

## **Supporting Information**

### **Elevational Dynamics in Soil Microbial Co-occurrence: Disentangling Biotic and Abiotic Influences on Bacterial and Fungal Networks on Mt. Seorak**

Supplementary Tables S1 and S2

Supplementary Figures S1, S2, S3, S4 and S5

**Table. S1.** Description of node-level and network-level topological features in the co-occurrence network for soil bacterial and fungal communities on Mt. Seorak.

Level	Topological feature	Description
Node-level	Degree	The number of connections for a single node.
	Betweenness centrality	In the network, any two nodes have the shortest path, and the betweenness centrality of a node is the number of times the shortest path passes through the node.
	Eigenvector centrality	A relative score measurement of the influence of a single node on the network. A high feature vector score means that a node is connected to many nodes with a high score.
	Closeness centrality	The average of the shortest path length from the node to every other node in the network.
Network-level	Node number	Number of nodes
	Edge number	Number of potential links between associated nodes
	Average path length	The average value of the distance between all pairs of nodes in the network
	Average degree	The average number of edges per node in the network
	Edge density	The ratio of the number of edges and the number of possible edges
	Diameter	The shortest distance between the two furthest nodes in the network
	Modularity	Measures the strength of dividing the network into modules
	Global clustering coefficient	The degree to which nodes in the network tend to cluster together
Degree centralization	Creating a network level centralization measure from the degree centrality scores of the nodes	

Betweenness centralization

The mean of betweenness centrality values for all nodes

Closeness centralization

The mean of closeness centrality values for all nodes

Eigenvector centralization

The mean of eigenvector centralization values for all nodes

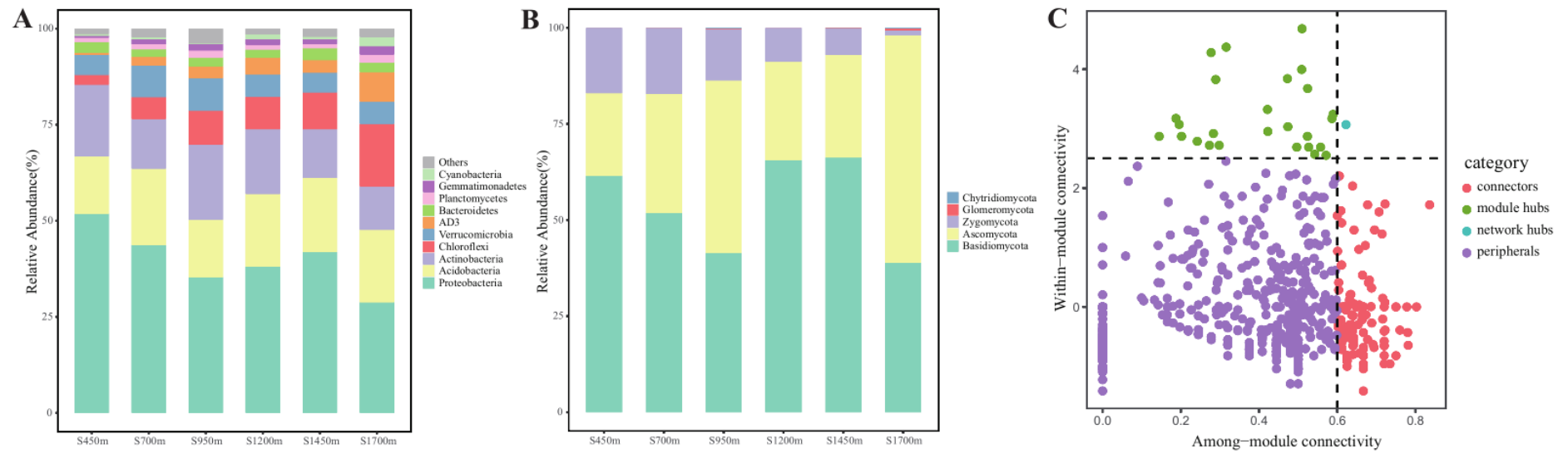
Mean connectivity

The average degree of interconnection between the various parts of the network

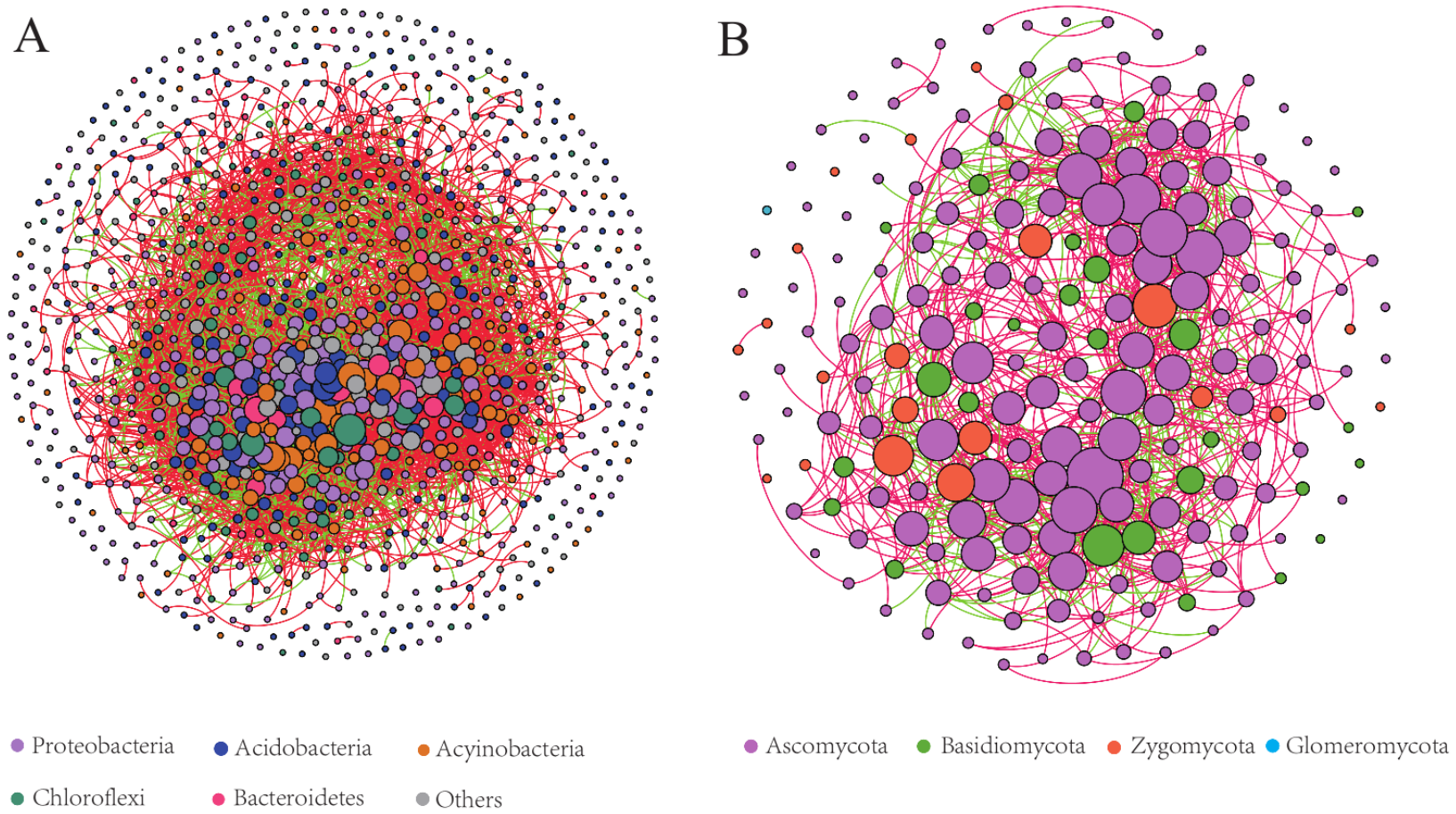
**Table. S2.** Topological features of the empirical networks in comparison to the random networks.

Model	Topological features	BF	BB	FF
Empirical network	Average path length	3.373 <sup>a</sup>	3.405 <sup>a</sup>	3.011 <sup>a</sup>
	Clustering coefficient	0.383 <sup>b</sup>	0.385 <sup>b</sup>	0.451 <sup>b</sup>
	Modularity	0.434 <sup>c</sup>	0.429 <sup>c</sup>	0.448 <sup>c</sup>
	Density	0.016	0.015	0.047
Random network	Average path length	2.694±0.0004	2.794±0.0009	2.575±0.0045
	Clustering coefficient	0.016±0.0004	0.015±0.0006	0.047±0.0036
	Modularity	0.149±0.0033	0.176±0.0042	0.249±0.0111
	Density	0.016	0.015	0.047

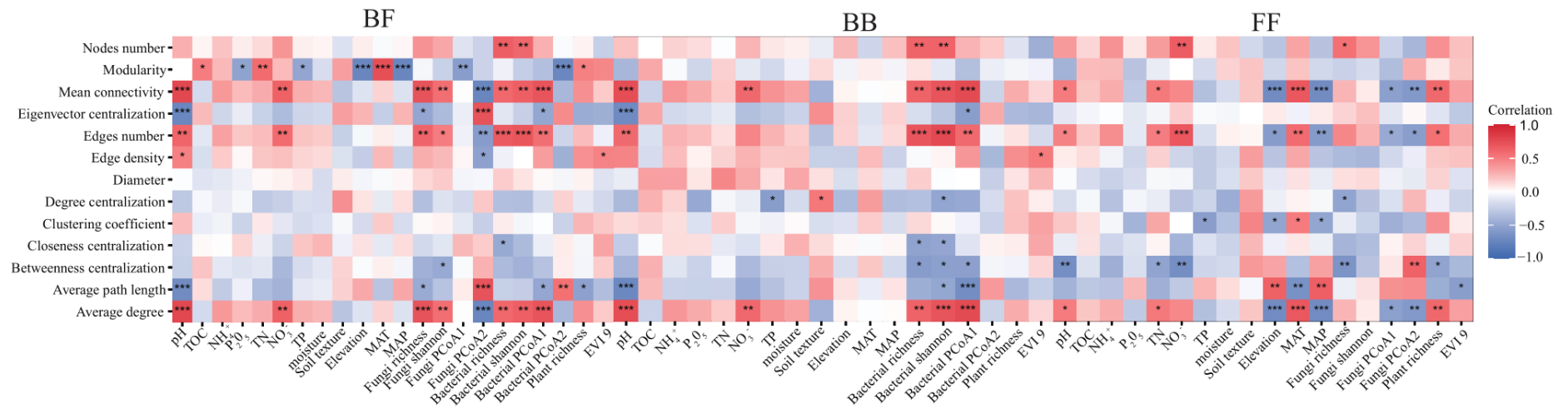
*\*Random networks with the same numbers of nodes and edges as the empirical network were generated, and topological indices were summarized by 999 iterations based on the Erdős–Rényi model. <sup>a</sup> Significant difference ( $p < 0.05$ ) in Average path length between Empirical networks and Random networks based on the Students  $t$ -test. <sup>b</sup> Significant difference ( $p < 0.001$ ) in Clustering coefficient between Empirical networks and Random networks based on the Students  $t$ -test. <sup>c</sup> Significant difference ( $p < 0.05$ ) in Modularity between Empirical networks and Random networks based on the Students  $t$ -test.*



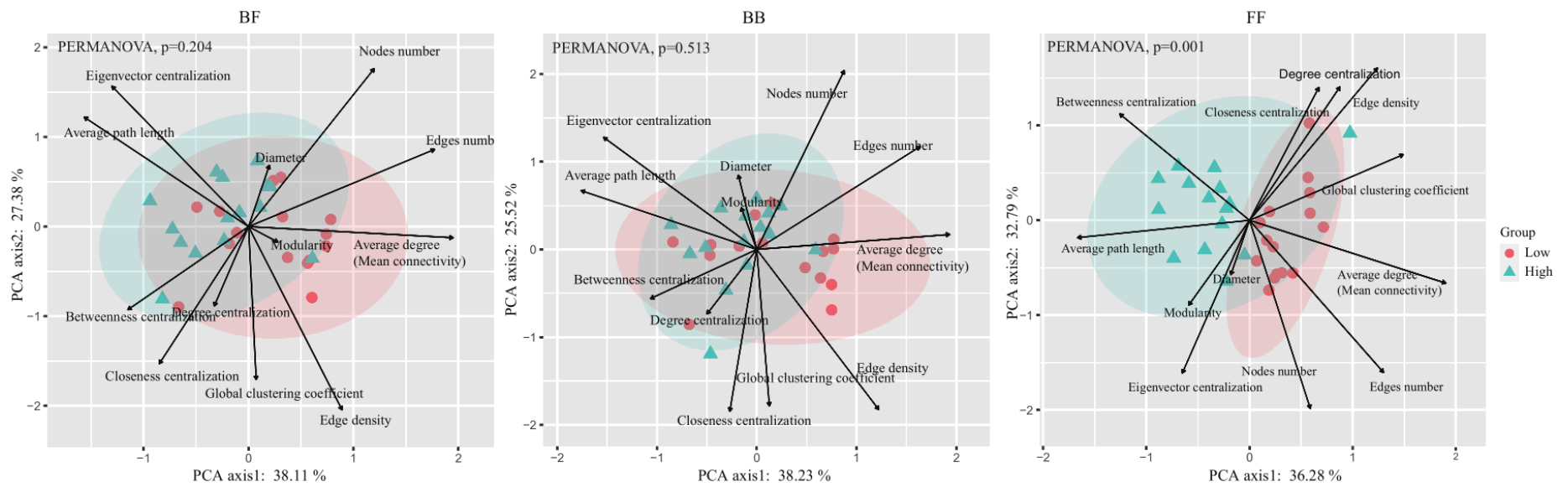
**Fig. S1.** Relative abundance (%) of soil bacterial (A) and fungal (B) families at different elevational isoclines on Mt. Seorak. (C) The Z-C plot facilitated the classification of nodes, enabling the recognition of putative keystone OTUs within the ecological network. Each symbol within the plot represents an OTU.



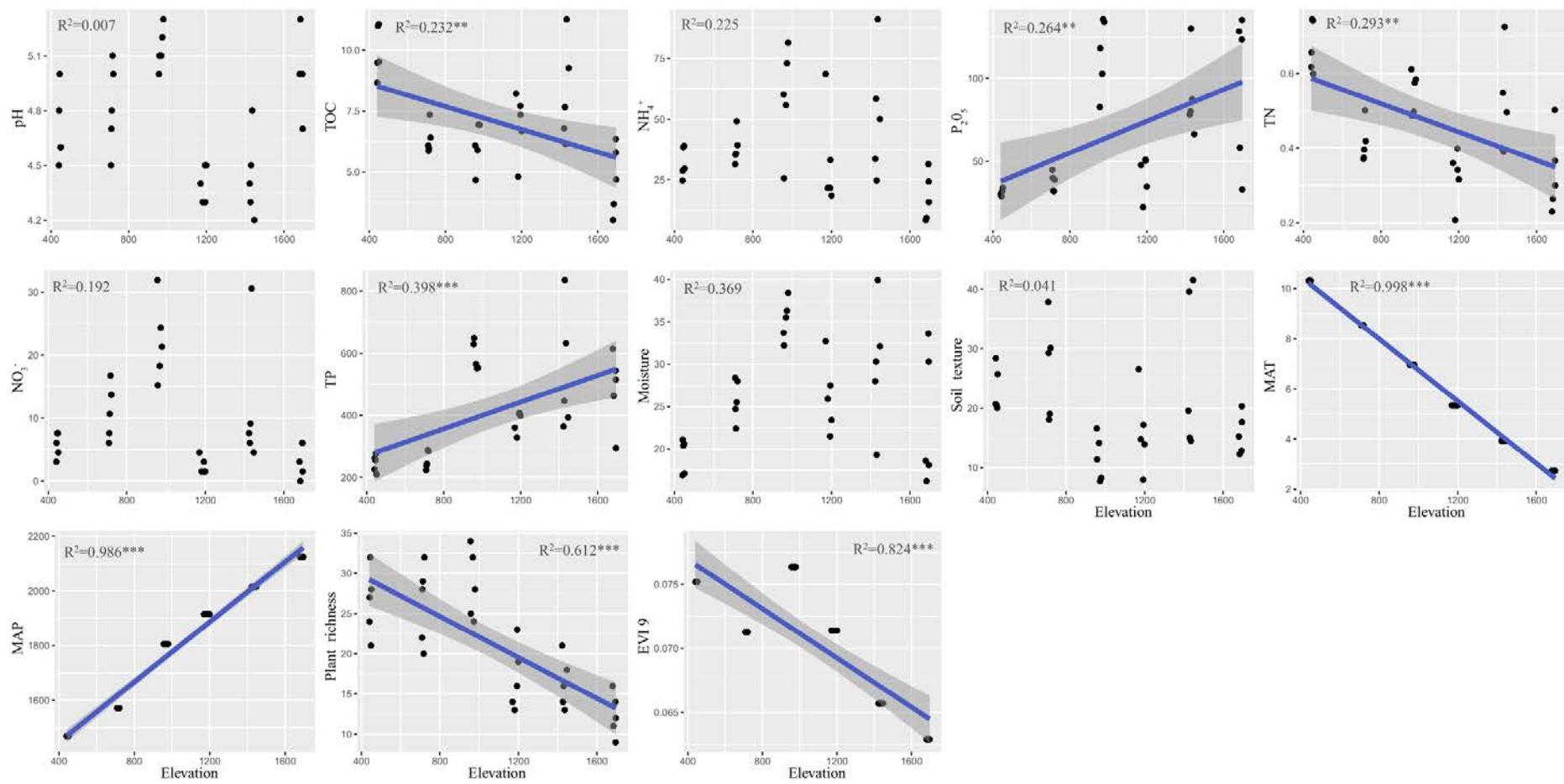
**Fig. S2.** Co-occurrence network of soil microbiota (A: bacteria and B: fungi) on Mt. Seorak. The node color represents the dominate phyla; The red edge represents a positive correlation, and the green edge represents a negative correlation.



**Fig. S3.** The correlation between abiotic and biotic factors and network-level topology features of meta-network (BF) and sub-networks (BB and FF) on Mt. Seorak. \*P < 0.05, \*\*P < 0.01 and \*\*\*P < 0.001.



**Fig. S4.** Principal component analysis (PCA) of the network topological features of meta-network (BF) and sub-networks BB and FF. The high group comprised samples collected from 1200 to 1700 masl, while the low group included samples from 450 to 950 masl.



**Fig. S5.** Elevational patterns of soil, climate, and plant properties on Mt. Seorak. \*P < 0.05, \*\*P < 0.01 and \*\*\*P < 0.001.