Reconstruction of paleoclimate from buried ancient forest since mid-Holocene in South China

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Coherent high- and low- latitude climate variability during the Holocene has been reported widely from corals, marine and lake sediments, and stalagmite records. However, evidence for unstable Holocene climate in southern China is still limited and the interpretation of recently published high-resolution lake records is still under debate. Here we report results of an investigation on a 5.7 m thick record of buried tree remains from Gaoyao, a site located in sub-tropical China.

In South China, especially in Pearl River Delta, many well-preserved ancient forests dominated by *Glyptostrobus pensilis* were found buried underground. *Glyptostrobus pensilis* is a hydrophilous plant and prefers to grow along river banks or wetland under warm climate conditions. Although the buried forests have potential for paleoclimate studies, very little is known about the historical evolution of these forests. The ancient forests at Gaoyao consists of several development stages, and its development was interrupted for three times. Therefore, we studied the buried forest profile at Gaoyao, aiming to provide more detailed information about local climate change. In this study, we first establish the ^{14}C chronology for the buried ancient forest at Gaoyao, and then discuss the palaeoclimate implications of the variations in the content of the organic carbon and the composition of stable carbon isotope ($\delta^{13}C$). The main conclusions are as follows

1. The ancient forest at Gaoyao developed earlier than 5.0 ka, and ended at about 1.1 ka.

2. The climate since mid-Holocene in South China was unstable and punctuated by four climate events, which occurred at 4.3 ka, 3.6 ka, 2.0 ka and 1.1 ka, showing an approximately period of 1000 years.

3. The precipitation decreased since 3.6 ka, which caused the disappearance of the wetland and associated ancient forest around 3.3 ka at Sihui, and finally the termination of the wetland at 2.0 ka at Gaoyao.

Soil microbial processes of coexisting atrazine and dichlobenil in the presence of a biochar

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Biochar from crop residues contains both black carbon and nutrients. Information on the role of these nutrients in the biodegradation of coexisting pesticides in soil is scanty. This study was conducted to evaluate the competition for nutrients from a biochar between two bacterial species in degrading their respective target pesticides. Dichlobenil and atrazine with their respective bacterial degraders were chosen. High concentrations were used to ensure that these substrates were not limiting on degradation. Relatively low initial cell densities and thus growing conditions allowed us to determine the competition between degraders for nutrients and its influence on subsequent pesticide degradation.

Under growing conditions, dichlobenil and atrazine degradation in soil extract was slow with <40% and <20% degraded within 64 h, respectively. The degradation in extracts and slurries of biochar-amended solids increased with increasing biochar content, due to nutritional stimulation on microbial activities. By supplementing soil extract with various major nutrients, P was found the exclusive limiting nutrient. The reduction in the degradation of coexisting dichlobenil and atrazine resulted apparently from the competitive utilization of P by the two degraders. With a shorter lag phase, atrazine degrader commenced growing earlier than dichlobenil degrader with the advantage of utilizing P first in insufficient supply. This resulted in an inhibition on the growth of dichlobenil degrader and thus suppression on dichlobenil degradation.

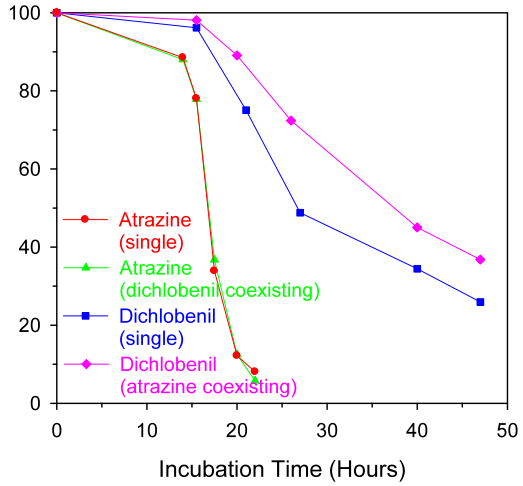

Figure 1: Biodegradation of dichlobenil and atrazine in 0.3% biochar-soil slurry as single and coexisting pesticides.