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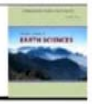

Application of stable isotope analysis methods for reconstructing paleoenvironment and paleoclimate in sediment cores

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ABSTRACT

Reconstruction of paleoenvironment and paleoclimate aims to clarify characteristics of environment and climate in the past, providing crucial information for simulating the change in environment and climate in the future. However, this research area has not been commonly carried out in Vietnam. The present study aims to contribute the methodologies and research methods for solving this gap by presenting the sampling and analytical methods of stable isotopes ($\delta^{13}C$, $\delta^{15}N$, $\delta^{18}O$, δD) in sediment cores. An experiment was performed for a certified reference material L-Alanine to demonstrate the analytical errors of $\delta^{13}C$ and $\delta^{15}N$ by the Nu-IRMS system. Additionally, the interpretation of $\delta^{18}O$ and $\delta^{13}C$ data in carbonate and organic materials of a sediment core from Ao Tien Lake, Ba Be National Park, Bac Kan province has also presented in detail. Temporal variations of $\delta^{18}O$ và $\delta^{13}C$ values demonstrated that the climate regime of this area was shifted similarly with Asian monsoon and the water flows from surrounding areas to lake tended to increase from the 1700 year ago to the present.

Keywords: Stable isotopes, paleoenvironment, paleoclimate, sediment, Ba Be Lake.

1. Introduction

Paleoenvironmental and paleoclimate reconstruction aims to assess and clarify the characteristics of climate and the environment in the past (Kilian and Lamy, 2012; Leng and Marshall, 2004). These studies provide crucial information for simulating the change of climate and environment in the future (Stocker et al., 2014). The sediment strata can achieve various climate and environmental indicators such as temperature, humidity, and precipitation in the past (Leng and Marshall, 2004). Analysis of such indicators achieved in sediments (stable isotopes, micro-fossils, pollen, organic matter compositions and sedimentary compositions) has been widely applied in many regions of the world (Wanner et al., 2008; Villalba et al., 2009; Berger et al., 2012; Kilian and Lamy, 2012;).

Paleoenvironment and paleoclimate in Vietnam have been reconstructed using sediment characteristics, pollen and diatoms in the sediment cores (e.g, Li et al., 2006; Tanabe et al., 2006; Nguyen and Duong, 2011). The analysis of ^{14}C dating and sedimentary facies in the Red River Delta showed that the transgression phase was taken

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