

# The response of archaeal species to seasonal variables in a subtropical aerated soil

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**Abstract:** Archaea are cosmopolitan in aerated soils around the world. While the dominance of Thaumarchaeota have been reported in most soils, the methanogens are recently found to be ubiquitous but with low abundances in the aerated soil globally. However, the seasonal changes of those low abundant methanogens are still in the mist. In this study, we investigated the change of Archaea in the context of environmental variables over a period of 12 months in a subtropical soil on the Chongming Island, China. The results showed that *Nitrososphaera spp.* were the dominant archaeal population while the methanogens were in low proportions but highly diverse (including five genera: *Methanobacterium*, *Methanocella*, *Methanosaeta*, *Methanosarcina* and *Methanomassiliicoccus*) in the aerated soil samples by high throughput sequencing. A total of 126 eLSA correlations were found in the dataset including all the 72 archaeal OTUs and 8 environmental factors. A Significance Index defined as the pagerank score of each OTU divided by its relative abundance was used to evaluate the significance of each OTU. The results showed that the of five out of 17 methanogen OTUs were significantly positively correlated with temperature, suggesting those rare methanogens might increase with temperature rather than being dormant in the aerated soils.