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Interaction Between Environmental Conditions Changes the Function and The Community of Soil Ammonia Oxidizers

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Very little is known regarding the ecology of AmoA cluster 10 and its high relative abundance in a Californian soil offers a unique opportunity to study this group. Changes in potential nitrification activity and in the relative and total abundance of Nitrosospira AmoA cluster 10 in response to shifts in temperature, soil moisture and fertilizer concentration were studied in a multi-factorial laboratory experiment in which these factors were manipulated. Our study demonstrated that interactions among these environmental factors influence the potential nitrification activity as well as the community structure and total abundance of ammonia oxidizers. However, relationship between the activity and the community of ammonia oxidizers was evident only after a long period of incubation (e.g. 16 weeks). Total abundance of each cluster ('scaled abundance') was influenced by interactions among the three environmental factors tested, and striking community shifts occurred in the high fertilizer treatment. Ammonia concentrations were influenced also by an interaction between temperature and soil moisture. A multiple regression model could explain 84% of the differences in potential nitrification activity in the high fertilizer treatment. Path analysis demonstrated that the major path by which ammonia influenced potential nitrification was indirectly through its influence on the scaled abundance of cluster 3a. In contrast, the indirect effect of ammonia through its influence on the scaled abundances of clusters 9 and 10 was very small. Ammonia also influenced potential nitrification activity directly, although to a lesser degree than its indirect effects. This study demonstrates how microbial community structure may be linked to ecosystem function.