

SEISMO-ACOUSTIC IMAGERY OF A CARBONATE/HYDRATE MOUND IN THE GULF OF MEXICO

Thomas McGee and Leonardo Macelloni
Center for Marine Resources and Environmental Technology
University of Mississippi

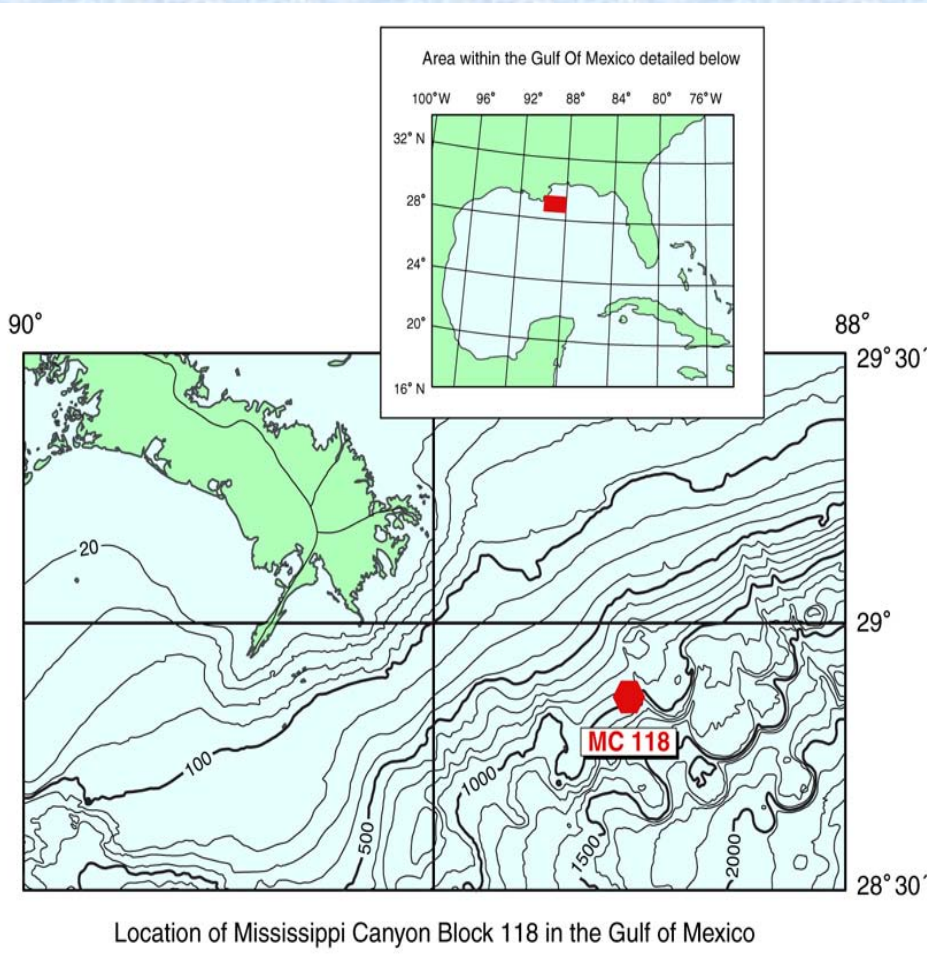
Presented to the
American Geophysical Union Fall Meeting
San Francisco, California
11-15 December 2006



BACKGROUND INFORMATION

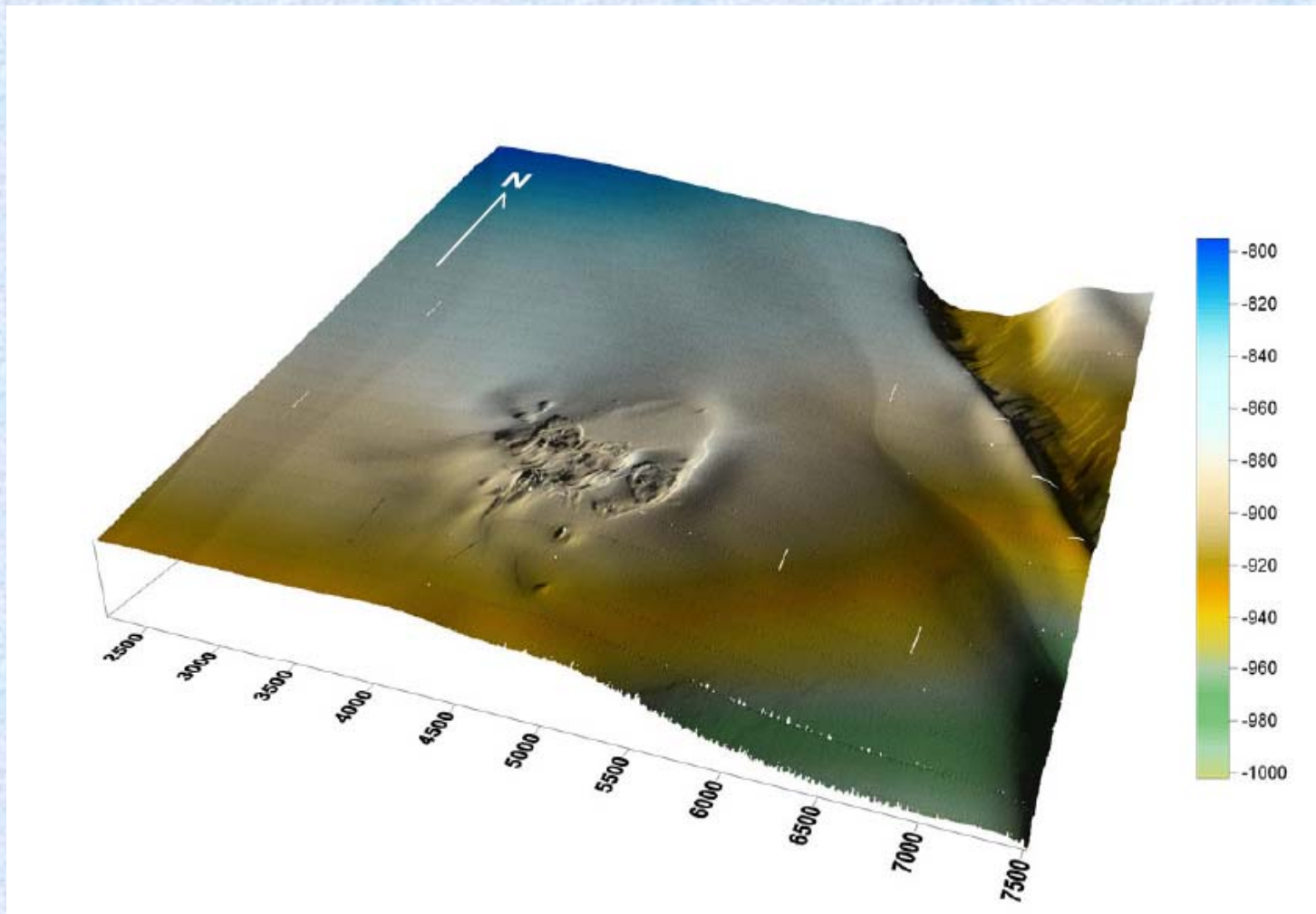
In the northern Gulf of Mexico, hydrates outcrop within carbonate mounds precipitated by microbial action at sites of hydrocarbon venting from cold seeps.

Such seeps are located along faults that act as pathways for fluids migrating upward from deep reservoirs.

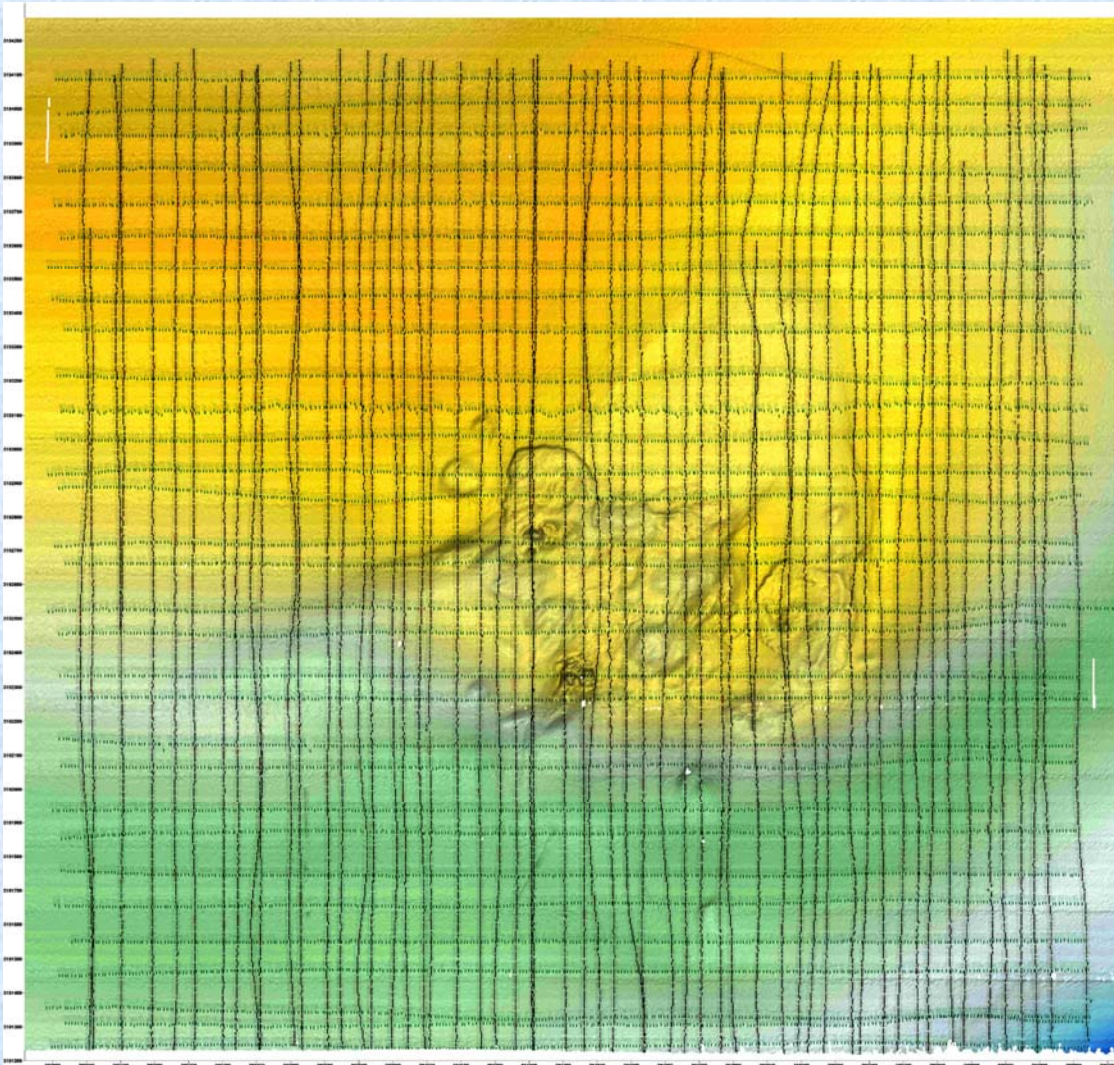


Location of MC118

**The Gulf of Mexico
Hydrate Research
Consortium has begun
to install a sea-floor
observatory at such a
mound in federal lease
block
Mississippi Canyon 118.**

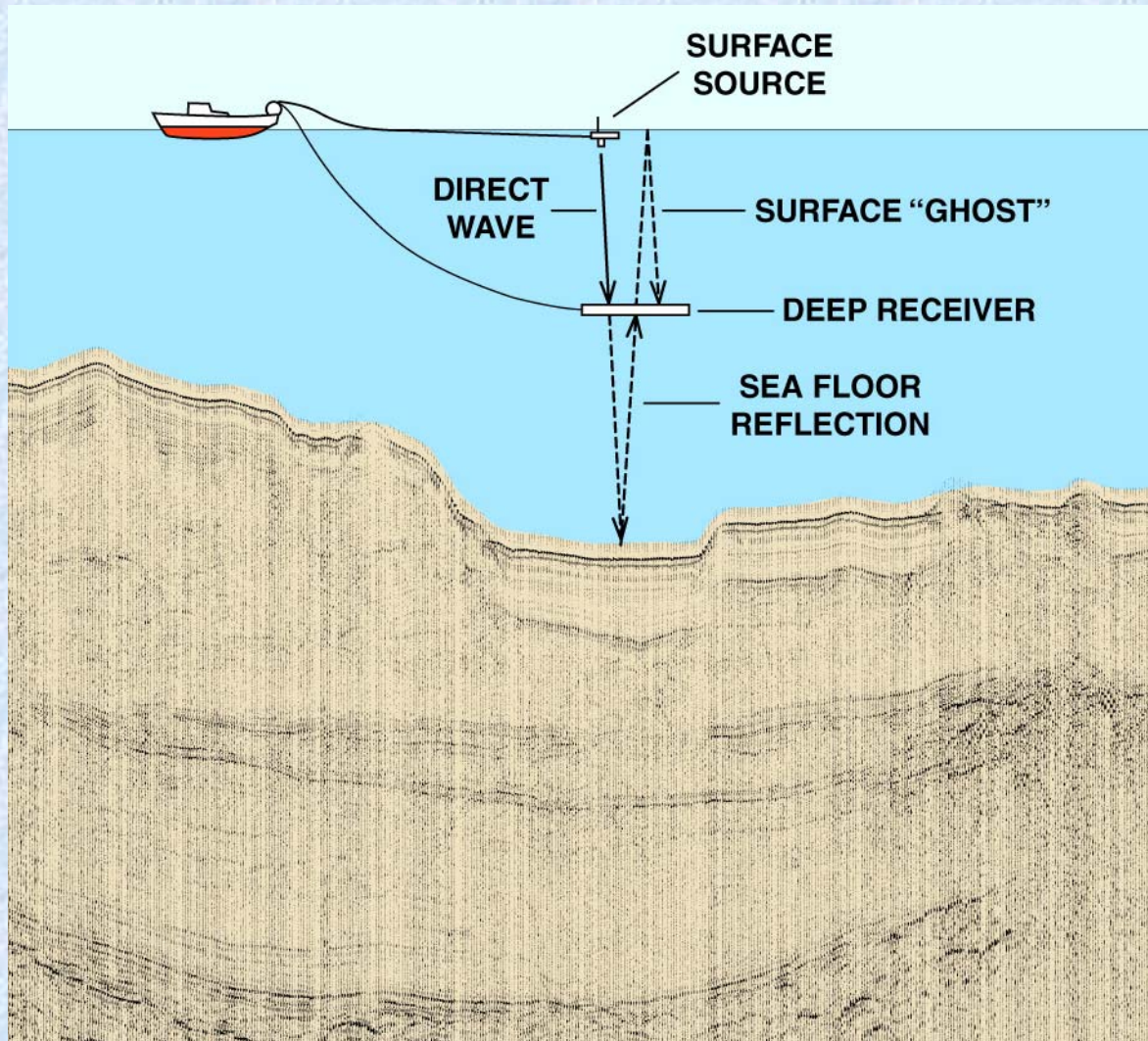


Oblique view of AUV swath bathymetry in MC118.

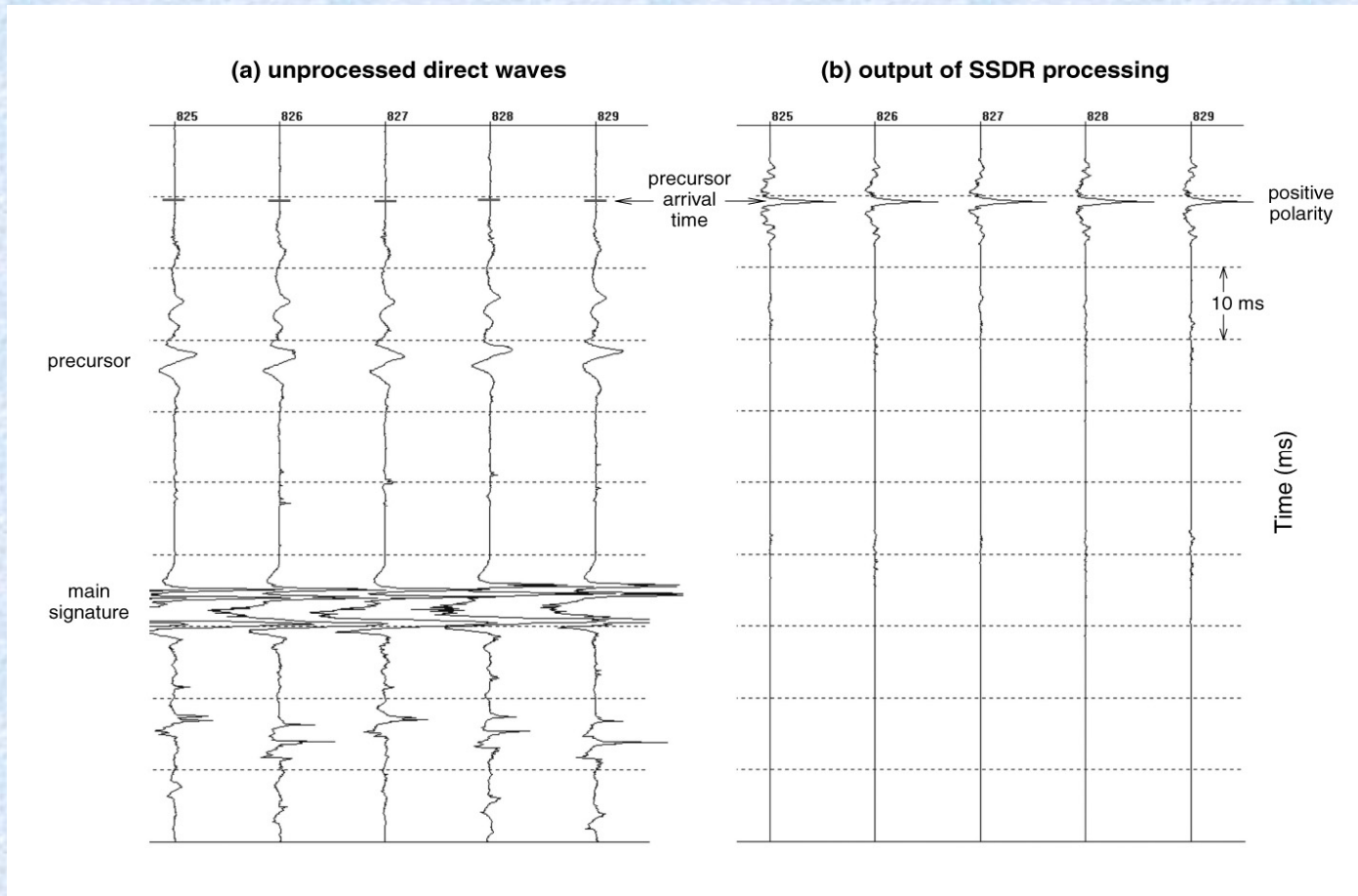


**A grid of seismic profiles
has been acquired
over the mound.**

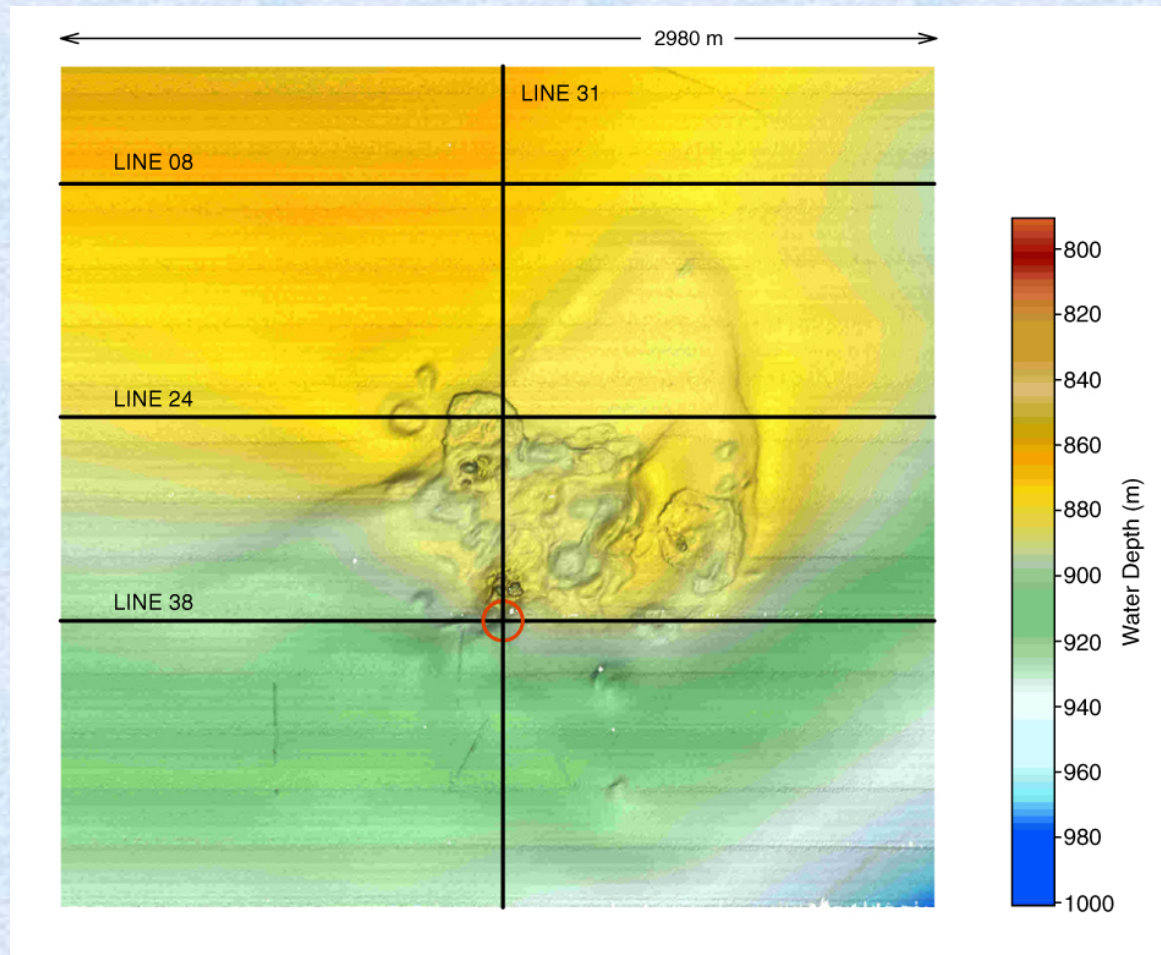
**Nominal spacing
is 50m between
north-south
profiles and
100m between
east-west profiles.**



The profiling used the “surface source, deep receiver” (SSDR) technique with an 80in³ watergun source and a single-channel receiver.



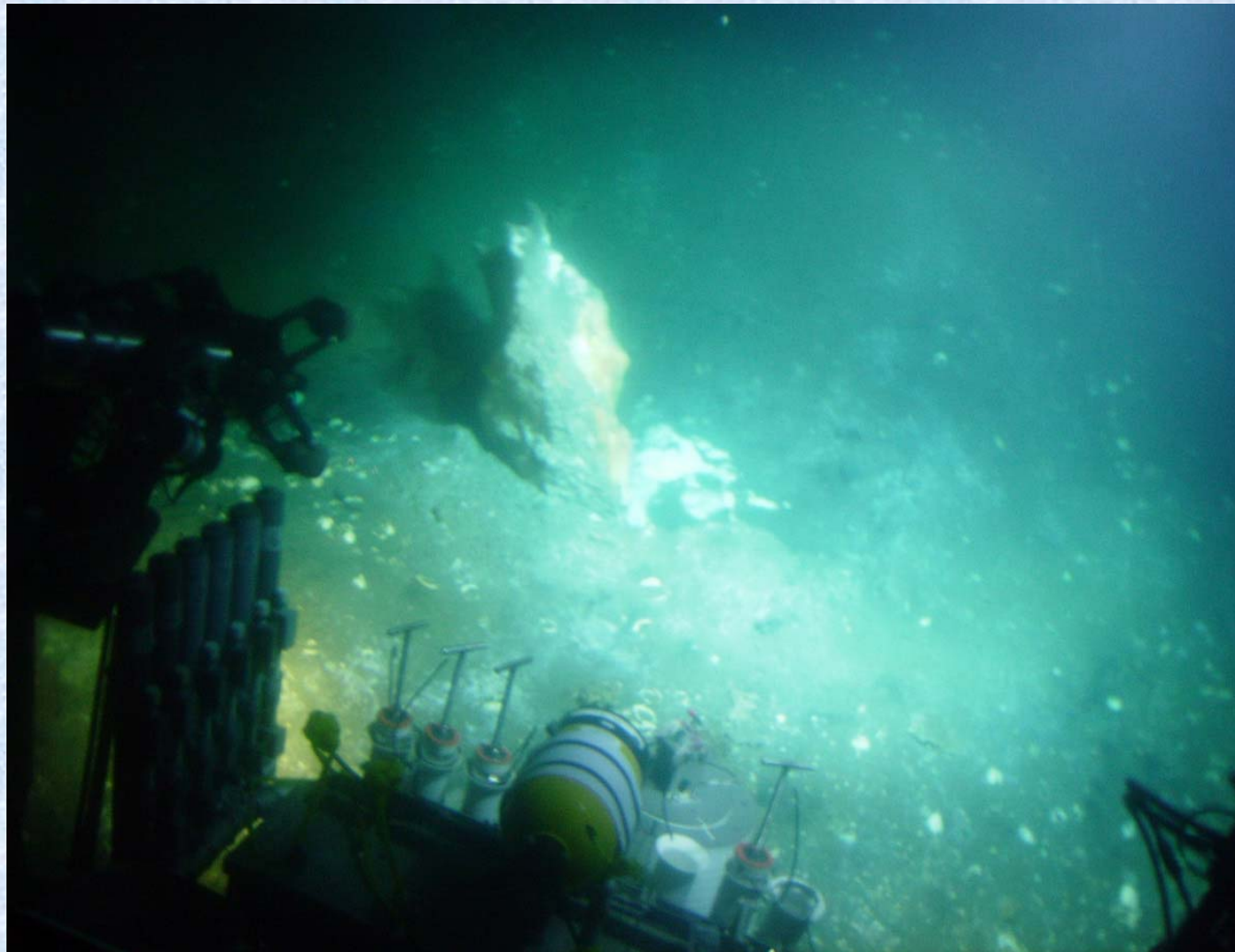
SSDR direct waves before and after processing. Note the ~100ms input compresses to a 2ms output of positive polarity.



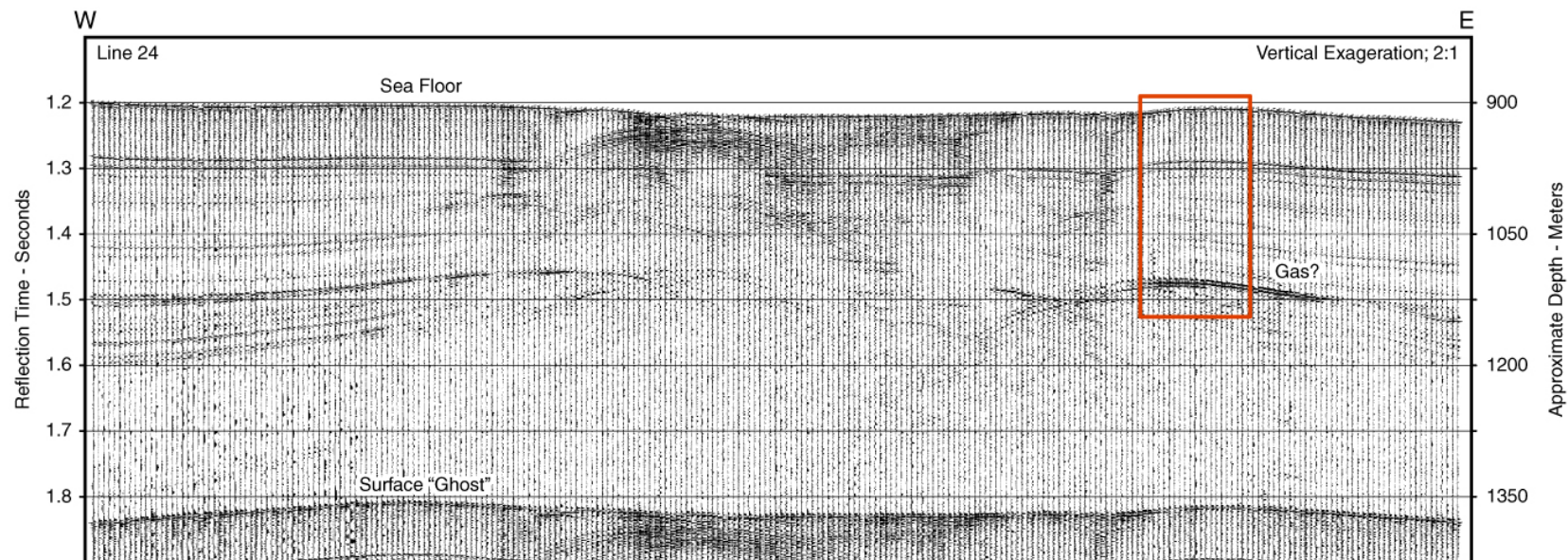
**Location of example profiles shown herein.
Circle marks region of vent craters and hydrate outcrops.**



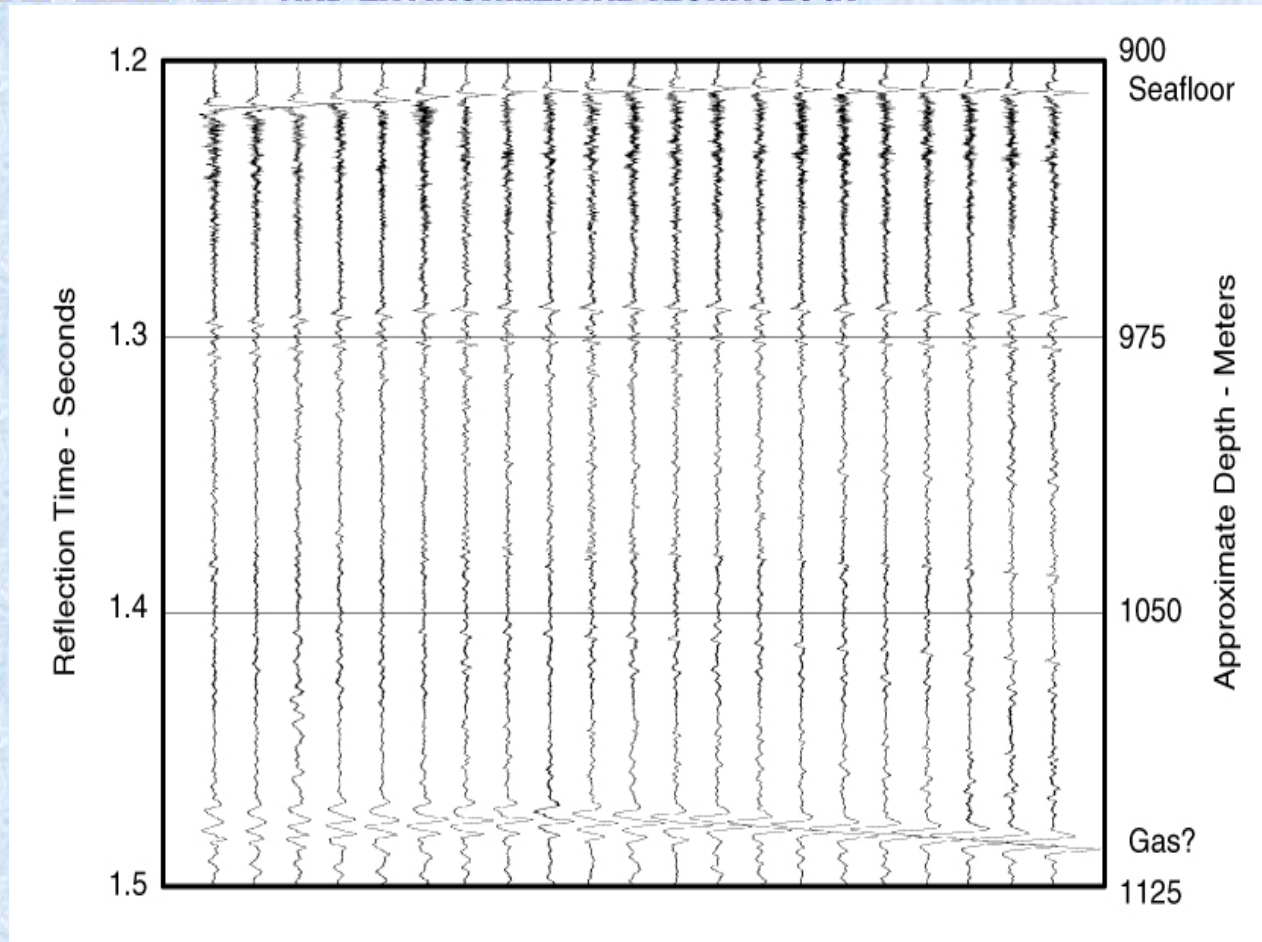
**Hydrate outcrop (~6x2x1.5m) extending from crater wall
within circled region.**



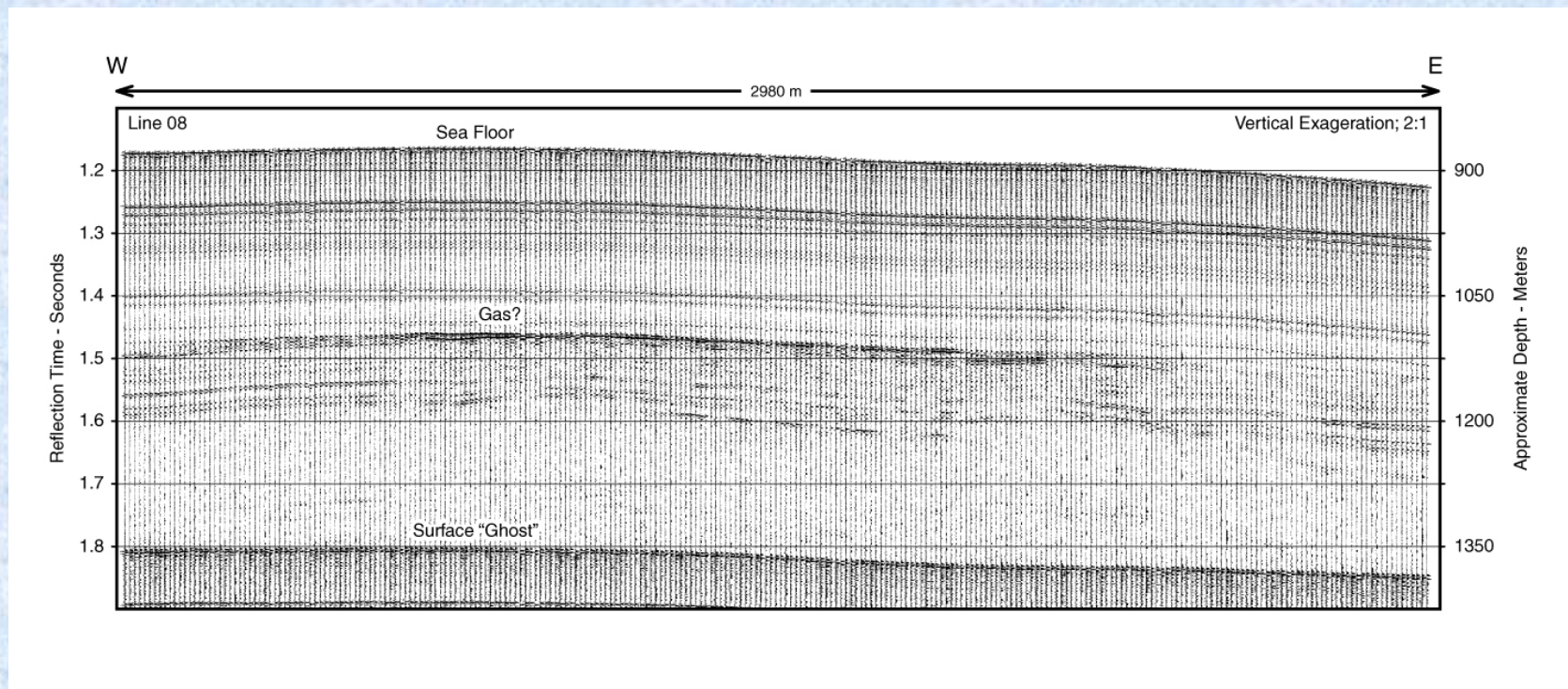
Hydrate outcrop (~1.5m tall) within same crater.



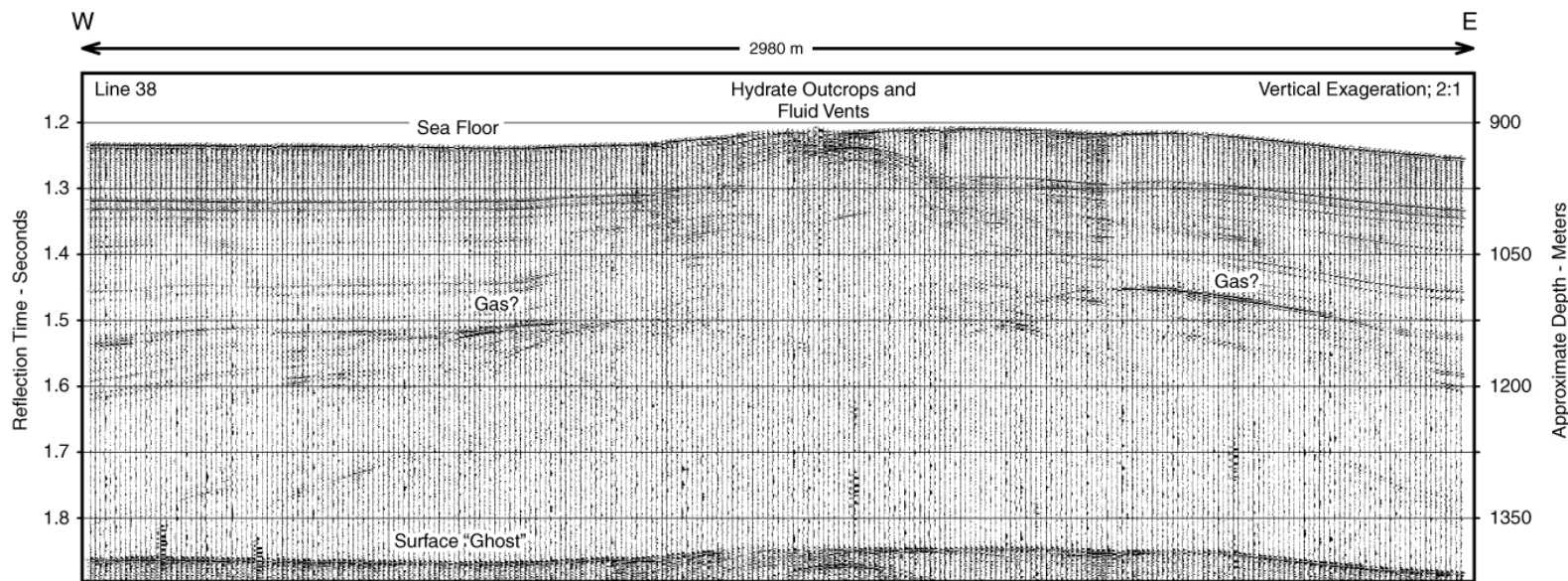
**East-west profile across northern part of mound.
Note arrival of surface “ghost” limits depth of useful
penetration. Detail within rectangle is shown on next slide.**



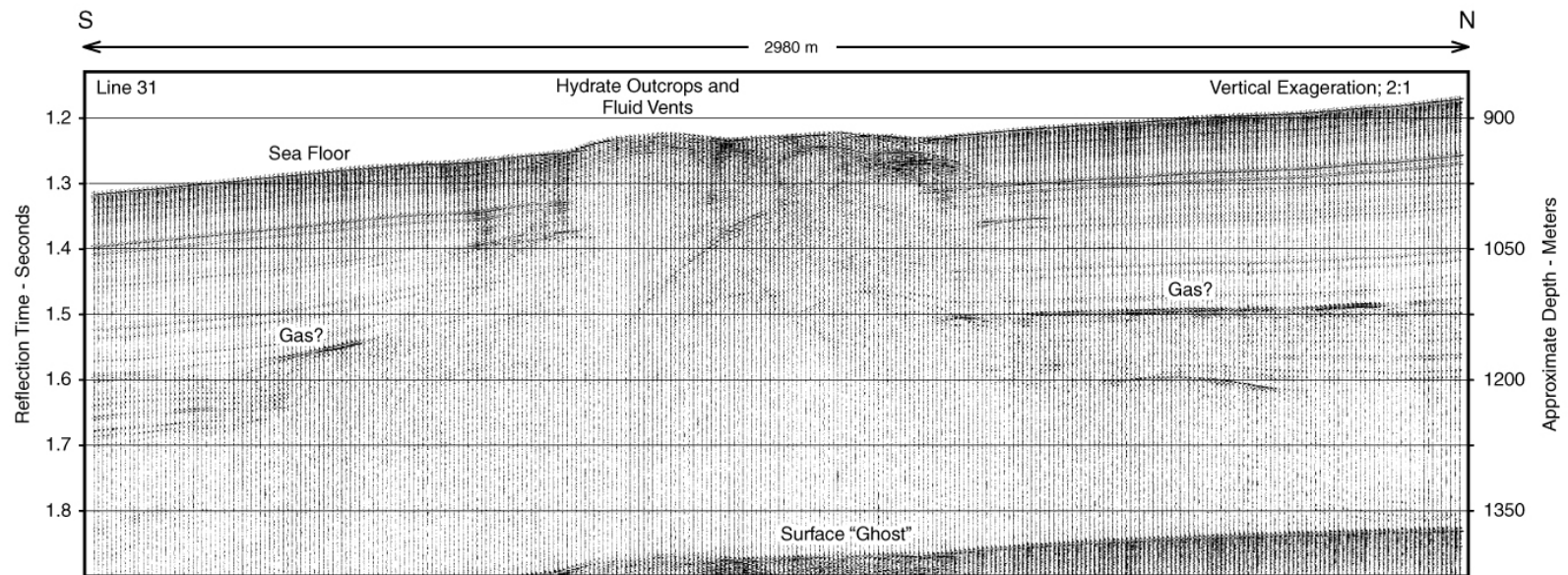
Detail from previous slide. Polarity of seafloor reflection is positive, that of sub-bottom reflections is negative. Transmission coefficient from Seafloor to “Gas?” is ~0.99.



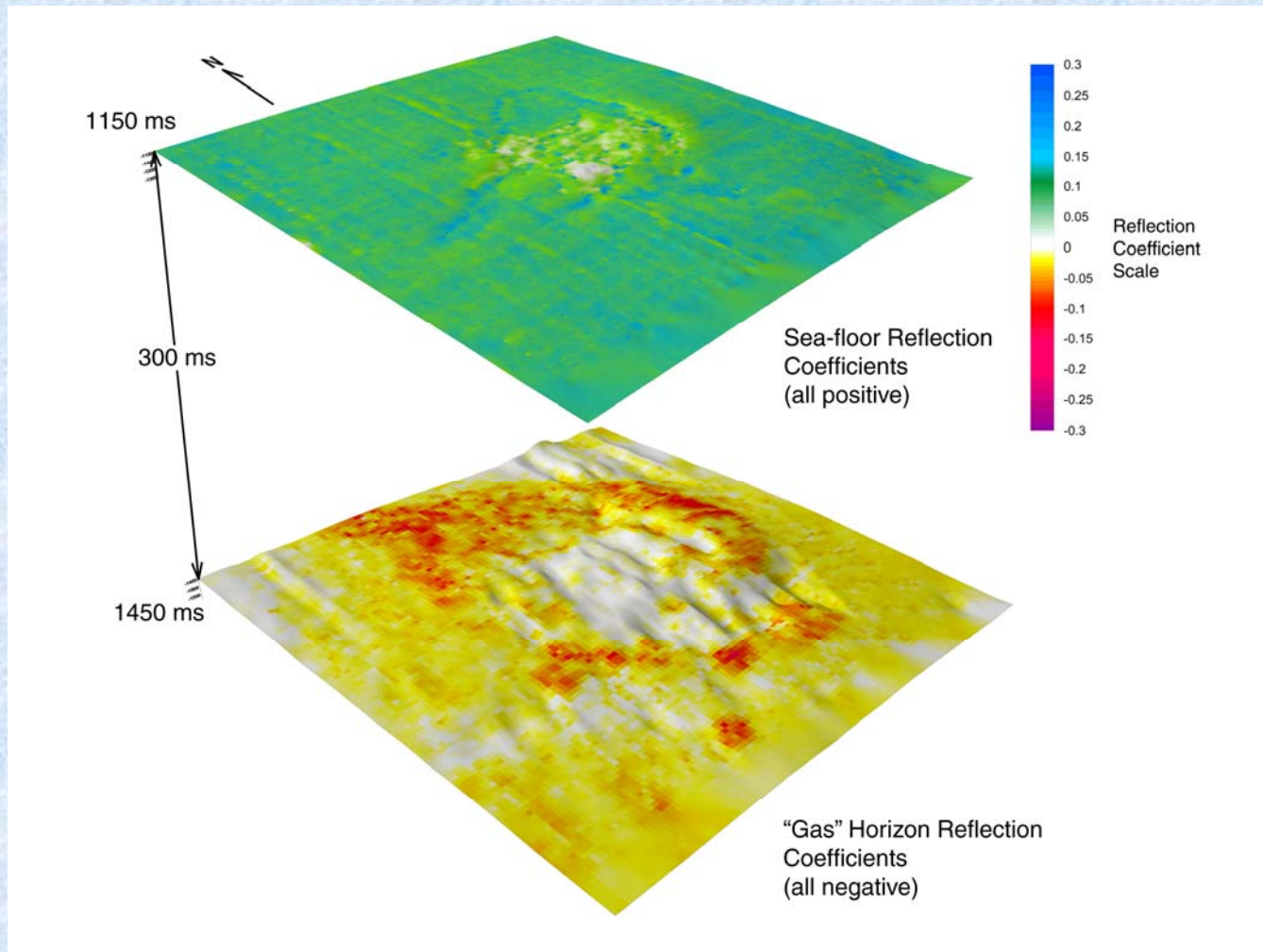
East-west profile located north of mound. The negative reflector (“Gas?”) corresponds to that on previous profile.



East-west profile across region of massive hydrate outcrops and fluid venting.



North-south profile across region of massive hydrate outcrops and fluid venting.



Estimates of reflection coefficients on all profiles.

CMRET

**CENTER FOR MARINE RESOURCES
AND ENVIRONMENTAL TECHNOLOGY**

Thanks for your attention.



ACKNOWLEDGMENTS

Carol Lutken, Alessandro Bosman, Charlotte Brunner, Ken Sleeper, Bob Woolsey and Paul Mitchell contributed substantially.

Swath bathymetry data were recorded/processed by C&C Technologies of Lafayette, Louisiana, and reprocessed by the Department of Earth Science at the University of Rome “La Sapienza”.

SSDR profiles were acquired with the assistance of Specialty Devices Inc. of Plano, Texas, and recorded/processed using software by Lookout Geophysical Company of Palisade, Colorado.

Funding was provided by the U.S. Department of the Interior (MMS), the U.S. Department of Energy (NETL) and the U.S. Department of Commerce (NOAA/NIUST).



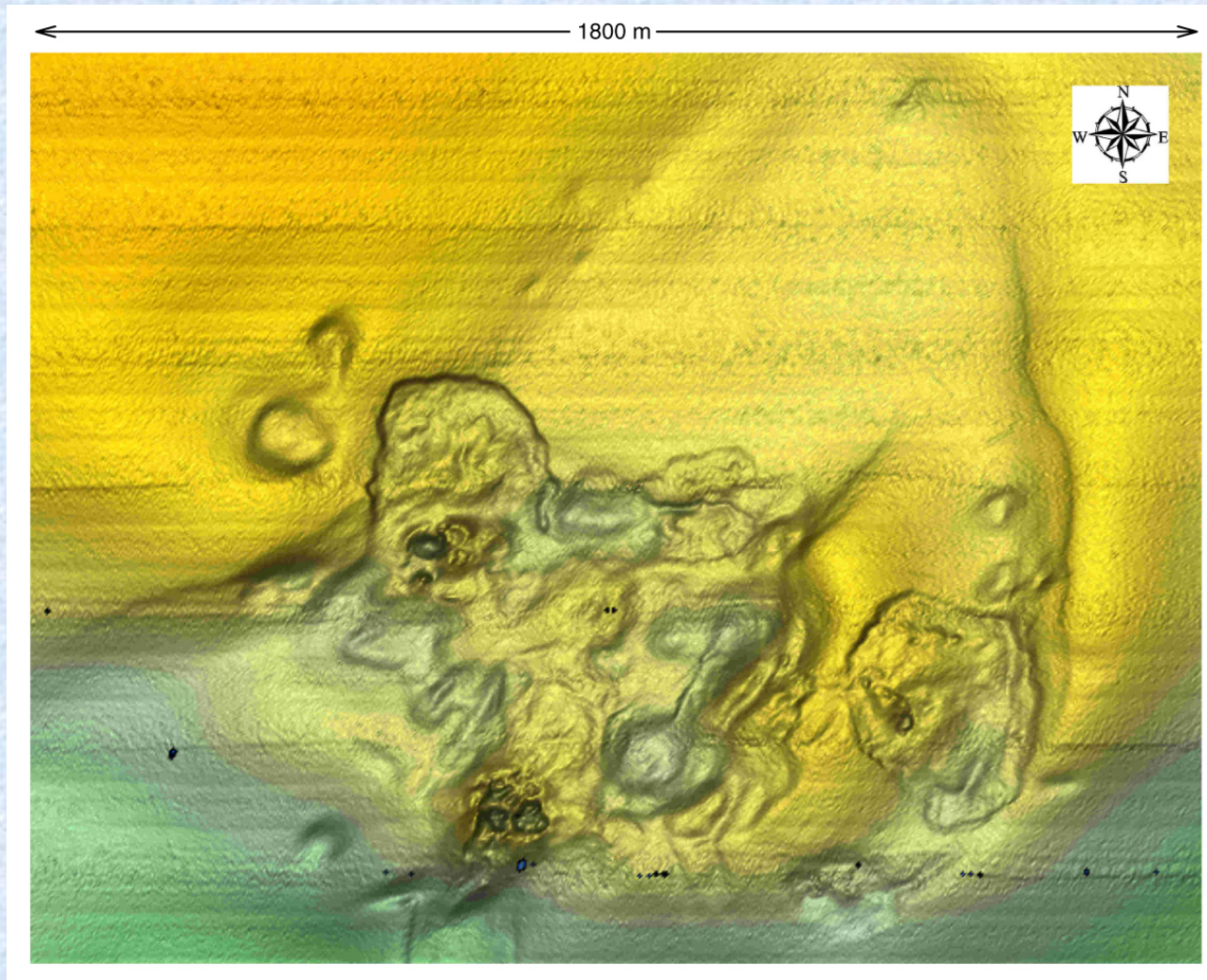
Hydrates in MC118 are structure II.

The gas contained in them is

70% methane, 12% ethane and 16% propane with

minor other hydrocarbon gases and CO₂

(analysis by Roger Sassen).



Plan view of MC118 mound. Note well-defined depressions.