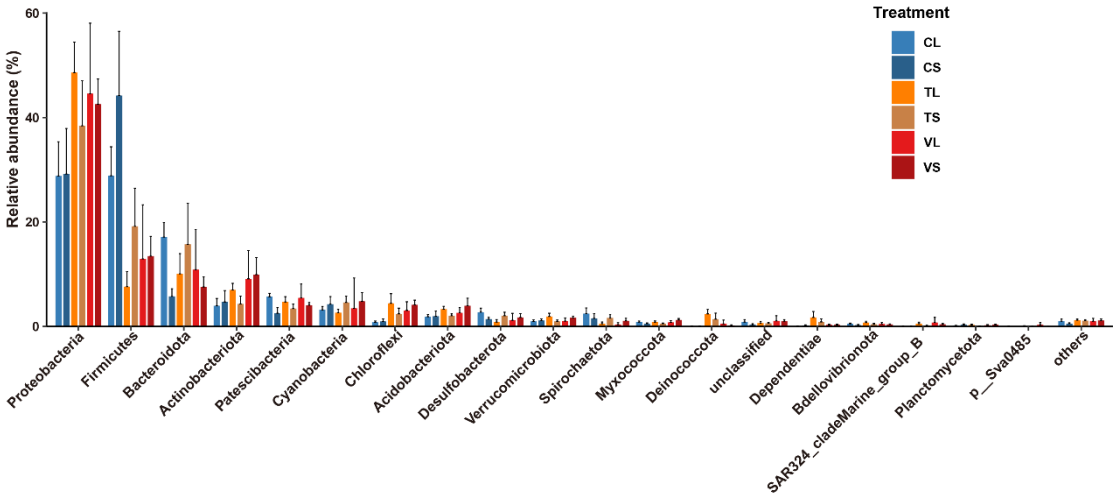


Figure S1. The scatterplot of decomposition rates of (A) Stem and (B) Leaf litter in each tank (C, T, V with 6 replicates). The 1.0 on the vertical axis represent 100%.

Table S1 Results from Tukey's post hoc comparing the differences of *k* of different treatments for in stem or leaf litter respectively. *p<0.05; **p<0.01. C, ambient temperature; T, +4℃ constant warming; V, fluctuate warming.

Contrast	estimate	z	P
CL - TL	-0.6890	-4.685	<0.0001***
CL - VL	-0.9831	-6.685	<0.0001***
CL - CS	-0.0974	-0.662	0.9860
CL - TS	-0.8550	-5.813	<0.0001***
CL - VS	-0.8011	-5.447	<0.0001***
TL - VL	-0.2941	-2.000	0.3423
TL - CS	0.5916	4.023	0.0008***
TL - TS	-0.1660	-1.129	0.8696
TL - VS	-0.1121	-0.762	0.9738
VL - CS	-0.8857	6.022	<0.0001***
VL – TS	0.1281	0.871	0.9534
VL – VS	0.1820	1.238	0.8183
CS – TS	-0.7576	-5.151	<0.0001***
CS - VS	-0.7037	-4.785	<0.0001***
TS - VS	0.0539	0.367	0.9991



Supplementary Figure S2. Relative abundances of the dominant bacterial phyla (>0.01) under different warming conditions. All data are presented as mean + se

Table S2 Results from GLM comparing the differences of the relative abundance of different treatments for decomposition-related Phylum (>1%) in stem or leaf litter respectively. *p<0.05; **p<0.01; ***p<0.001. C, ambient temperature; T, +4°C constant warming; V, fluctuate warming.

Phylum	Treatment	Estimate	*t*	*P*
Proteobacteria	**T**	0.6709	1.7462	0.0910
	V	0.5818	1.5142	0.1404
	Tissue	-0.1992	-0.5185	0.6079
	T:Tissue	-0.1346	-0.2477	0.8061
	V:Tissue	0.1626	0.2993	0.7668
Firmicutes	**T**	-1.7524	-2.9936	0.0054*
	V	-1.0371	-1.7716	0.0866
	Tissue	0.2817	0.4811	0.6339
	T:Tissue	0.6551	0.7913	0.4350
	V:Tissue	-0.1254	-0.1515	0.8806

Bacteriodota	**T**	-0.6863	-1.6024	0.1196
	V	-0.5868	-1.3702	0.1808
	Tissue	-1.1376	-2.6560	0.0125*
	T:Tissue	1.3503	2.2293	0.0334*
	V:Tissue	0.8009	1.3223	0.1961
Actinobacteriodota	**T**	0.9275	1.4807	0.1491
	V	1.1322	1.8074	0.0807
	Tissue	-0.1082	-0.1727	0.8641
	T:Tissue	-0.4394	-0.4960	0.6235
	V:Tissue	-0.00934	-0.0106	0.9916
Patescibacteria	**T**	-0.3000	-0.7347	0.4682
	V	-0.1288	-0.3154	0.7546
	Tissue	-1.3554	-3.3187	0.0024**
	T:Tissue	1.0038	1.7380	0.0925
	V:Tissue	1.1476	1.9870	0.0561
Cyanobacteria	**T**	-0.2093	-0.3823	0.7049
	V	-0.6889	-1.2583	0.2180
	Tissue	0.0310	0.0567	0.9552
	T:Tissue	0.4441	0.5736	0.5706
	V:Tissue	0.6917	0.8933	0.3788

Chloroflexi	**T**	1.3997	2.3120	0.0278*
	V	1.4584	2.4090	0.0223*
	Tissue	-0.2620	-0.4327	0.6683
	T:Tissue	-0.5142	-0.6006	0.5526
	V:Tissue	0.5039	0.5886	0.5606
Acidobacteriota	**T**	0.7118	1.6764	0.1041
	V	0.4095	0.9644	0.3426
	Tissue	-0.3187	-0.7506	0.4588
	T:Tissue	-0.1961	-0.3265	0.7463
	V:Tissue	0.5812	0.9678	0.3409
Desulfobacterota	**T**	-1.8671	-2.1760	0.0376*
	V	-1.2113	-1.4117	0.1683
	Tissue	-0.7233	-0.8430	0.4059
	T:Tissue	1.5669	1.2913	0.2065
	V:Tissue	0.8394	0.6918	0.4944
Verrucomicrobiota	**T**	0.6828	1.5577	0.1298
	V	0.1598	0.3645	0.7180
	Tissue	0.2996	0.6834	0.4996
	T:Tissue	-0.8861	-1.4293	0.1632
	V:Tissue	0.2446	0.3946	0.6959

Spirochaetota	**T**	-2.6292	-1.9535	0.0605
	V	-2.2934	-1.7871	0.0844
	Tissue	-0.7758	-0.6046	0.5502
	T:Tissue	2.0217	1.0872	0.2859
	V:Tissue	1.6256	0.8957	0.3778
Myxococcota	**T**	-0.1071	-0.2890	0.7745
	V	0.0187	0.0505	0.9601
	Tissue	-0.5107	-1.3788	0.1782
	T:Tissue	0.2580	0.4925	0.6260
	V:Tissue	0.9135	1.7439	0.0914
Deinococcota	**T**	3.0060	2.5041	0.0184*
	V	1.9287	1.6067	0.1194
	Tissue	-0.3802	-0.2833	0.7790
	T:Tissue	-0.9996	-0.5551	0.5832
	V:Tissue	-0.2672	-0.1484	0.8831
unclassified	**T**	0.2277	0.3041	0.7632
	V	1.2283	1.6407	0.1113
	Tissue	-0.1354	-0.1808	0.8577
	T:Tissue	0.5912	0.5584	0.5807
	V:Tissue	0.2046	0.1933	0.8481

Dependentiae	**T**	2.1545	2.1523	0.0395*
	V	1.7280	1.7262	0.0946
	Tissue	0.1788	0.1786	0.8594
	T:Tissue	-0.4661	-0.3293	0.7443
	V:Tissue	-0.3266	-0.2307	0.8191
Bdellovibrionota	**T**	0.4189	0.8886	0.3813
	V	0.0918	0.1947	0.8470
	Tissue	-0.8517	-1.8066	0.0809
	T:Tissue	0.1674	0.2511	0.8034
	V:Tissue	0.7196	1.0793	0.2891
SAR324_cladeMarine_group_B	**T**	1.7097	2.3011	0.0285*
	V	2.0746	2.7921	0.0090
	Tissue	0.4196	0.5648	0.5764
	T:Tissue	-1.0463	-0.9958	0.3273
	V:Tissue	-0.7231	-0.6882	0.4966
Planctomycetota	**T**	0.3800	0.7346	0.4683
	V	0.7824	1.5125	0.1409
	Tissue	0.4830	0.9337	0.3579
	T:Tissue	-0.8417	-1.1506	0.2590
	V:Tissue	-0.1406	-0.1922	0.8489

p__Sva0485	**T**	-0.4639	-0.2602	0.7988
	V	-0.9524	-0.5973	0.5606
	Tissue	-1.3395	-0.5601	0.5850
	T:Tissue	0.4703	0.1669	0.8700
	V:Tissue	1.1228	0.4066	0.6909
others	**T**	0.5321	1.2844	0.2088
	V	0.2953	0.7129	0.4814
	Tissue	-0.3054	-0.7375	0.4666
	T:Tissue	0.2267	0.3870	0.7015
	V:Tissue	0.4622	0.7890	0.4363