

SUBMARINE MASS MOVEMENTS AND THEIR CONSEQUENCES

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Submarine Slides During Relative Sea Level Rise: Two Examples from the Eastern Tyrrhenian Margin

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Abstract

Two extensive mass-failure deposits originated during the late-Quaternary sea level rise on the eastern Tyrrhenian margin. The deposits that failed had markedly different architectures: offshore Cape Licoso, a shelf-margin low-stand wedge failed along its basal downlap surface; in Paola slope basin, extensive failure on the upper slope involved a few-m-thick mud drape and older consolidated units. Regardless of their geometric differences, both failures occurred close to an interval of accelerated late-Quaternary sea-level rise (ca. 13.8 cal. kyr BP). This evidence suggests that rapid drowning of unconsolidated sediment resulted in increased water load; enhanced pore pressure played a role in favoring failure.

Keywords Sea-level rise - melt-water pulse - sediment failure - weak layer - geochronology

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SUBMARINE SLIDES DURING RELATIVE SEA LEVEL RISE: TWO EXAMPLES FROM THE EASTERN TYRRHENIAN MARGIN

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Abstract

Two extensive mass-failure deposits originated during the late-Quaternary sea level rise on the eastern Tyrrhenian margin. The deposits that failed had markedly different architectures: offshore Cape Licosa, a shelf-margin low-stand wedge failed along its basal downlap surface; in Paola slope basin, extensive failure on the upper slope involved a few-m-thick mud drape and older consolidated units. Regardless of their geometric differences, both failures occurred close to an interval of accelerated late-Quaternary sea-level rise (ca.13.8 cal. kyr BP). This evidence suggests that rapid drowning of unconsolidated sediment resulted in increased water load; enhanced pore pressure played a role in favoring failure.

Keywords: Sea-level rise, melt-water pulse, sediment failure, weak layer, geochronology

1. Introduction

Sea level lowering is commonly invoked as an important predisposing factor or potential trigger for sediment failure of unconsolidated sediment deposited during previous high-stand conditions on continental shelves and slopes (Vail et al., 1977; Coleman et al., 1983; Mutti, 1985). On Mediterranean margins, a significant portion of the Plio-Quaternary stratigraphic record consists of mass-failure deposits including deep-sea fans (Droz and Bellaiche 1985) and base-of-slope deposits (Farrán and Maldonado 1990; Nelson et al. 1991). These are clear examples of extensive deep-water mass wasting deposits originated during the low sea level stand of the Last Glacial Maximum (LGM). Despite this compelling evidence, studies from Quaternary continental margins increasingly document sediment failure during times of relative sea-level rise (Torres et al., 1995; Lastras et al., 2002); these results hint to a more complex relation between changing relative sea level and the generation of mass wasting (Ross et al., 1994). Additional examples of sediment failure during intervals of sea level rise come from two deposits (the Licosa slide and the Paola Basin mud flow deposit) on the eastern Tyrrhenian margin (Gallignani, 1982; Trincardi and Field, 1992; Trincardi et al., 1995). Herein, we review the architecture and age of these deposits to determine if a relation can be established between sediment failure and precise intervals of increased rates of sea level rise during the late Quaternary (Fig. 1). This relationship, however, does not exclude the role of seismicity (Soloviev, 1990) in triggering failure on the tectonically-active eastern Tyrrhenian margin.

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