Adding Another Dimension to Learning: Application of Real World Globes to (Undergraduate)

MIAMI UNIVERSITY OXFORD, OH • EST. 1809

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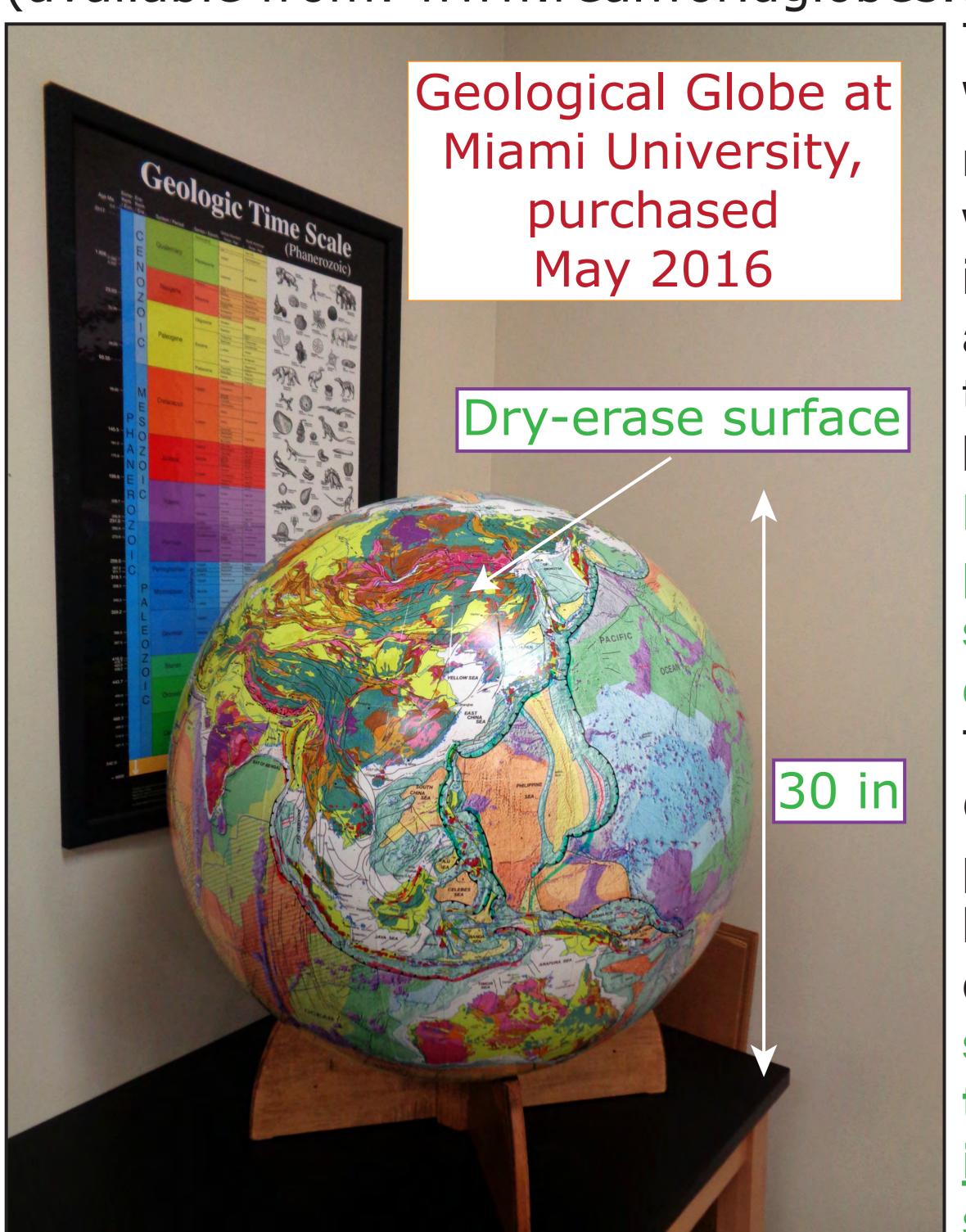
@AGU FALL MEETING



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1. The Geological Globe of the World

(available from: www.realworldglobes.com - Booth #942 at AGU!)



The Globe measures 30 inches in diameter nic activity, distribution of igneand has a dry-erase surface - easy to clean! ous, sedimentary and metamor-Globe arrived assembled, with stand.

The Geological Globe of the World by RealWorldGlobes was released for sale at AGU 2015. It was purchased for \$3000 following a successful application for an internal teaching grant from the Center for Teaching Excellence (CTE) at Miami University. Discussion of spatial, and temporal, relationships on Earth's surface is integral to any undergraduate geology course. The dry-erase surface of the Globe is unique, and naturally promotes the development of hands-on activities within the classroom. Any exercise designed using this Globe should therefore require critical thinking by challenging students to synthesize concepts and processes; e.g. plate motion, volcaphic rocks, at the planetary scale.

Boundary

for mass balance and

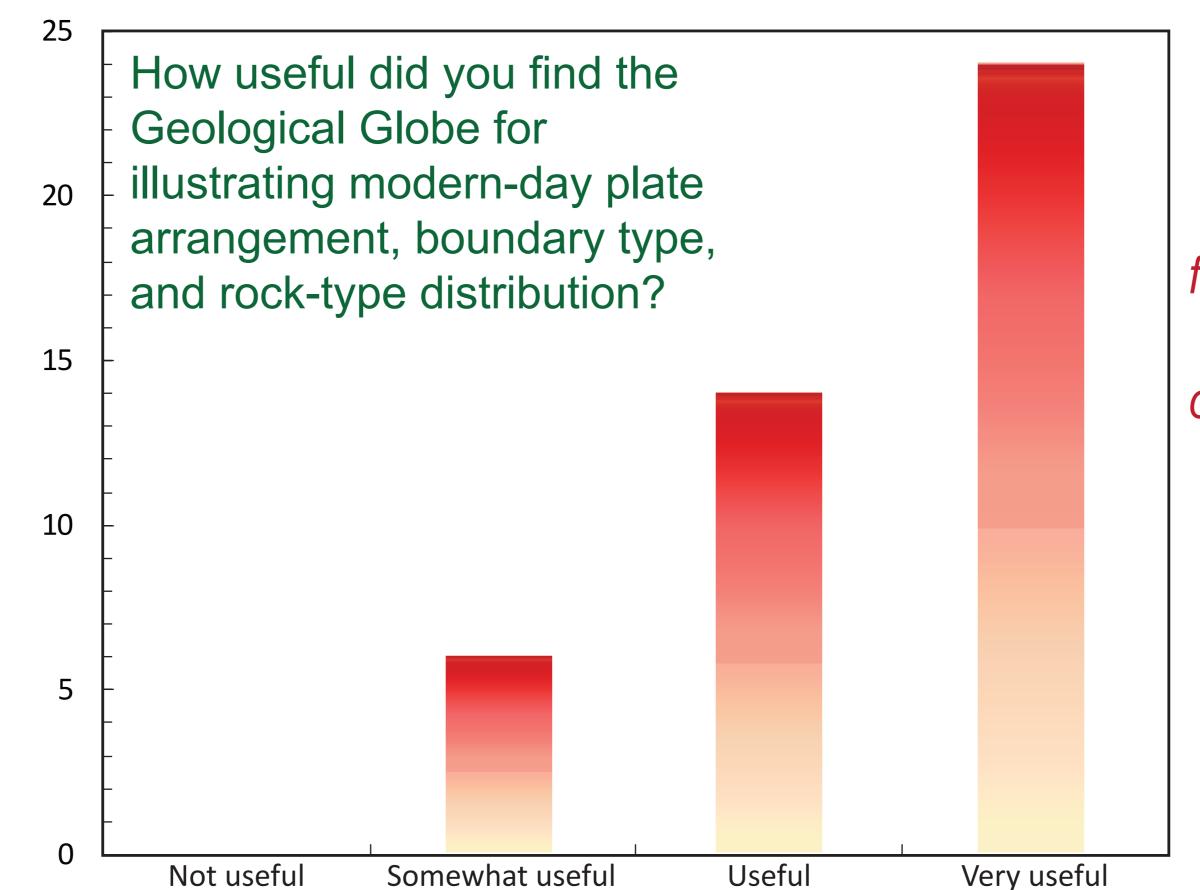
mass transport on Earth?

3. Geoscience Outreach: DiscoverSTEM (8th grade) DiscoverSTEM in Butler County, OH, is an annual event held in October

during which 8th grade students are invited to participate in a day of interactive, STEM-focussed, workshops and seminars. Students used the Geological Globe to evaluate where the plate tectonic boundaries are, and <u>assess</u> what motion is: CONVERGENT, DIVERGENT, or-TRANSFORM. Each boundary was colored in a different color on the Globe.

Butler County, OH Discover STEM Day for 8th grade students, October, 2016.

The process of Plate Tectonics was introduced as a process which has fundamentally re-shaped, re-worked, and re-surfaced the Earth throughout geological time. Following boundary identification, the students discussed which features were associated with those boundaries (e.g. earthquakes, tsunamis, volcanoes) and sketched the 2-D nature of the boundary at depth.



What did you like most about the Geological Globe?

"I liked to look at the globe and "That it **shows** figure out where the plates were, where the and hypothesize about having Earth's plates one continent. It sparked my interest in being a geologist"

"It was a very good representawrite on it tion and gives a clear perspective of the tectonic plates

"It is very colorful" "It was a **very useful**/

"That the globe helpful visualization. was interactive" helped me understand"

> scaled measuremen of where everything

4. Introductory Geology Activity

Prior to the lab, a short 10-minute presentation on different boundary types, and their features, is presented to the students.

Learning Objectives

- 1. Identify Earth's geological features on a 3-D projection
- 2. Recognize different plate tectonic environments
- 3. Interpret historical data
- 4. Predict the location of geological events based on plate motion

You will need:

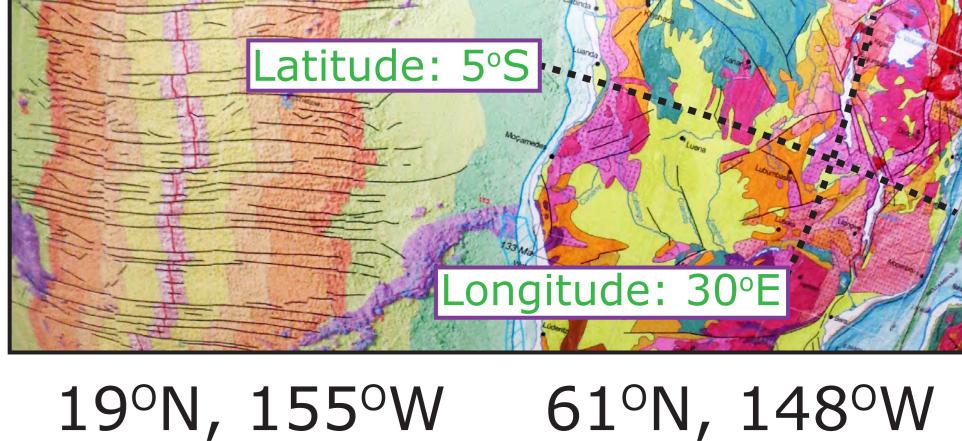
The Geological Globe (3-D) World topographic map (2-D) Plate Tectonic map (2-D) Geology Globe Legend Volcano and Earthquake locations



Students will plot the location of histori- How many oceanic and concal earthquakes and volcanic activity on the 3-D Globe.

The relative motion of the Pacific Plate can be evaluated using the position of the Hawaiian-Emperor seamounts. The rate of plate motion can also be calculated. What is the average rate of plate

motion?

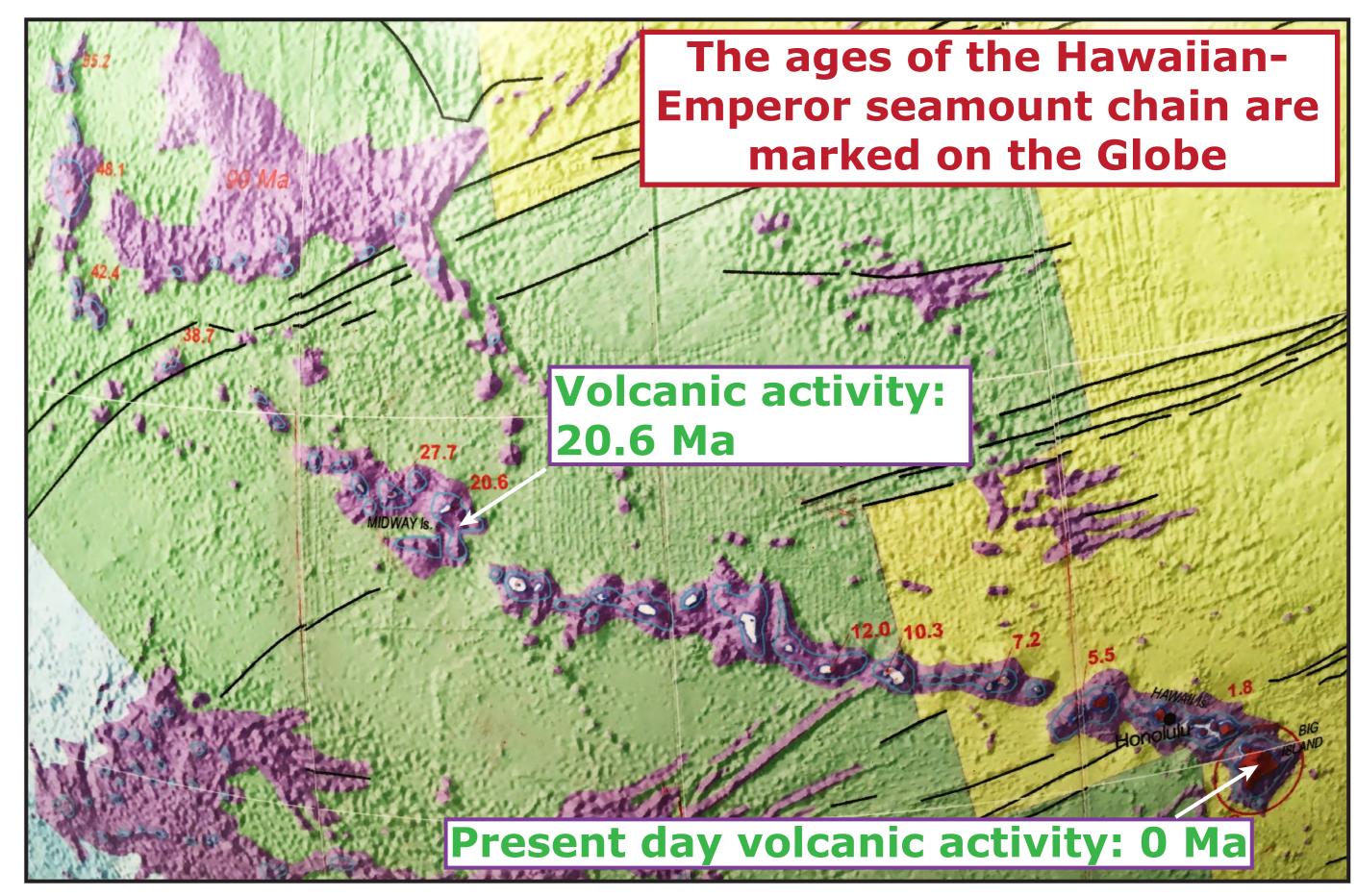


52°N, 175°W 46°N, 123°W 15°N, 92°W 29°N, 97°E 38°N, 15°E 54°N, 161°E 16°S, 176°W 23°S, 114°W 78°S, 167°E 78°S, 167°E 5°S, 131°E 5°S, 131°E

Which data set represents volcanic activity and which dataset represents earthquake activity?

Explain your answer.

Use the 3-D Geology Globe, and associated legend, to discuss where Earth's oldest and youngest rocks are relative to plate boundaries. tinental plates are there?



2. Enhancing Learning

From Bamford (2013) it has been shown that visual learning improves understanding of functionality, and that by seeing the whole (the students) understand the parts". This research demonstrated that "students learning with 3D teaching aids were more likely to use gestures of body language when describing concepts, had better ordering of

concepts, and had enhanced Constructiv skills in describing their learn-<u>ing, including writing more,</u> saying more, and being more likely to use models to demon- What are the implications strate their (own) learning.

The Geological Globe will be integrated into an introductory Plate Tectonics lab during Spring se-

mester 2017 at Miami University. Over 450 students complete our introductory geology lab course (GLG 115L) each semester. This course offers students the opportunity to explore topics outside of their own majors. This is fundamental to, and at the core of, a liberal arts education at Miami University.

Boundary

different plates and

helps you better un-

derstand the Earth"

liked the colors and how it showed different areas of geological time. I liked using it to help me visualize where different rocks are found. I also liked how it shows the Earth's plates

"I liked how it gave ? and areas of destruction, and where continents are separate.

5. Acknowledgements: We are grateful to the Center for Teaching Excellence at Miami University for awarding us a teaching grant in March 2016 which enabled us to purchase the Geological Globe of the World. We are grateful to Doug Rogers at RealWorldGlobes, who facilitated our purchase and oversaw preparation of the globe, shipment, and delivery in time for Fall semester 2016. We thank Kendall Hauer, Director of the Karl E. Limper Museum at Miami University who assisted in the unpacking and installation of the Globe in our department. Reference: Bamford, A (2013): The 3D in Education White Paper.