

Education Component of
the Ridge2K component
of the
Marine Geoscience Data System

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*Presentation to Advisory Committee
8 November 2006*

Education Component of the Ridge2K component of the Marine Geoscience Data Management System

- Input from education-oriented users into design of data access and display tools
- Learning Science research
- Development, dissemination, and testing of exemplary data-rich student activities
 - Earth Exploration Toolkit
 - Data Puzzles
 - Conceptests

Input from education users into tool design

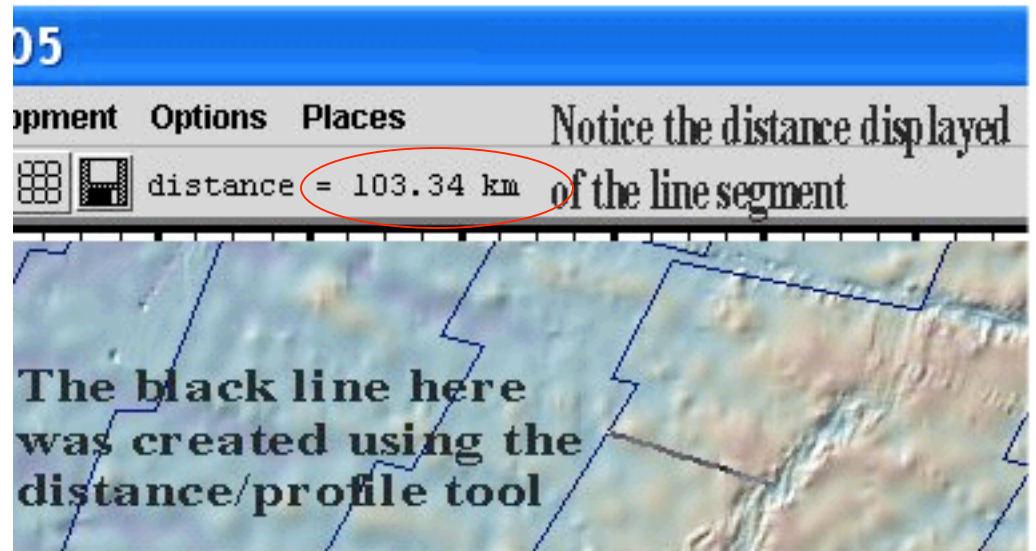
- 2005 DLESE Data Services Workshop
- Dedicated workshop on use of Ridge data in education (2005)
- MARGINS Education & Public Outreach workshop
- 2006 DLESE data services workshop
- Earth2Class (K-12 teachers)
- L-DEO summer interns
- Hamilton College undergrads



Input from education users into tool design

Recommendations implemented:

- Map scale (adjusts with zoom)
- Inset location map
- Distance-measuring tool
- Clearer links to information about how data were collected
- Overlay of place names (partial)
- Visual indicator when system is thinking
- User manual or “Help” feature



Compelling recommendations remaining:

- Depth scale for earthquakes

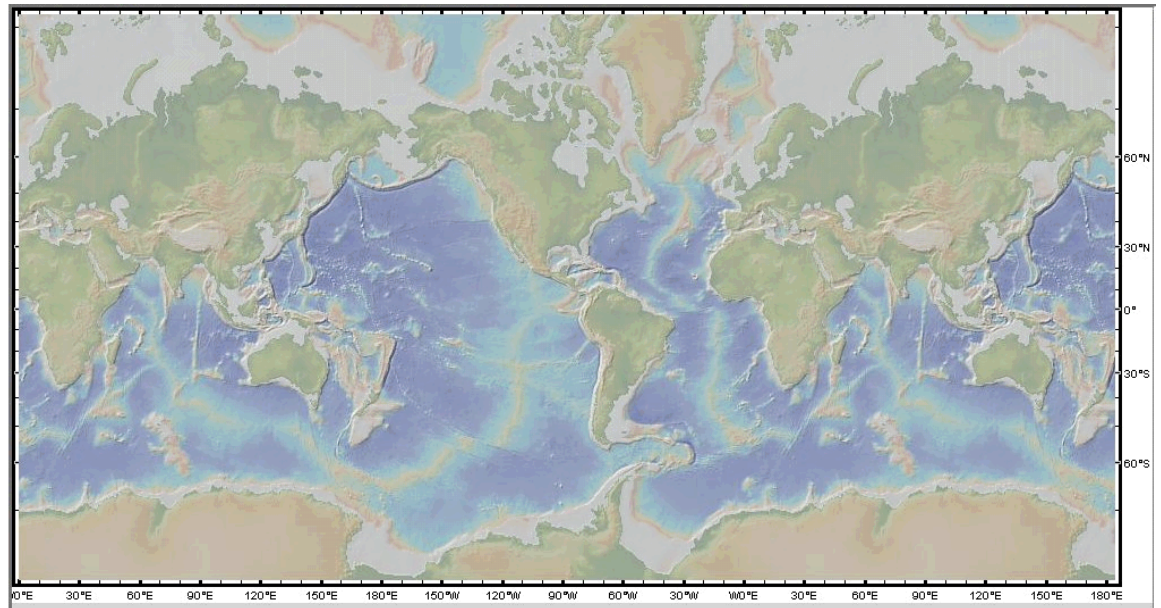
Learning Science Research

Investigator: Sandra Swenson, Teachers College
doctoral student

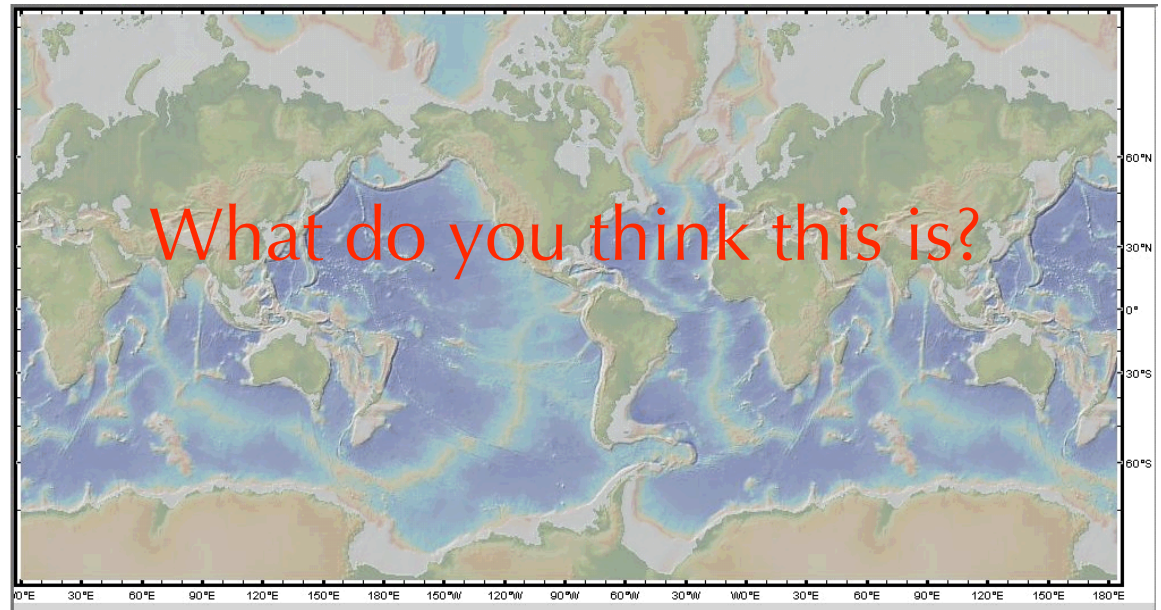
Participants: 120 total: 8th, 10th, 12th graders

Questions:

- What do you think this is?
- How do you think this was made?
- What do you think this is useful for?



8th grade
Earth Science
students,
spring 2005



- geographical map (15)
- world map (20)
- underwater features (13)
- topography (29)
- depth of water "dark area is higher"
- plate boundaries (3)
- geological map (3)
- "shows temperature by different blue colors"
- shows where there are high levels of sodium (for fishing)"
- "a map showing tides"
- world climates (e.g. white near N. pole is snow and glaciers)"

Data-rich Activities for Students

Earth Exploration Toolkit (summer 2005)

- full access to professional quality datasets

Lamont Data Puzzles (summer 2006)

- carefully pre-selected data snippets

Conceptests (forthcoming)

- in-class response/discussion/re-response


Data-rich Activities for Students

Earth Exploration Toolbook example:

- bathymetry & isochrons from GeoMapApp
- by Jeff Thomas, Fairfield High School (CT), Earth Science class

Earth Exploration Toolbook

Step-by-Step Guides for Investigating Earth System Data



Home »

Investigating the Dynamics and Geomorphology of Mid Ocean Ridges

Teaching Notes Page

Case Study Page

Step-by-Step Instructions

About the Tool and Data

Going Further

Investigating the Dynamics and Geomorphology of Mid Ocean Ridges

Jeff Thomas

Teachers College Columbia University

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August 31, 2005

Description

One of the most fundamental concepts within the earth system is plate tectonics. The theory of plate tectonics can help explain most of the dynamic geologic process that occur on our planet such as earthquakes, volcanoes, mountain building, and the rock cycle. In addition, these dynamic processes affect other parts of the earth system including our atmosphere, biosphere, and hydrosphere. Fundamentally, understanding this theory is the most important concept for students to appreciate our dynamic earth.

http://serc.carleton.edu/dev/eet/rodes_6/index.html

Lamont Geoscience Data Puzzles

- Low-barrier-to-entry for teachers
- High insight to effort ratio for students
- Offers an “aha” moment
- Built around carefully selected (but authentic) geoscience data
- Time-efficient
- Detailed pedagogical content knowledge (PCK) documentation for teachers



The diagram illustrates the layout of a Lamont Geoscience Data Puzzle. It consists of a large light blue rectangular frame. Inside this frame, at the top, is a white rectangular box with a black border. Below this box, within the same light blue frame, are three lines of text: 'One question', 'Another question', and 'To explore further see....'.

One figure

One question

Another question

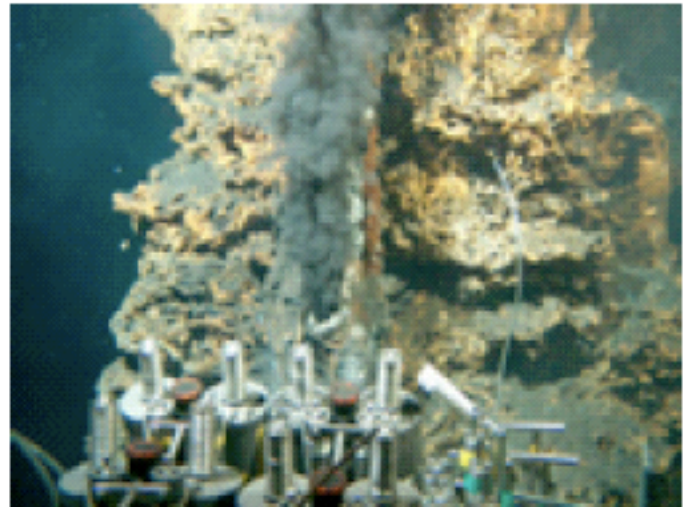
To explore further see....

Lamont Geoscience Data Puzzles

"How much heat is released from a hydrothermal vent?"
By Rosemarie Sanders, Ramapo High School.



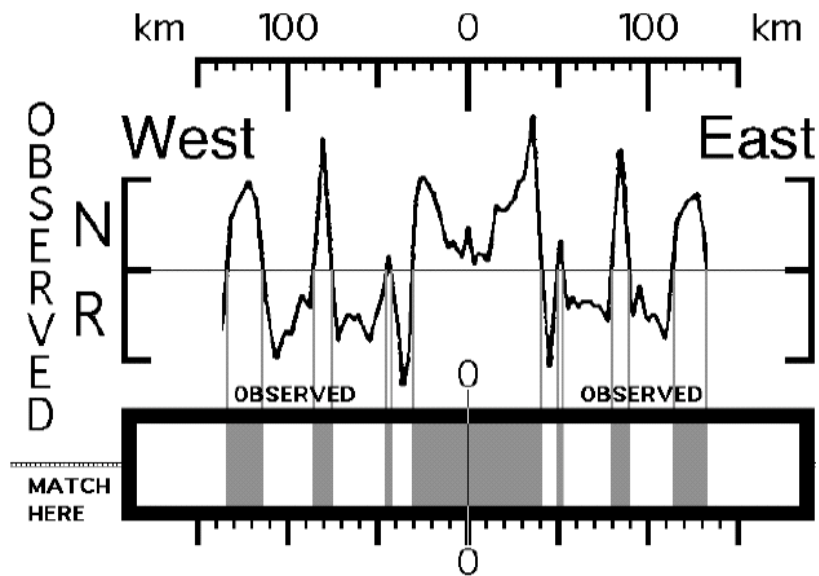
vs.



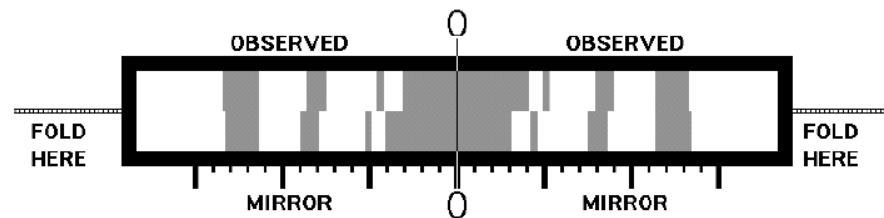
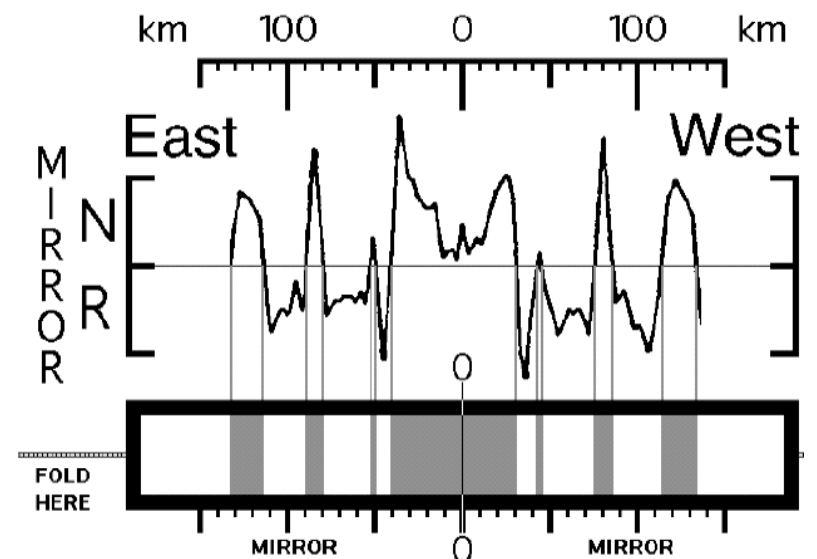
Lamont Geoscience Data Puzzles

"Ocean Floor Spreading"

by Greg Hofer, Baccalaureate School for Global Education.



VS.



Lamont Geoscience Data Puzzles: Pedagogical Content Knowledge document

- The “aha” moment
- Alignment with science education standards
- Skills & understandings needed
- Step-by-step solution
- Common misconceptions and mistakes
- Tough questions
- To learn more...

Q: If the water is above 100°C, why isn't it steam?

A: The water at the bottom of the ocean is at high pressure from the weight of the overlying water. The high pressure keeps the water in its liquid state. At 3000m water depth, the boiling point of water is around 410°C.

“Conceptests”

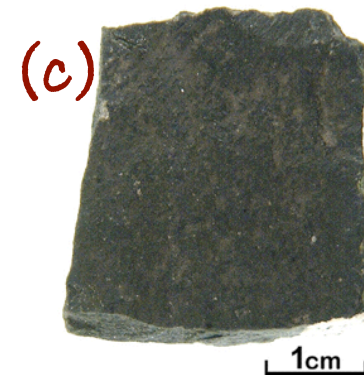
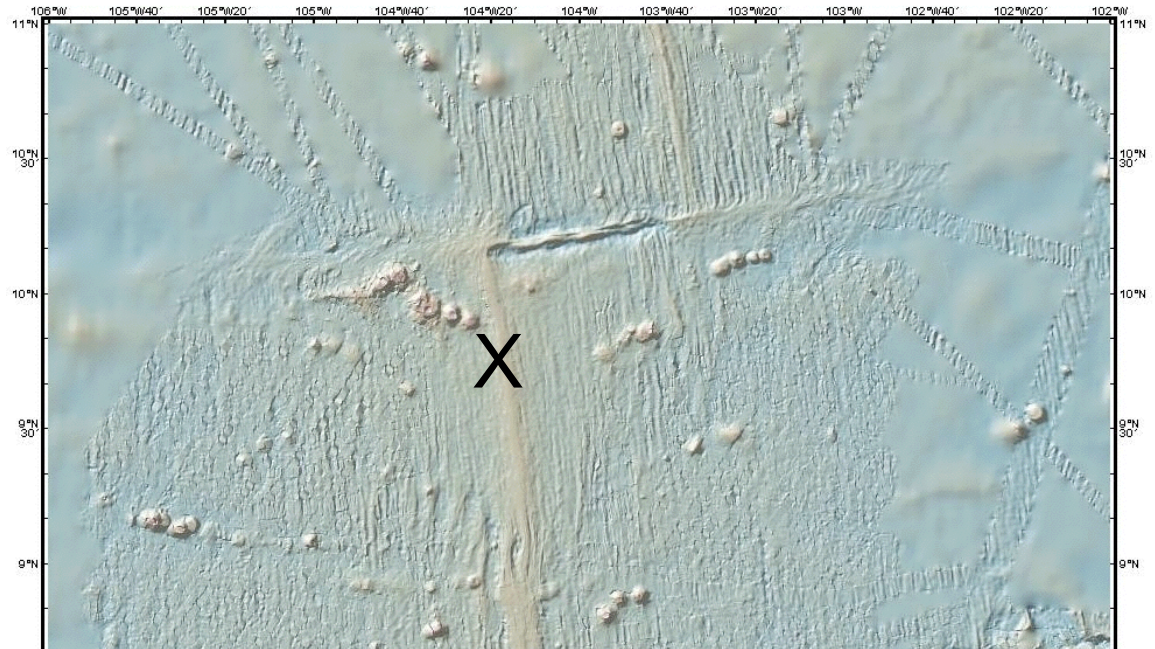
- Question assessing student understanding of principal concepts is projected mid-lecture.
- Students answer, results tallied immediately, students discuss in small groups, students answer again.
- Reported benefits: student engagement, attendance, understanding, teacher pacing

References:

- Mazur, E., 1997, *Peer instruction: A user's manual*, Prentice Hall, 253pp.
- McConnell, D. A., et al, 2006, *Using Conceptests to Assess and Improve Student Conceptual Understanding in Introductory Geosciences Courses*, *Journal of Geoscience Education*, v. 54, p. 61-68.
- Question bank at: serc.carleton.edu/introgeo/interactive/ctestexm.html

Example Mid-Ocean Ridge Concepttest

If you dredged a rock sample from the seafloor at the spot labelled "X" on the map, which rock type would you be most likely to recover?



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Questions or Suggestions?