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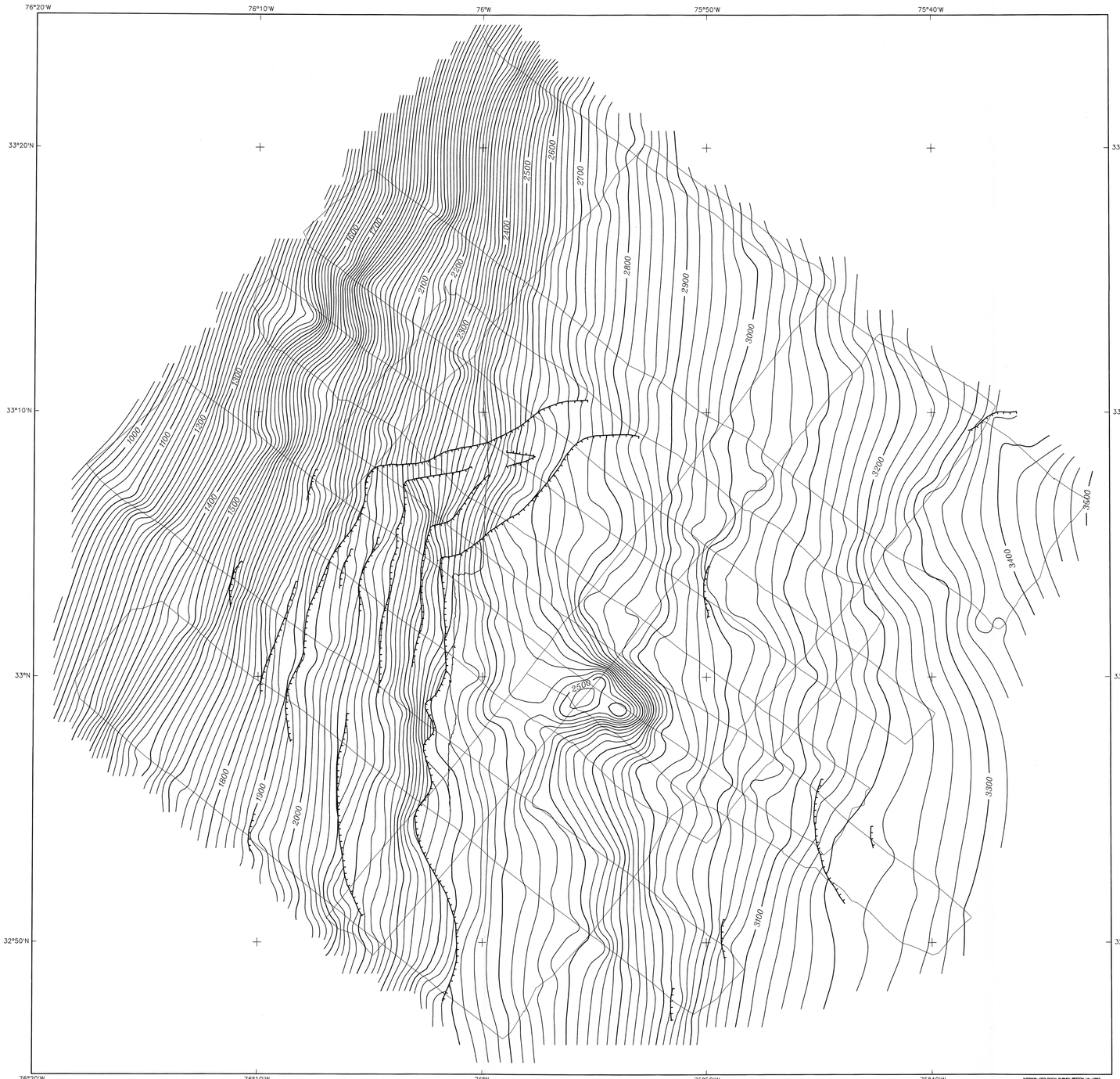

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BATHYMETRY AT THE HEAD OF THE CAPE FEAR SLIDE, OFFSHORE NORTH CAROLINA

By

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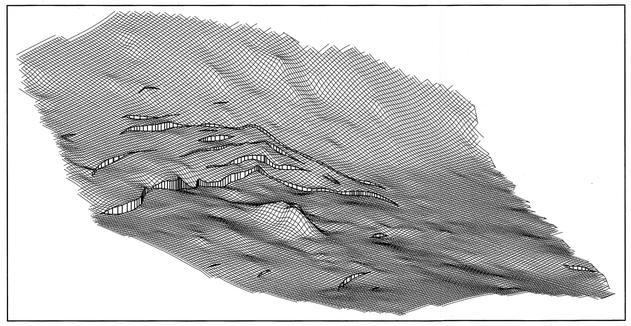

Figure 1. A three–dimensional view of the head of the Cape Fear slide looking northwest with a vertical exaggeration of 10x. The diapir is visible near the center of the image as a broad high. The scarps can be seen upslope of the diapir.

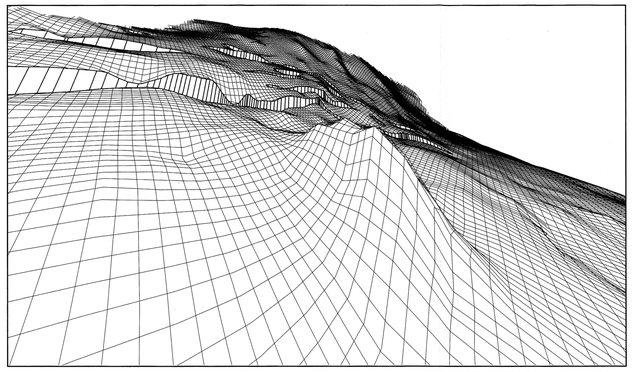

Figure 2. A three–dimensional view of the head of the Cape Fear Slide looking northwest from a viewing location 400 m above the seafloor southeast of the diapir. The vertical exaggeration is 15x and the angle of view is 120 degrees. The diapir is immediately visible in the foreground with the scarps in the background. There is a slight distorsion due to the wide angle of view.

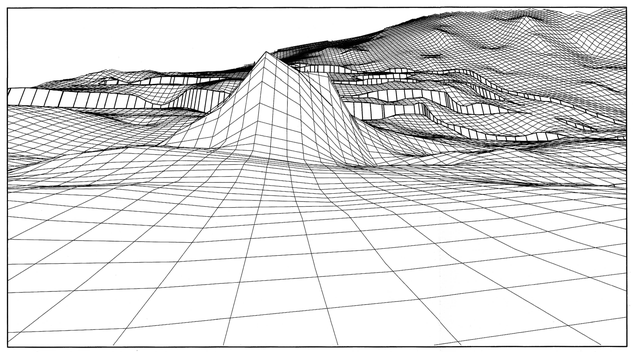

Figure 3. A three–dimensional view of the head of the Cape Fear Slide looking westward from a viewing location 50 m above the seafloor directly east of the diapir. The vertical exaggeration is 15x and the angle of view is 75 degrees. The diapir protrudes abruptly from the seafloor in the foreground with the scarps visible in the background.

EXPLANATION OF MAP SYMBOLS

- Scarp
- 3.5 kHz trackline
- Sidescan trackline

INTRODUCTION

The Cape Fear Slide is the largest mass–movement that has been observed on the U.S. Atlantic Margin. It is located off the Carolinas on the continental rise in approximately 1,200 – 5,500 m water depth and extends downslope for over 300 km (Popenoe, 1982). These maps show the bathymetry at the head of the Cape Fear Slide as interpreted from single–channel 3.5 kHz seismic–reflection profiles and mid–range Sea Marc I sidescan sonar imagery (Popenoe, 1982; Popenoe and others, 1991; Schmuck, 1991). The 3.5 kHz data consist of over 1000 km of profiles that were collected in 1988 for the University of North Carolina, Department of Geology. The UNC 3.5 kHz data were used as the main data set in interpreting the bathymetry. The sidescan sonar data were collected in 1980 by the U.S. Geological Survey in cooperation with the Lamont–Doherty Geological Observatory for the U.S. Bureau of Land Management Environmental Studies Program. Only 28 km (5 km swath width) of the sidescan data were used in the interpretation to identify the morphology of the main slump scarp and visible secondary scarps.

METHODS

The bathymetry was digitized by hand from the 3.5 kHz seismic–reflection profiles, merged with navigation and plotted using MAPGEN mapping computer software (Evenden and Botbol, 1985). The gridding, contouring and three–dimensional views of the bathymetric data were done by ISM (Interactive Surface Modeling, Dynamic Graphics Corp.). ISM was used to grid and contour the data because the program is capable of recognizing faulted surfaces. The contour data were later transported into ARC/INFO (ESRI, Environmental Systems Research Institute) for editing. Both ISM and ARC/INFO were run on a DEC 5000 workstation.

BATHYMETRY AND STRUCTURE

The head of the Cape Fear Slide occurs near 76° 00' N, 33° 00' W in water depths between approximately 1,500 and 3,300 m. The head of the slide is characterized by a main slump scarp that partially surrounds a large, breached diapir (Cashman and Popenoe, 1985). The main slump scarp is irregular, between 20 and 100 m in height and extends laterally for nearly 50 km. Several secondary scarps are located upslope from the main slump scarp and are smaller (< 40 m in height) and less continuous. The secondary scarps are believed to be the surface expression of fault–bounded, rotated blocks (Schmuck, 1991). Both the 3.5 kHz data and the sidescan sonar data show the scarps as being vertical or nearly vertical. The most prominent feature in the area is the large breached diapir located approximately 10 km downslope from the main slump scarp in the center of the map area. The diapir stands about 100 m above the seafloor on its landward flank and over 250 m above the sea floor on its seaward flank and has a lobate shape with two main highs with a depression between them. The diapir has an approximate diameter of 8 km and its highest point is at 2,526 m. Ten kilometers due north of the breached diapir is a bulge in the 2,740 m – 2,860 m contours that corresponds with another diapir located a few meters below the surface that is known from airgun seismic–reflection profile data (Schmuck, 1991). It can be inferred from these maps that a large section of the rise strata are missing seaward of the main slump scarp and that the breached diapir has been exhumed by the mass–movement. The abundance of secondary scarps and the extent and relief of the main slump scarp suggest that the area is inherrently unstable.

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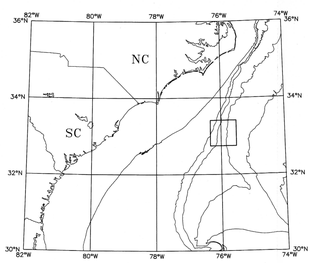

Index map showing study area

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