Available online at www.sciencedirect.com
ScienceDirect
Quaternary Research 68 (2007) 162–172
QUATERNARY RESEARCH
www.elsevier.com/locate/yqres

Sedimentary responses to the Pleistocene climatic variations recorded in the South China Sea

Sébastien Boulay [a,*], Christophe Colin [a], Alain Trentesaux [b], Stéphane Clain [c], Zhifei Liu [d], Christine Lauer-Leredde [e]

[a] *Intéractions et Dynamique des Environnements de Surface, UMR IDES-CNRS 8148, Bât. 504, Université Paris-Sud, 91405 Orsay Cedex, France*
[b] *Processus et Bilans des Domaines Sédimentaires, UMR PBDS-CNRS 8110, Université Lille I, 59655 Villeneuve d'Ascq, France*
[c] *Mathématiques Appliquées, CNRS-UMR 6620, Université Clermont II, 63117 Aubière, France*
[d] *Marine Geology, Tongji University, Shanghai 200092, People's Republic of China*
[e] *Dynamique de la Lithosphère, Université Montpellier II, 34095 Montpellier cedex 05, France*

Received 24 October 2006
Available online 11 May 2007

Abstract

Grain-size analyses, coupled with end-member modelling, have been performed on the terrigenous fraction of two Leg 184 Ocean Drilling Program sites (1144 and 1146) from the South China Sea. The grain-size distributions over the last 1.8 Ma enable a new interpretation of their connections to sea-level variations and East Asian monsoon strength. Previous investigations in this area have associated grain-size variability with enhanced eolian input during glacial stages. End-member modelling downgrades the importance of this eolian contribution and indicates that the sediments can be described as a mixture of three end-members: fluvial mud inputs, shelf reworking and river mouth migration. Grain-size variations in the Pleistocene section of the cores indicate a multiple-stage evolution: (i) from 1.8 to 1.25 Ma, the downcore grain-size variations are low but show a correspondence between monsoon rainfall intensity and the fine grain-sized fluvial inputs; no link with sea-level variations is noticeable; (ii) from 1.25 to 0.9 Ma, there is an increase (decrease) in the intermediate (fine) end-member (~100 kyr cycle) that is associated with the onset of a stronger summer monsoon and modest shelf reworking; (iii) from 0.9 to 0 Ma the grain-size record is dominated by global sea-level variations; each glacial stage is associated with extensive shelf reworking and conveyance of coarse particles to the basin.

Keywords: South China Sea; Grain size; End-members modelling; East Asian monsoon; Mid-Pleistocene Transition

Introduction

The South China Sea is under the influence of the East Asian monsoon, characterized by seasonal switches in wind direction, precipitation and runoff (Webster, 1987). During winter months, a high-pressure cell over Asia induces cold and dry winds blowing from Central Asia to the North Pacific Ocean. Conversely, during summer months, the formation of a low-pressure cell over the continent induces a reversal in wind direction and heavy monsoon rainfall over most of Southeast Asia (Webster, 1987).

Past variability in East Asian winter monsoon strength have been intensively investigated in the Chinese Loess Plateau, North Pacific Ocean as well as South China Sea sediments. These studies indicate a strengthened winter monsoon during glacial marine isotope stages and enhanced summer monsoon during interglacial marine isotope stages. In most of these studies, winter monsoon strength variations are characterized by strong cyclicities at ~100 and 41 kyr with considerably smaller variance in the 23 kyr precession band, indicating a link between high-latitudes climatic changes and monsoon variations (e.g., An et al., 1990; Ding et al., 1995; Xiao et al., 1995; Wang et al., 1999; Jian et al., 2001; Beaufort et al., 2003). Recent studies have shown that the East Asian summer monsoon pattern could be independent from the winter monsoon intensity and be characterized by different orbital

* Corresponding author. Fax: +33 1 69 15 48 82.
E-mail address: boulay_sebastien@yahoo.fr (S. Boulay).

0033-5894/$ - see front matter © 2007 University of Washington. All rights reserved.
doi:10.1016/j.yqres.2007.03.004