

CRUISE REPORT

R/V CAPE HATTERAS CRUISE CH-15-91

19-30 AUGUST, 1991

9470-65081  
DOE

91027

This cruise was designed to study the controlling factors for offshore hydrate deposits. The cruise sailed the day after hurricane "Bob" passed by offshore, so the first day of the cruise was marked by very rough seas, but conditions improved rapidly and data collection was very successful. Three data efforts were made:

AIRBORNE

- Seismic Profiling - Twelve seismic profiles, totalling 450 statute miles (391 nautical miles) were collected by workers from the U.S. Geological Survey, Woods Hole. These were obtained in three settings: 1. In a landslide setting we confirmed that the base of the hydrate zone became shallower or broke down under the slide, suggesting a pressure control on hydrate formation. 2. Over salt diapirs the hydrate also either broke down or became shallower, probably because of increased heat flow in the diapir. 3. In the open slope setting, extensive evidence for trapping of free gas beneath the hydrate was observed.
- Coring - Twelve cores up to nearly 40 feet long were collected in areas of strong hydrate development by a group from the University of North Carolina. Pore water was squeezed from the sediments aboard ship using nitrogen pressure and some geochemical analyses made. Both microbially-produced compounds, such as methane, ammonia and carbon dioxide and stable tracers such as chloride and sulfate have, or will be measured. Strong regional variations and gradients with depth have been documented.
- Heat Flow Measurements - Three transects were made, totalling 32 measurement sites where a probe was inserted into sea-floor sediments to remotely record heat gradient and heat conductivity of the sediments. The work was done by a group from Woods Hole Oceanographic Institution. The three transects correspond to the three settings for the seismic studies and show distinctly high heat flow over the salt diapir.

Scientific party

- W. P. Dillon, USGS, Co-Chief Scientist
- Kristen Fehlhaber USGS
- Thomas O' Brien USGS
- Charles K. Paull, UNC, Co-Chief Scientist
- William Ussler, UNC
- Walter Borowski, UNC
- Collin Mellor, UNC
- Sutton Edlick, UNC
- Richard Von Herzen, WHOI, Co-Chief Scientist
- Alain Bonneville, WHOI
- Paul Fucile, WHOI

APPROXIMATE LINE ENDS FOR SEISMIC SURVEYS

SEISMIC SURVEY #1

- 33° 20.5'N 75° 01'W  
Line 1
- 32° 39'N 75°21.5' W  
Line 2
- 32° 36.5'N 75° 15'W  
Line 3
- 33° 19'N 74° 55'W  
Line 4
- 33° 16'N 74° 43.5'W  
Line 5
- 32° 32'N 75° 03'W

SEISMIC SURVEY #2

- 32° 48'N 74° 55'W  
Line 6
- 32° 59.5'N 75° 16'W  
Line 7
- 33° 07.5'N 75° 44' W  
Line 8
- 32° 46' N 76° 13.5'W  
Line 9
- 32° 44.5' N 75° 32'W  
Line 10
- 33°13' N 76° 15'W

SEISMIC SURVEY #3

- 33° 49.4'N 75° 52.3' W  
Line 11
- 32° 35.9' N 75° 26.7'W  
Line 12
- 32° 38.1' N 76° 27.1'W

Location of Piston Core Sites, R/V Cape Hatteras Cruise CH-15-91  
 Chief Scientist, Wm. Dillon  
 Coring organized by Charlie Paull, U.N.C.

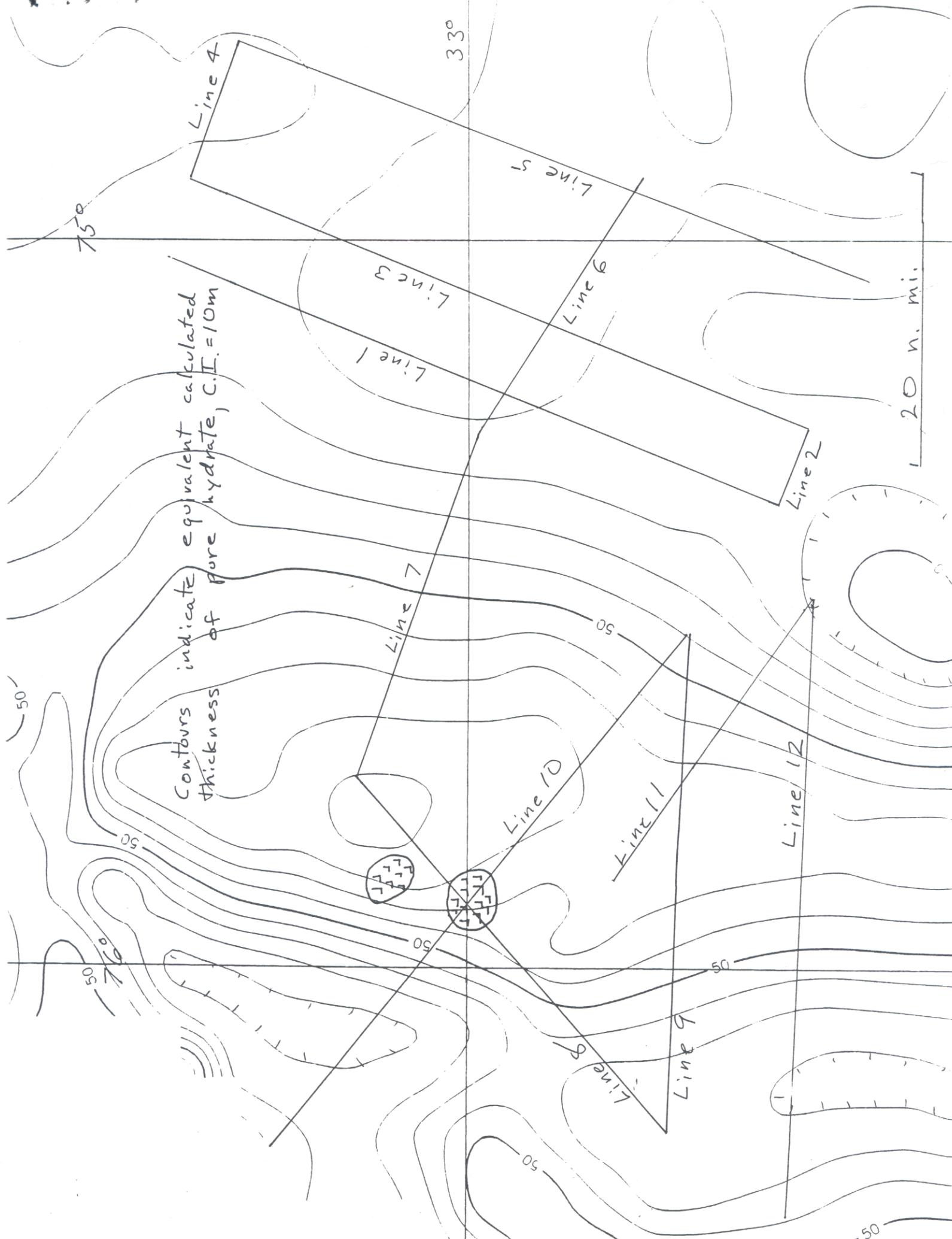
(Lat)	(Long)	
32d57.54	-75d05.04	Core 1
-33d06.90	-75d00.70	Core 2
32d42.70	-75d12.00	Core 3
32d56.09	-75d05.65	Core 4
-33d08.80	-74d59.90	Core 5
32d49.76	-76d08.38	Core 6
32d45.27	-75d51.70	Core 7
32d45.54	-76d04.94	Core 8
32d59.54	-75d54.71	Core 9
32d58.27	-75d52.29	Core 10
33d00.18	-75d56.31	Core 11
-33d01.40	-75d57.31	Core 12

Location of Heat Flow Stations, R/V Cape Hatteras Cruise CH-15-91  
 Chief Scientist, Wm. Dillon  
 Heat Flow study conducted by Richard von Herzen, WHOI

*33d09.80	-74d58.90	HF-1-1
-33d08.68	-74d59.86	HF-1-2
-33d07.20	-75d00.70	HF-1-3
-33d06.60	-75d01.60	HF-1-4
-33d04.60	-75d02.20	HF-1-5
-33d02.90	-75d03.10	HF-1-6
32d59.20	-75d04.50	HF-1-8
32d58.10	-75d05.40	HF-1-9
32d56.10	-75d05.60	HF-1-10
32d53.90	-75d06.70	HF-1-11
32d46.00	-76d13.00	HF-2-1
32d46.10	-76d11.70	HF-2-2
32d46.00	-76d10.20	HF-2-3
32d46.00	-76d08.70	HF-2-4
32d45.90	-76d07.20	HF-2-5
32d46.00	-76d05.20	HF-2-6
32d46.10	-76d03.30	HF-2-7
32d45.70	-76d01.40	HF-2-8
32d45.90	-75d59.30	HF-2-9
32d46.00	-75d57.10	HF-2-10
32d45.80	-75d55.10	HF-2-11
32d45.80	-75d53.10	HF-2-12a
32d45.60	-75d51.10	HF-2-13
32d45.70	-75d49.30	HF-2-14
32d45.30	-75d47.30	HF-2-15
-33d03.60	-76d00.80	HF-3-1
-33d02.80	-75d59.70	HF-3-2
-33d01.80	-75d58.00	HF-3-3
-33d01.30	-75d57.00	HF-3-4
-33d00.70	-75d56.20	HF-3-5
32d59.77	-75d54.68	HF-3-7
32d59.32	-75d54.03	HF-3-9

Thurs 1:30

Contours indicate equivalent calculated thickness of pure hydrate, C.I. = 10m



20 n. mi.