

Gas Blowout Workshop Lesson Plan: Landslide or Not?

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NOTE: THIS LESSON SHOULD BE USED IN CONJUNCTION WITH MATERIALS FROM THE [GAS BLOWOUT EXPLORATION AT THE LAMONT-DOHERTY EARTH OBSERVATORY](#) IN JULY 2005. THE PROGRAM WAS SPONSORED BY THE EARTH2CLASSWORKSHOPS FOR TEACHERS AND NSF COLLABORATIVE RESEARCH GRANT 0242426.

Standards Supported: (All from *Physical Setting: Earth Science Core Curriculum*, <http://www.emsc.nysed.gov/ciai/mst/pub/earthsci.pdf>)

Standard 2: Information Systems

Standard 4: Key Idea 2: Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

Standard 6: Interconnectedness: Patterns of Change

Standard 7: Interdisciplinary Problem Solving

Objectives:

Students will use stratigraphic principles learned in Earth Science courses to examine information about a large submarine landslide off of the coasts of Virginia and North Carolina. This slide, called the Albemarle-Currituck Slide, occurred approximately 18,000 years ago. It is estimated that over 33 cubic miles of material slid seaward from the edge of the continental shelf. Most likely, this event caused a tsunami that affected parts of eastern North America.

Students will use information and data to infer whether observed "cracks" in the continental shelf off the coast of the eastern United States point to a future undersea landslide.

Introduction:

Although the east coast of North America is generally much less likely to be affected by a tsunami than the west coast, tsunami threats do exist.

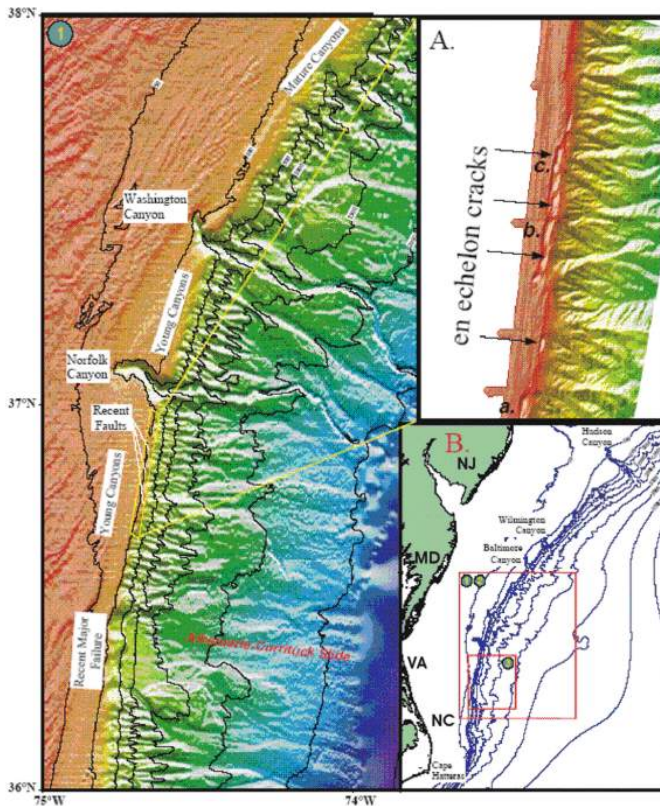
Please start by reading about Atlantic tsunami possibilities on this website:

<http://www.state.me.us/doc/nrimc/mgs/sites-2005/jan05.htm>

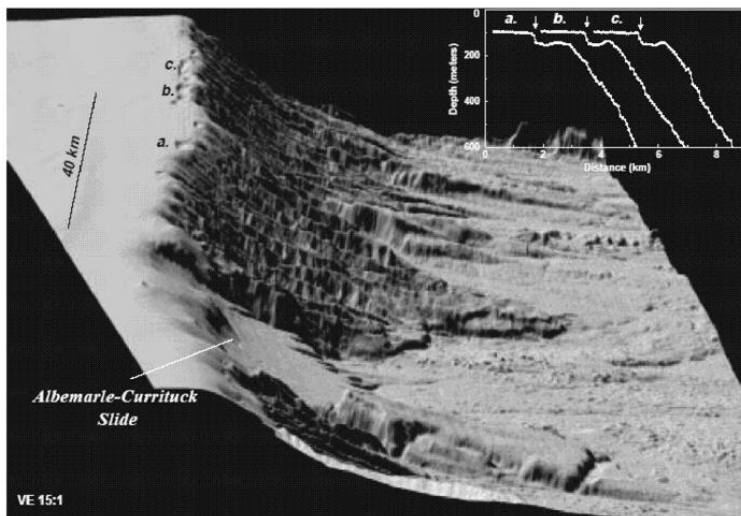
Driscoll and others (2000) found evidence of a large submarine landslide off of the coasts of Virginia and North Carolina. This slide, called the Albemarle-Currituck Slide, occurred approximately 18,000 years ago, and more than 33 cubic miles of material may have slid seaward from the edge of the continental shelf. Most likely, the event caused a tsunami. See Figure 11 on the website (<http://www.state.me.us/doc/nrimc/mgs/sites-2005/jan05-11.htm>).

Recent studies by Weissel, Cormier, and others aboard the R/V "Cape Hatteras" followed the original discoveries by exploring this region in more detail during 2004. Their research was shared with teachers during a [summer workshop](#) held at the Lamont-Doherty Earth Observatory of Columbia University.

The next images show some of their research results.



A three-dimensional image of the slide is shown in Figure 12 on the website (<http://www.state.me.us/doc/nrimc/mgs/sites-2005/jan05-12.htm>)



Investigation of the outer continental shelf just north of the slide and the slide's structure found that "cracks" in the continental shelf exist (marked as a, b and c in Figures 11 and 12, from Driscoll and others, (2000)). These cracks may or may not indicate a progression towards slope failure and the potential for another submarine landslide to occur that could trigger a tsunami on the order of a few to several meters in height, similar to a storm surge resulting from a Category 3 or 4 hurricane.

How will scientists determine whether these "cracks" really do indicate a future landslide? In this investigation, you will examine data that has been gathered by scientists and will come to your

own conclusions about the possibilities of a future landslide. You will cite evidence from these websites to support your inferences and answer the questions that follow.

Here is Dr. Jeffrey Weissel's PowerPoint presentation from the "Gas Blowouts Workshop":
http://www.earth2class.org/er/conferences/weissel%20summer%2005_files/Gas%20Blowout/JeffW/blowouts_teacher_wshop05.pdf

Here is Dr. Marie-Helene Cormier's PowerPoint presentation:
http://www.earth2class.org/er/conferences/weissel%20summer%2005_files/Gas%20Blowout/MileneC/blowouts_methods.pdf

Here is Kori Newman's PowerPoint presentation from the Workshop:
http://www.earth2class.org/er/conferences/weissel%20summer%2005_files/Gas%20Blowout/KoriN.pdf

Additional web resources:

Gas Blowouts

<http://pubs.usgs.gov/fs/fs021-01/fs021-01.pdf>

http://earthguide.ucsd.edu/seafloorscience/slopes/slopes_hydrates.html

Landslides

<http://www.ussartf.org/landslides.htm>

<http://www.naturalsciences.org/funstuff/faqs/tsunami.html#chance>

http://earthguide.ucsd.edu/seafloorscience/slopes/slopes_slides.html

http://www.ig.utexas.edu/people/staff/goff/abstracts/Driscoll_canyons.pdf

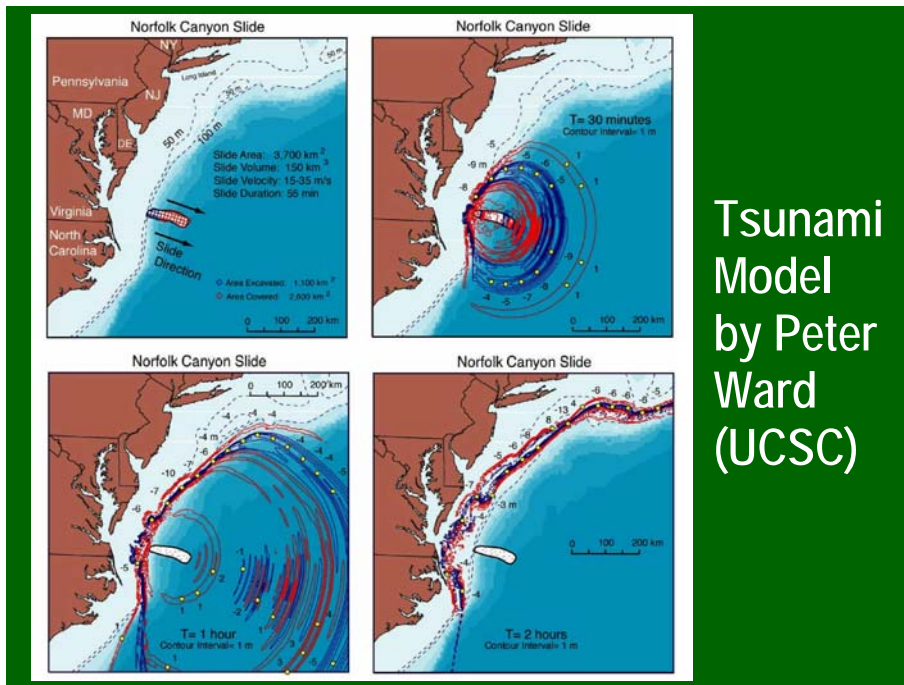
<http://www.ig.utexas.edu/research/projects/cracks/cracks.htm>

<http://www.who.edu/mr/pr.do?id=985>

Go to the website <http://www.soest.hawaii.edu/tsunami/tsugen.html> and read about how an underwater landslide can generate a tsunami.

Here is an article (published more than four years before the huge Sumatra tsunami) about such dangers: <http://archives.cnn.com/2000/NATURE/12/19/science.tsunamis.reut/>

The tsunami model developed by Peter Ward pictured below shows the theoretical effects of a tsunami generated by a landslide off the coast of Virginia and North Carolina



It is easy to see why scientists and others want to find out whether another such landslide may occur in the future.

Discuss with your teacher an appropriate format in which to answer these Questions. Cite evidence to support your inferences.

When did the Albemarle-Currituck Landslide occur? How do we know?

According to the scientists' data, what event(s) may have lead to the present shape of the Albemarle-Currituck Slide?

According to what is presently known about the composition of the upper continental shelf, are similar slides and cracking likely to have occurred elsewhere? How do we know?

What factors may cause a landslide such as the Albemarle-Currituck landslide? Which of these factors exist now on the continental shelf off Virginia and North Carolina?

What is a methane hydrate gas blowout? How might this be related to an off-shore landslide?

Compare and contrast a "gas blow-out" slide to a seismic-generated landslide.

According to the "Principle of Original Horizontality," what can be inferred from the cross-section of the Albemarle-Currituck Slide?

According to the research you have done, are we at risk for an undersea landslide such as the Albemarle-Currituck landslide?

Filename: LabLandslideorNot
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Template: C:\Documents and Settings\Administrator\Application
Data\Microsoft\Templates\Normal.dot
Title: Aim: Landslide or not
Subject:
Author: Cheryl Dodes
Keywords:
Comments:
Creation Date: 8/23/2005 11:21:00 AM
Change Number: 19
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Last Saved By: Michael Passow
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