

Sedimentary $\delta^{13}\text{C}_{\text{org}}$ and pigments in coastal ponds of Ross Sea, East Antarctica and their paleoenvironmental implication

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The carbon isotopic compositions of total organic matter ($\delta^{13}\text{C}_{\text{org}}$) and photosynthetic pigments in lake algae are important proxies for identification of organic matter source and reconstruction of paleoenvironmental records because they can be well preserved in Antarctic lacustrine sediments after deposition. $\delta^{13}\text{C}_{\text{org}}$ measured in the freshwater algae samples from the coastal ponds of Ross Sea region were very high up to about -12‰ . The sedimentary $\delta^{13}\text{C}_{\text{org}}$ values from different ponds of Ross Sea were very different, indicating the different source of sedimentary organic matter. Some lacustrine sediments had relatively high $\delta^{13}\text{C}_{\text{org}}$, almost in accordance with that of the studied lake algae, indicating organic matter predominantly sourced from aquatic algae, while the obviously low $\delta^{13}\text{C}_{\text{org}}$ values in some sediment profiles evince significant influence from penguin guano with algae as the secondary source. Based on the identification of sedimentary organic matter in the ponds, the sedimentary pigments had been analyzed for the sediment samples with different organic source using high performance liquid chromatography coupled with atmospheric pressure chemical ionisation mass spectrometry (HPLC-APCI-MS). The results showed that the pigment concentrations including chlorophyll a, chlorophyll b, zeaxanthin, echinenone, canthaxanthin, β -carotene, fucoxanthin, diadinoxanthin, peridinin and alloxanthin displayed large fluctuation against depth, and most of them showed almost consistent change trends. Based on the CHEMTAX analyses, we tentatively reconstructed the sedimentary record of algal community change and examined the possible effects of seabird activity on lake primary productivity and algal community structure. The results showed that chlorophyta, cyanophyta and diatom were the dominant species, and the input of penguin droppings promoted the growth of algae, especially for the chlorophyta, and thus increased lake primary productivity. The nutrient input derived from penguin droppings could cause the change of algal community structure in the coastal ponds and lakes of Antarctic region.