Technology in the Geoscience Classroom

(writ large: Classroom, Lab, and Field)

Steve Whitmeyer *(James Madison University)*

…with input and help from Declan De Paor, Mladen Dordevic, Callan Bentley, Chris Atchison, and many others!

Technology in the Geoscience Classroom

Things to ponder:

1. Technology developers assume that their creations enhance student learning
2. Educators want evidence that the technology is improving student learning
3. Students' have their own expectations
4. The broader reach of technology-facilitated education

Google earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Image U.S. Geological Survey
Image PGC/NASA

Technology in the Geoscience Classroom

Levels of technology in education:

1. Passive observation – “eye candy”

2. Student-driven investigation facilitated by technology

3. Real-time “instantaneous” feedback integrated with student-driven investigation

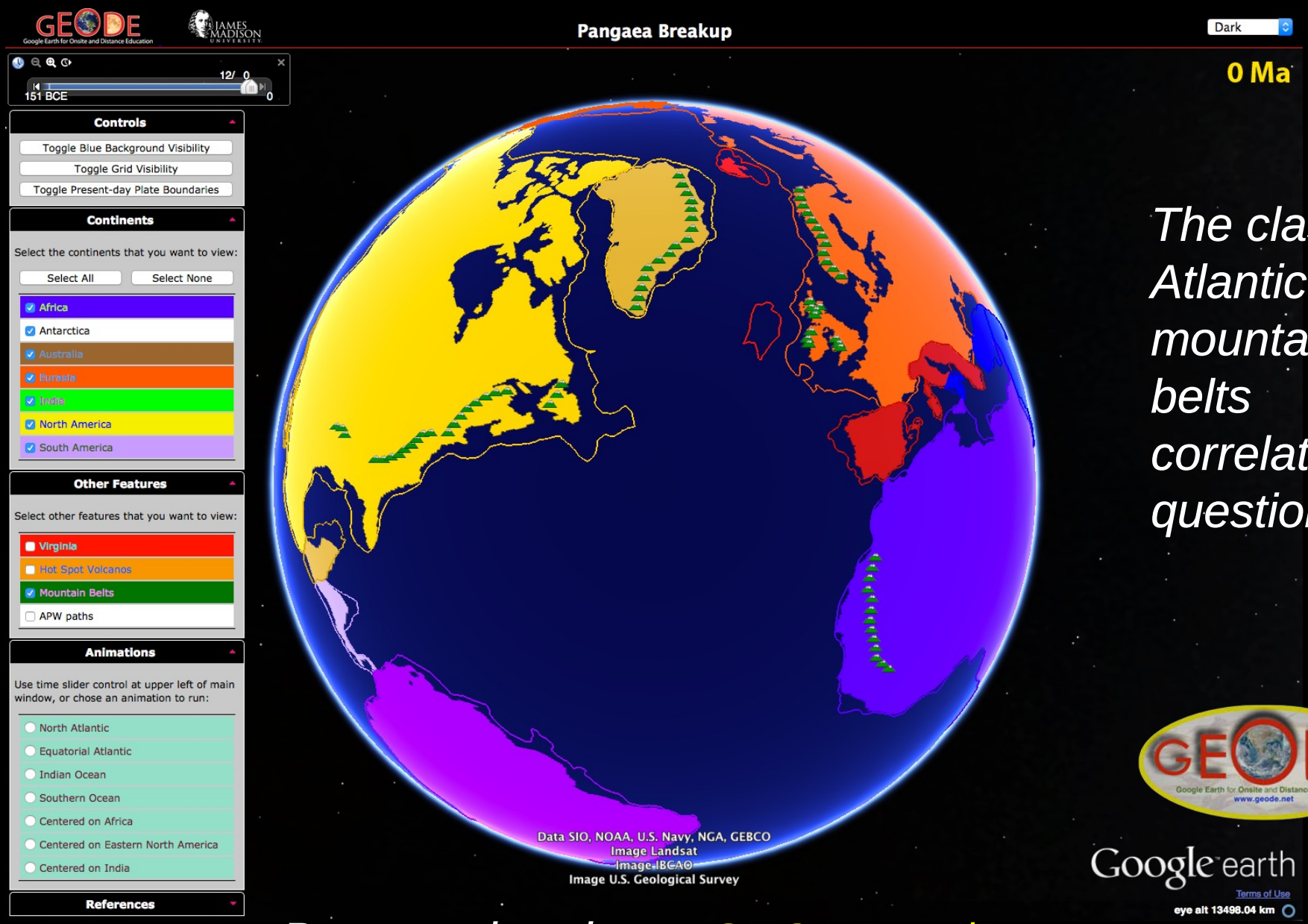
…with examples from the classroom, lab, and field

Technology in the Geoscience Classroom

Built with MaRGEE tool:
http://geode.net/margee/
(Dordevic & Whitmeyer, 2015)

Tectonic model
Rifting of Gondwa

Technology in the Geoscience Classroom



The classic Atlantic mountain belts correlation question…

GEODE
Google Earth for Onsite and Distance Education
www.geode.net

Pangaea breakup: GEODE.net/Pangaea

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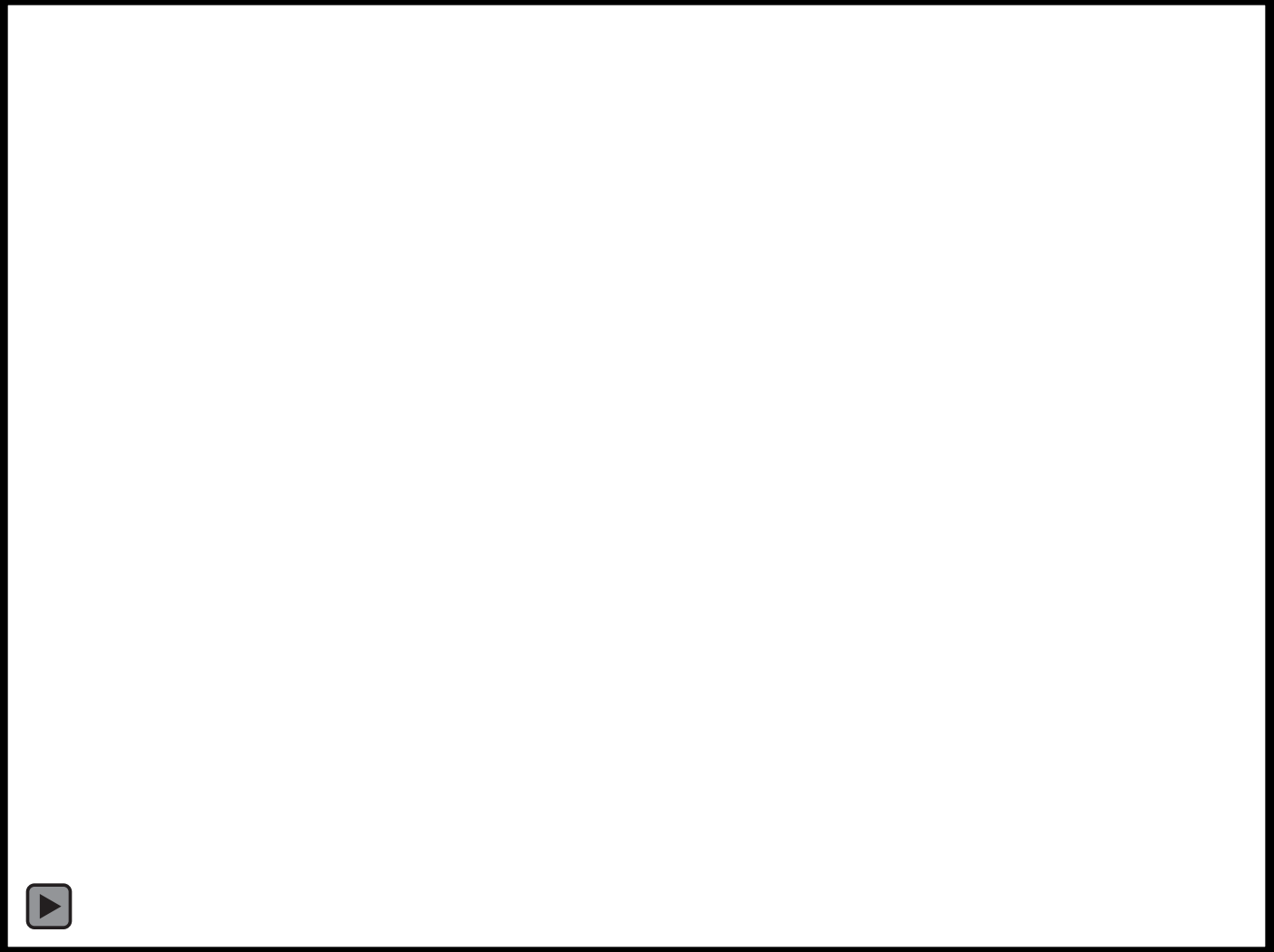

http://csmres.jmu.edu/Geollab/Whitmeyer/web/visuals/GoogleEarth/VAquakes.mov

Fault plane model from 2011 Virginia Earthquake aftershock data

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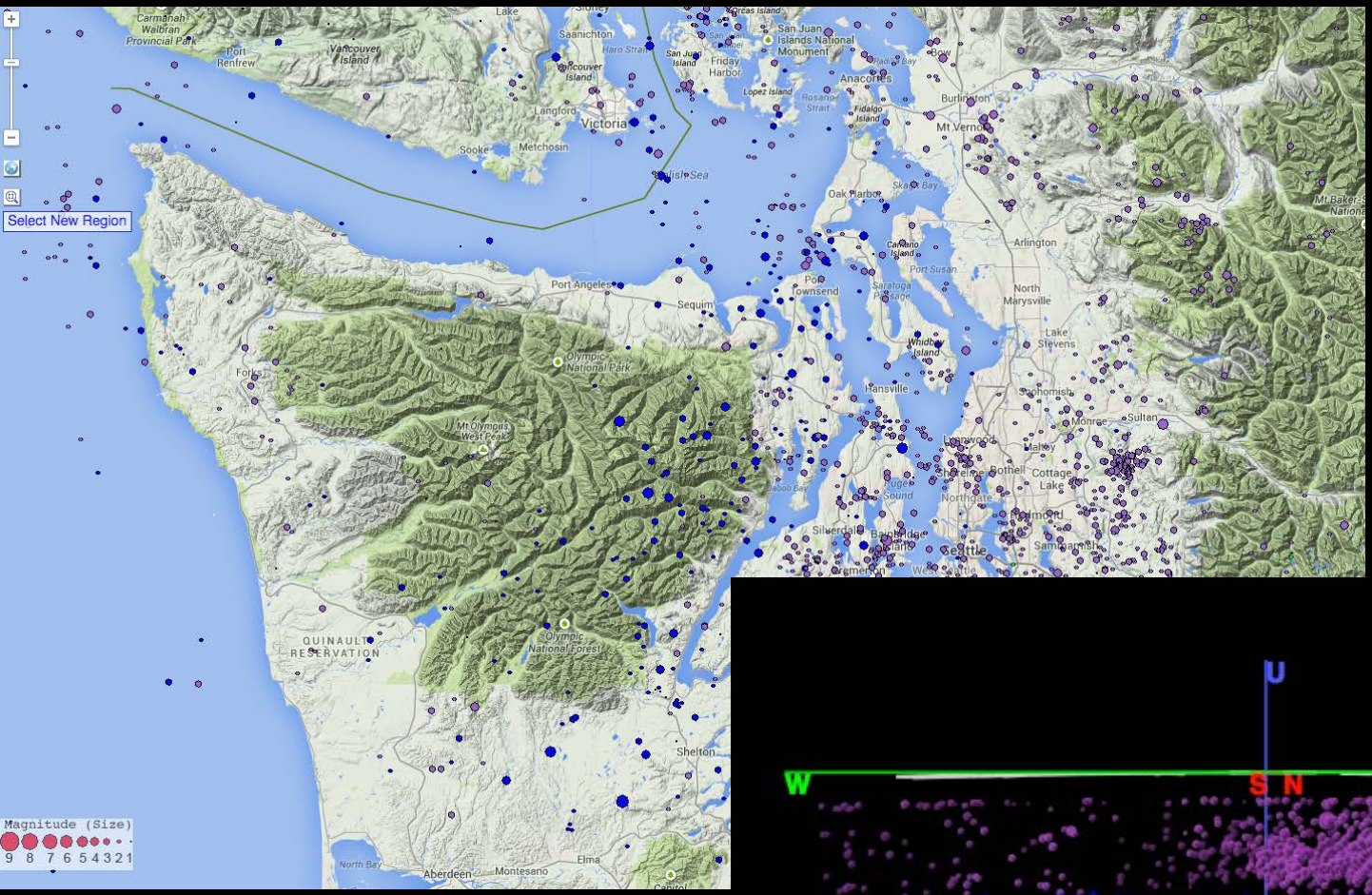
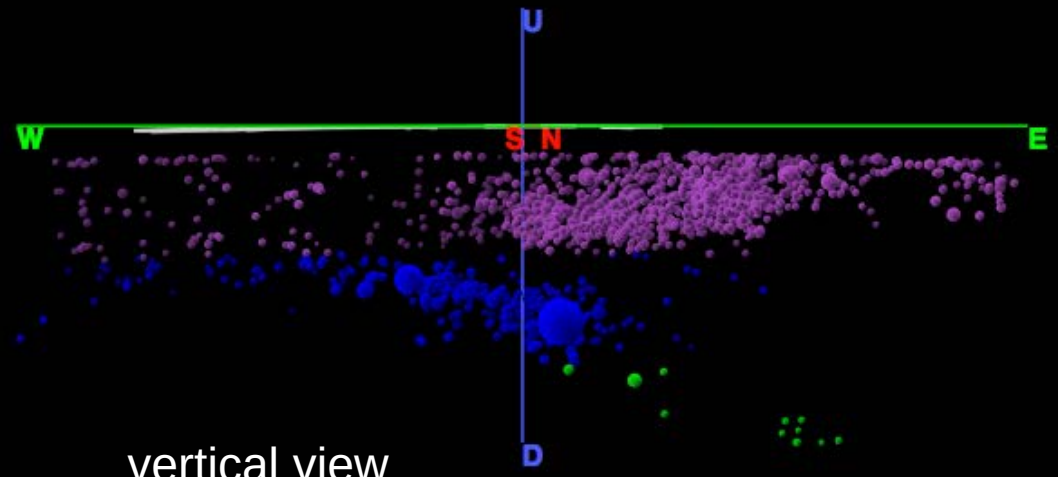


IRIS Earthquake Browser

Inquiry-driven models



vertical view

http://www.iris.edu/ieb

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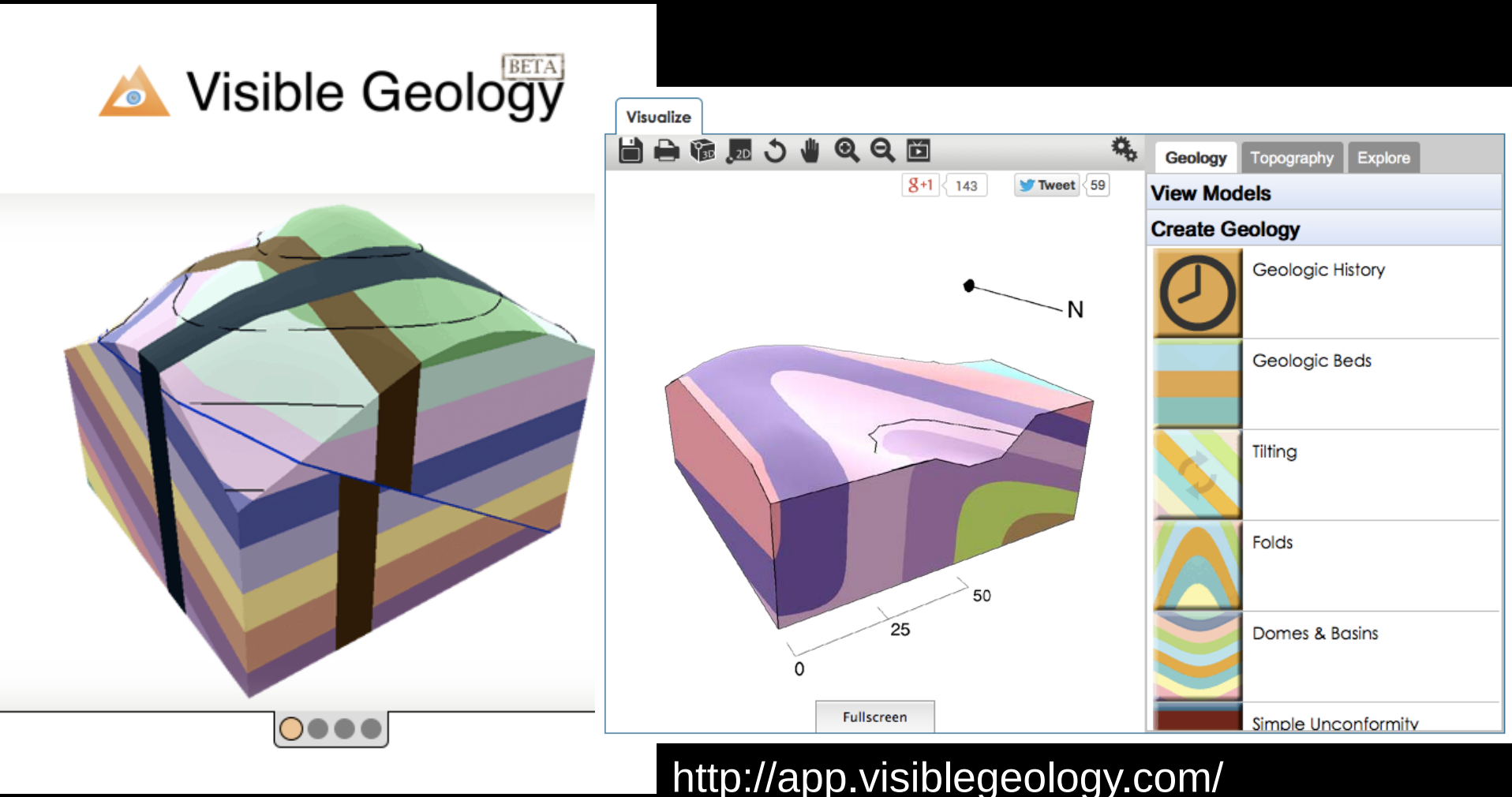

http://app.visiblegeology.com/

Inquiry-based, student-driven exploration of 3D models

Technology in the Geoscience Classroom

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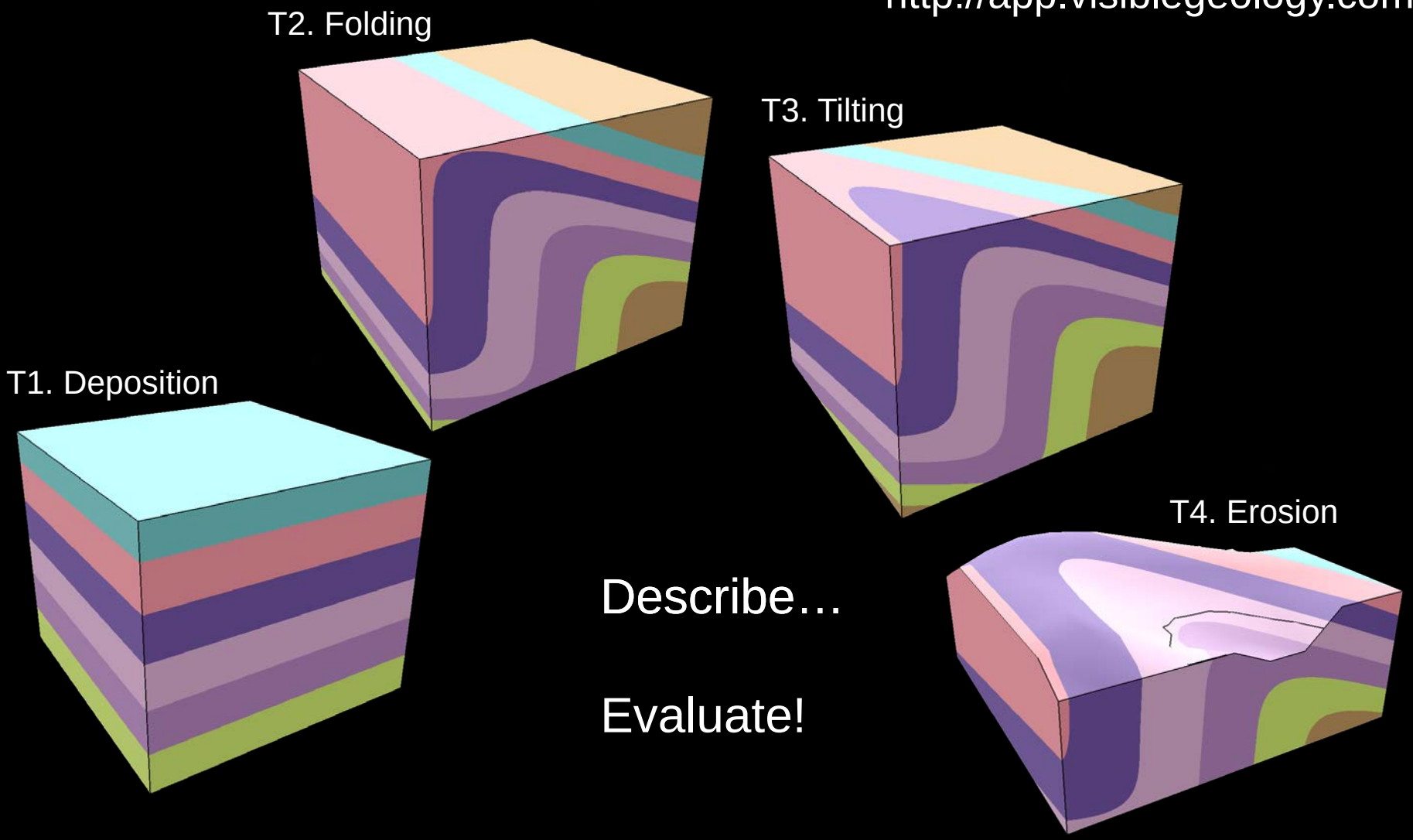

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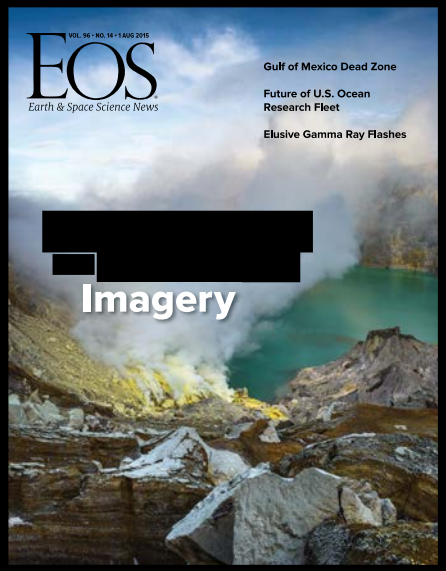
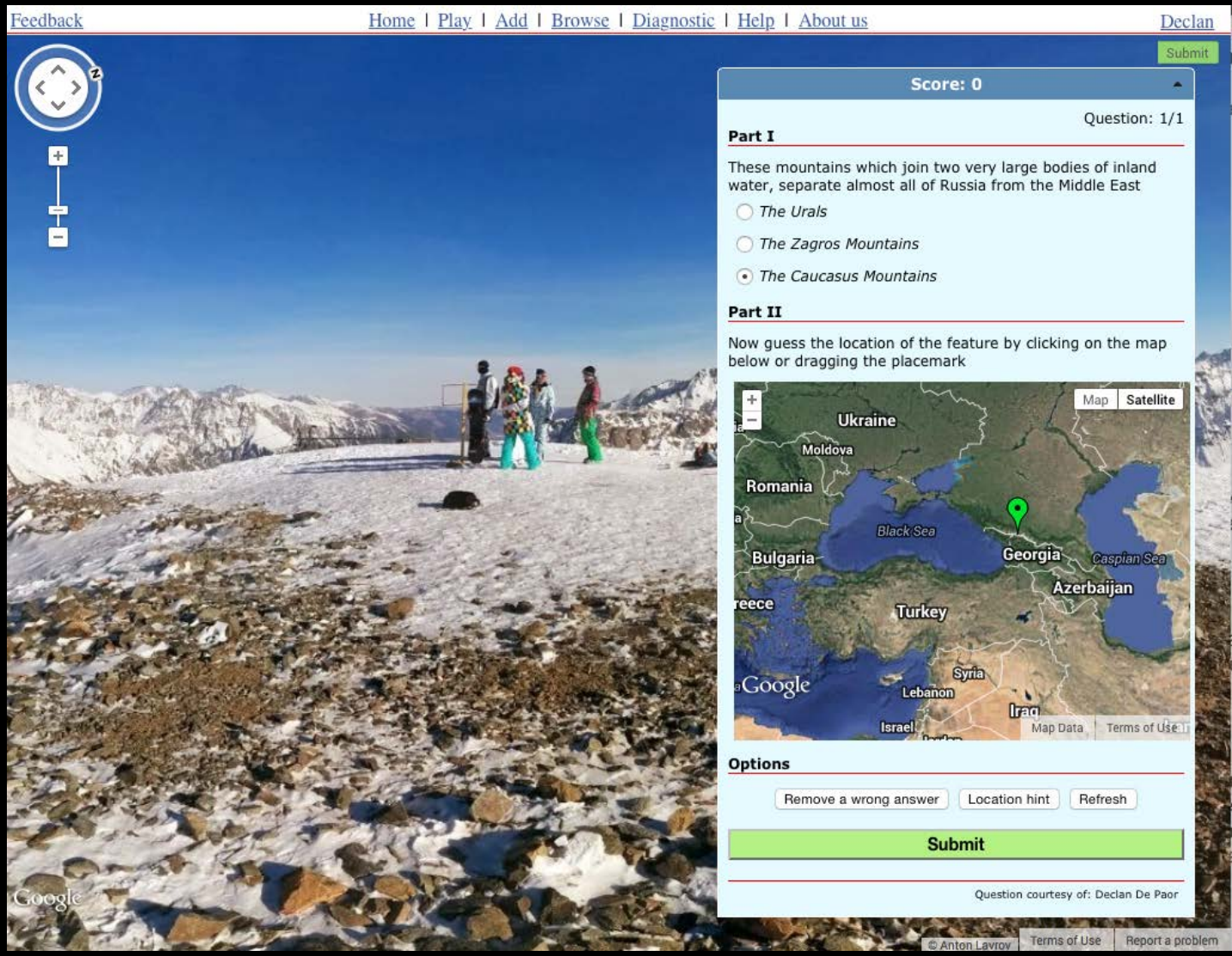


Eos: August 2015

EarthQuiz

http://earthquiz.net



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Exercises with real-time feedback

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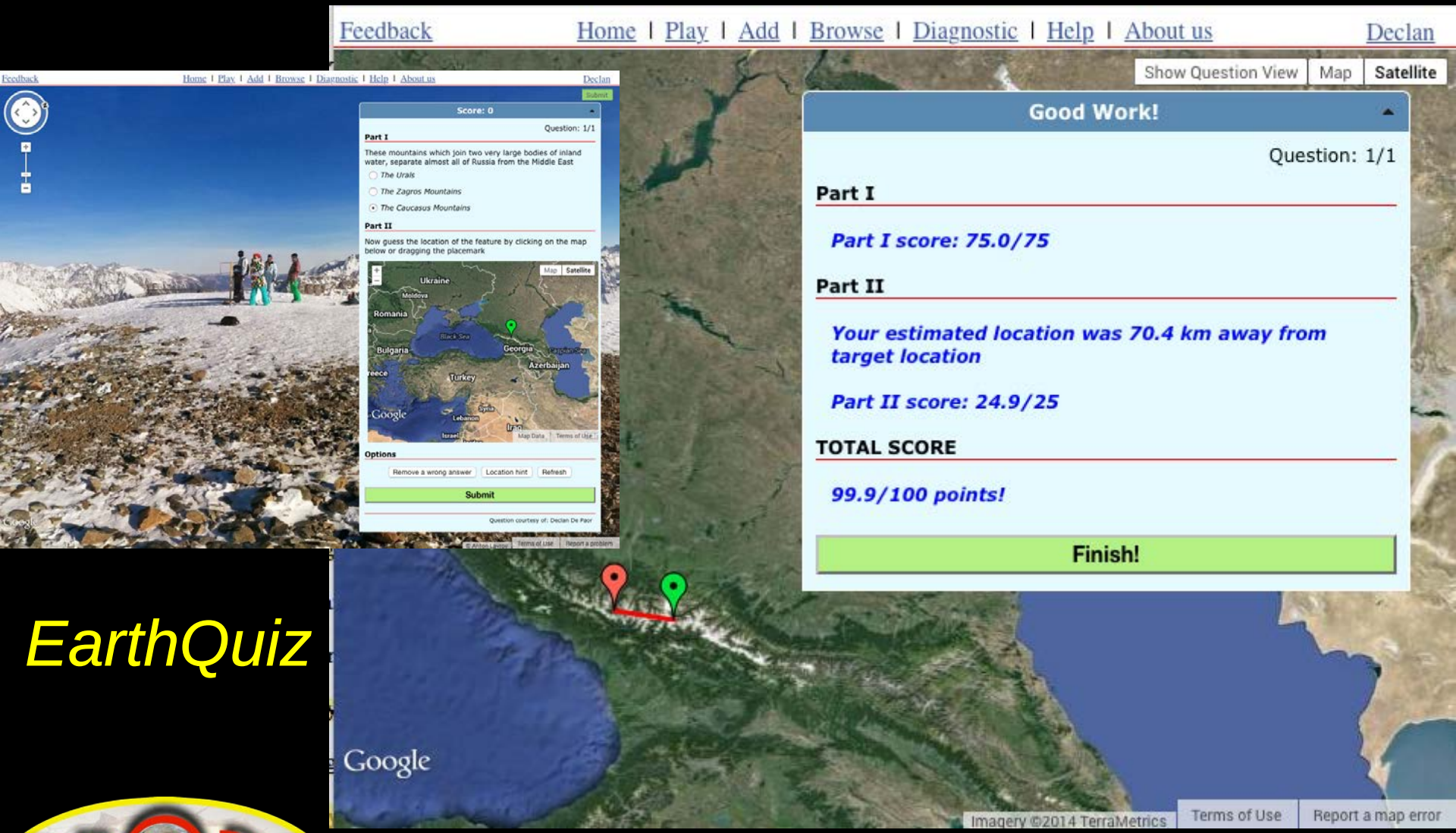

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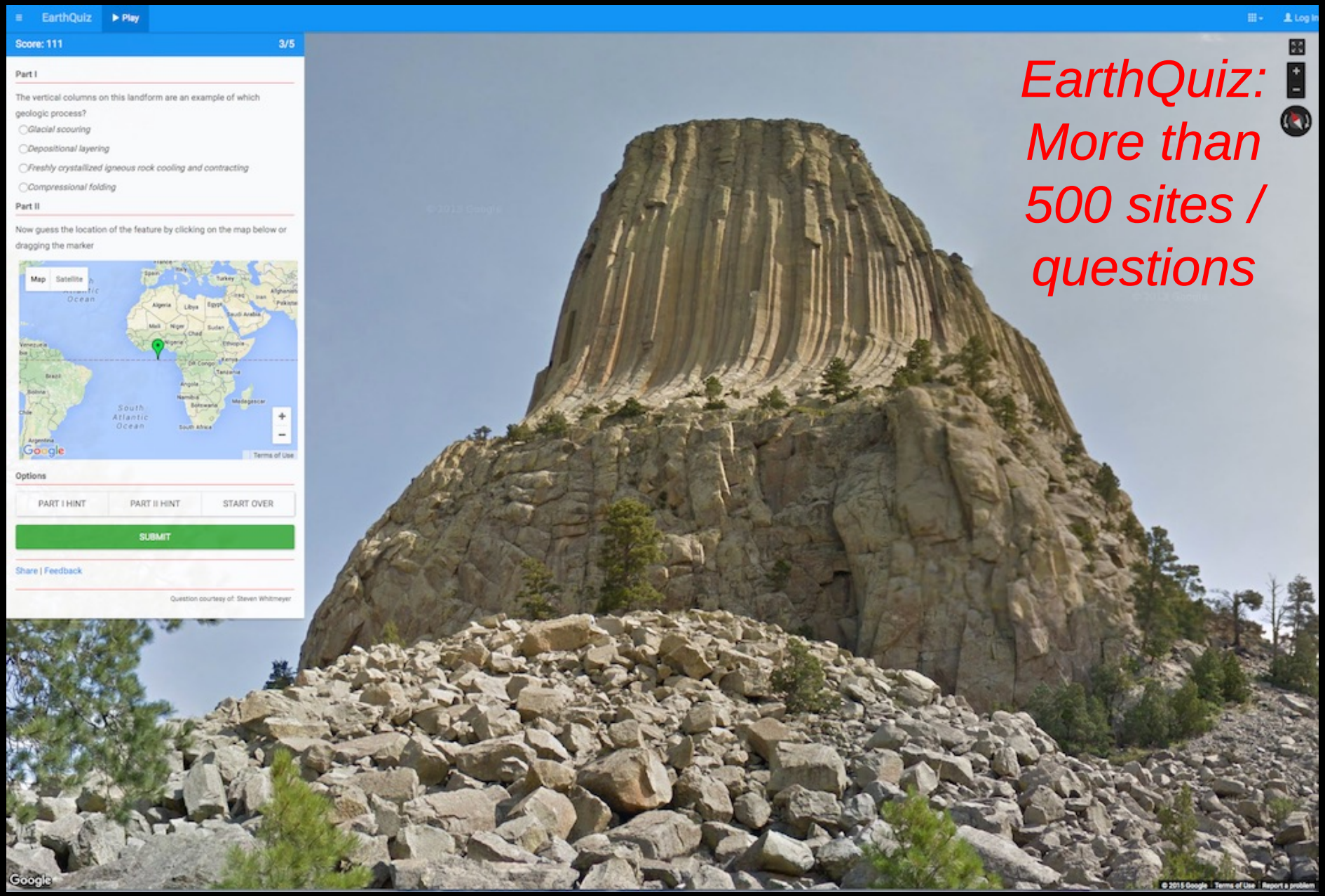
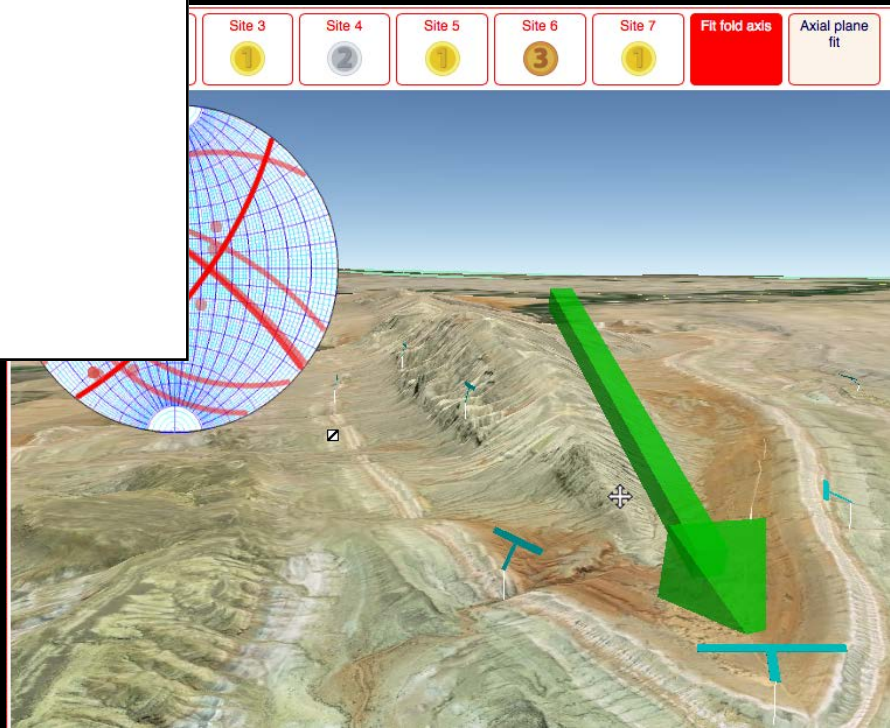


Fold Analysis Challenge

www.geode.net/fac



Sheep Mountain Anticline

Google Earth Plug-in or

Stand-alone GE application

Technology in the Geoscience Classroom

Things to ponder:

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Students expect technology-facilitated, inquiry-based learning.
Instructors need to assess its effectiveness.

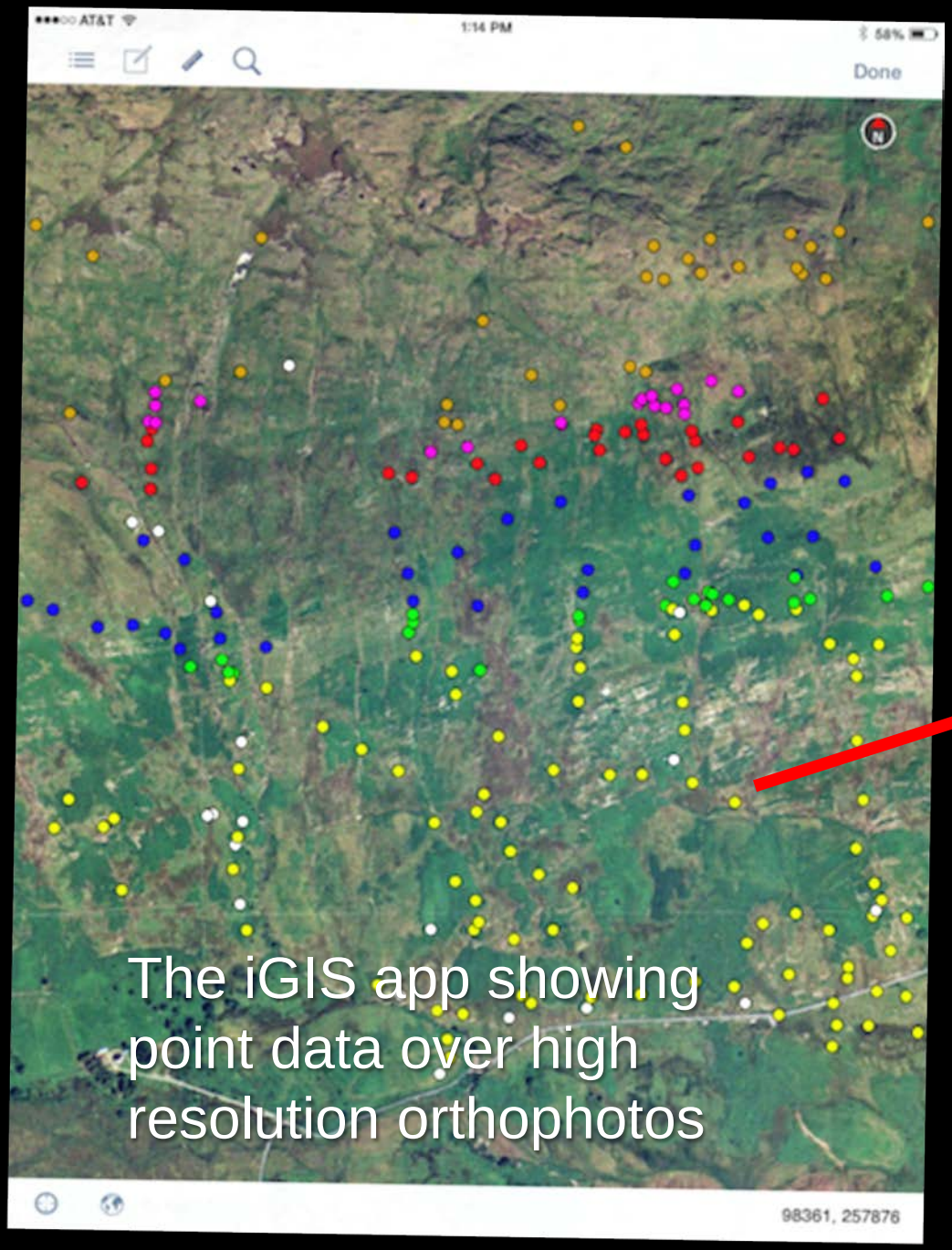
Technology in the Field

Technology in the Field

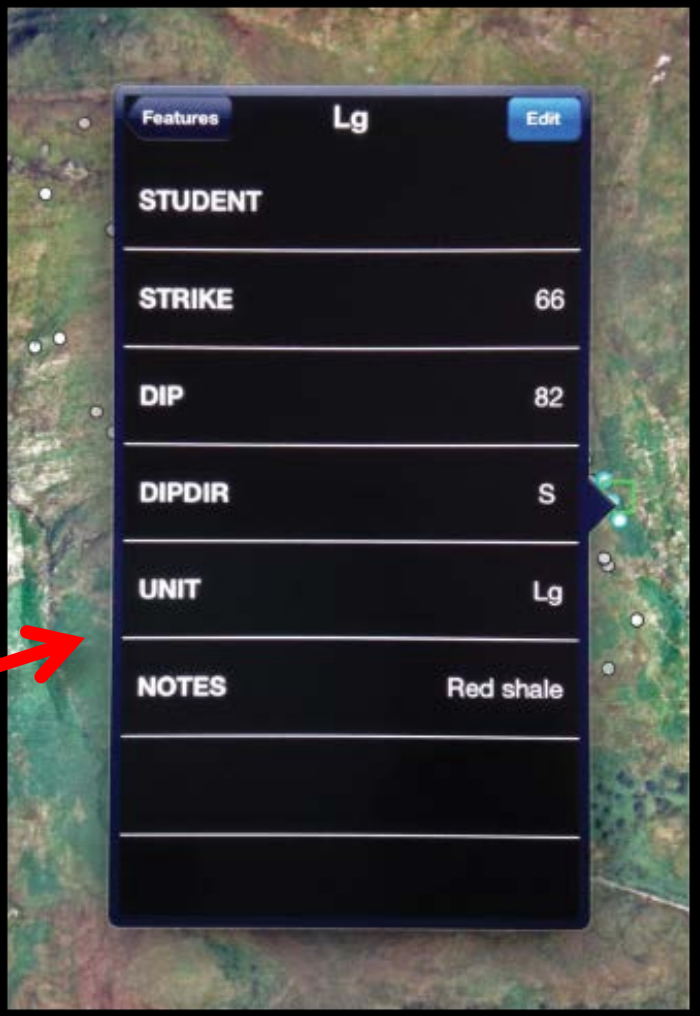
Digital mapping
& data collection
in the field

Mapping geology with an iPad, iGIS, and ArcGIS

Field Data

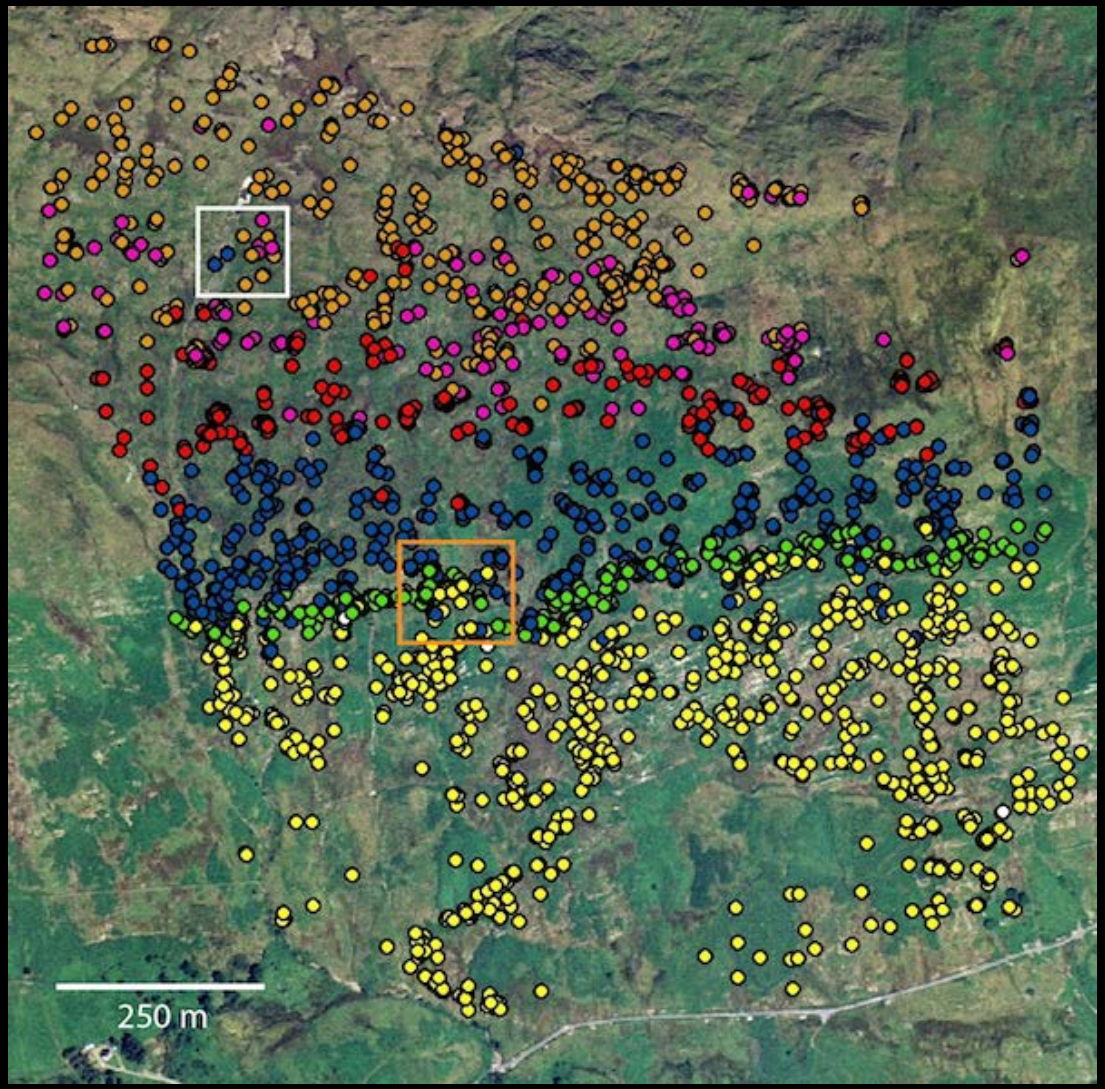


The iGIS app showing point data over high resolution orthophotos



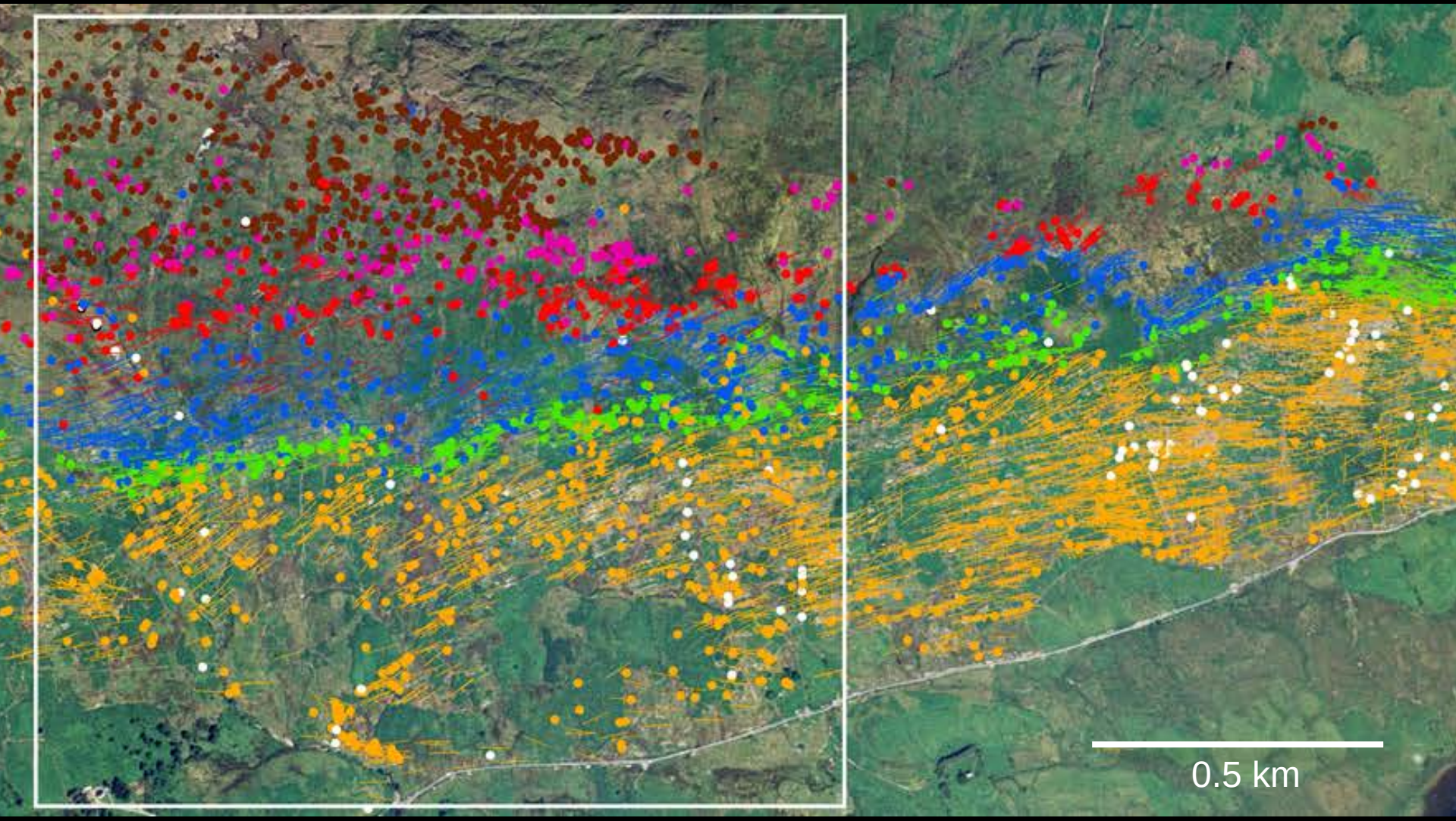
Simple GIS shapefile data table for outcrop data collection in iGIS

Crowdsourcing Field Data Collection



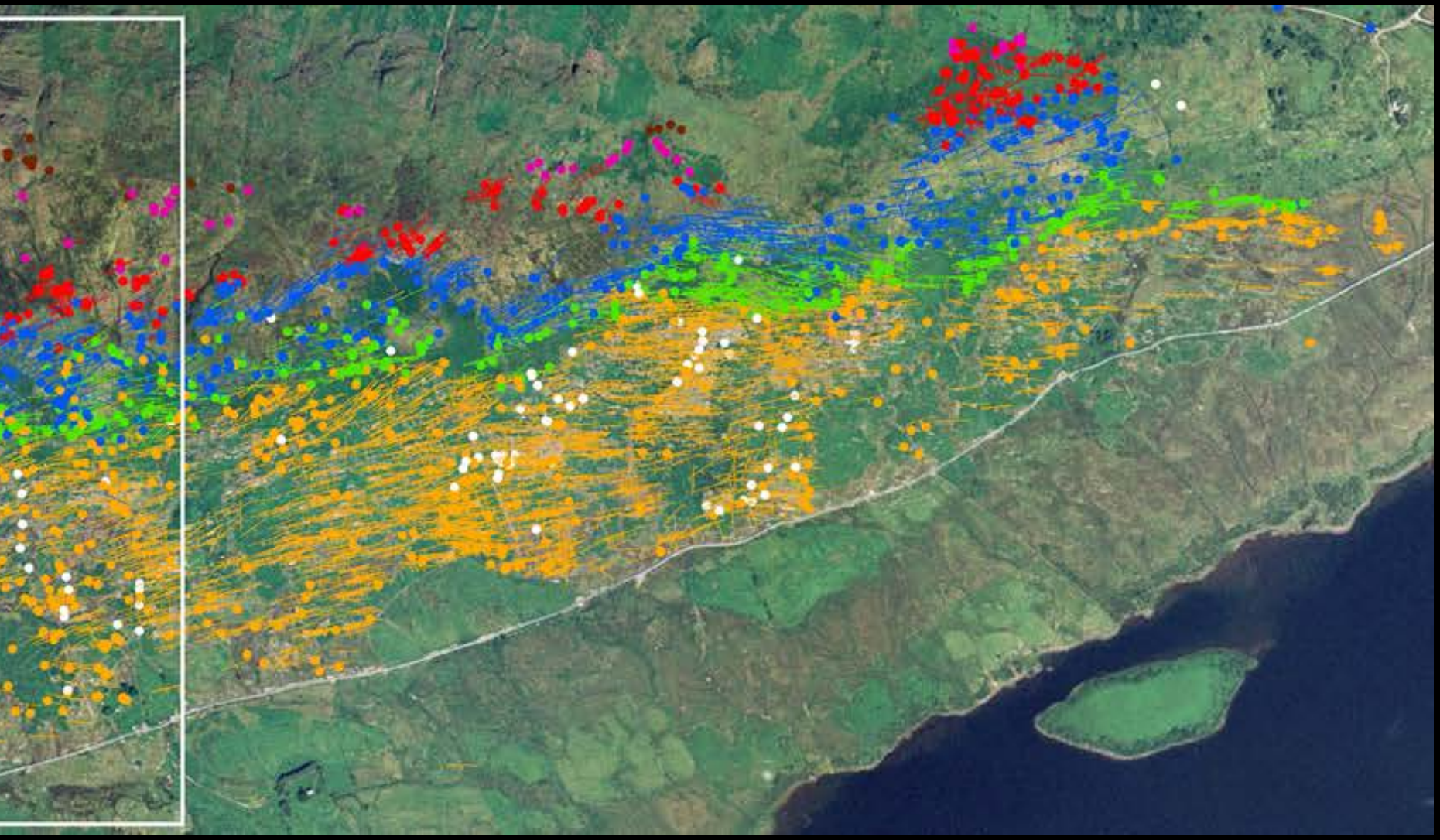
Outcrop data collected by 14 student teams during 4 day digital mapping project at JMU Ireland Field Course in 2014

Crowdsourcing Field Data Collection



6 years of data from the digital mapping project

Crowdsourcing Field Data Collection



6 years of data from the digital mapping project

	1	2	3	4	5	Mean
My prior experience with ArcGIS was:	Nonexistent	Very little	Moderate	Considerable	Extensive	2.15
My prior feelings specific to this exercise were	Great discomfort	Slightly apprehensive	Neutral	At-ease and comfortable	Highly motivated	2.97
My prior skill level with this exercise was	Completely unskilled	Basic	Competent	Skilled	Expert	2.34
My knowledge gains from this exercise were	Nonexistent	Very little	Moderate	Considerable	Extensive	3.77
My feelings after this exercise were	Great discomfort	Slightly apprehensive	Neutral	At-ease and comfortable	Highly motivated	3.66
I found this exercise to be:	Not valuable at all	Only slightly valuable	Moderately valuable	Useful	Essential	4.18
My skill level after this exercise was	Completely unskilled	Basic	Competent	Skilled	Highly skilled	3.49
My overall learning from this exercise was	Nonexistent	Trivial	Moderate	Considerable	Extensive	3.77

Assessment data for six years of digital mapping exercises; mean of responses, n=167. Significant gains were recorded in Feelings, Skill Level, and Knowledge. Assessment template from Pyle (2009).

(Whitmeyer & De Paor, 2014)

Technology-Enhanced Field Access

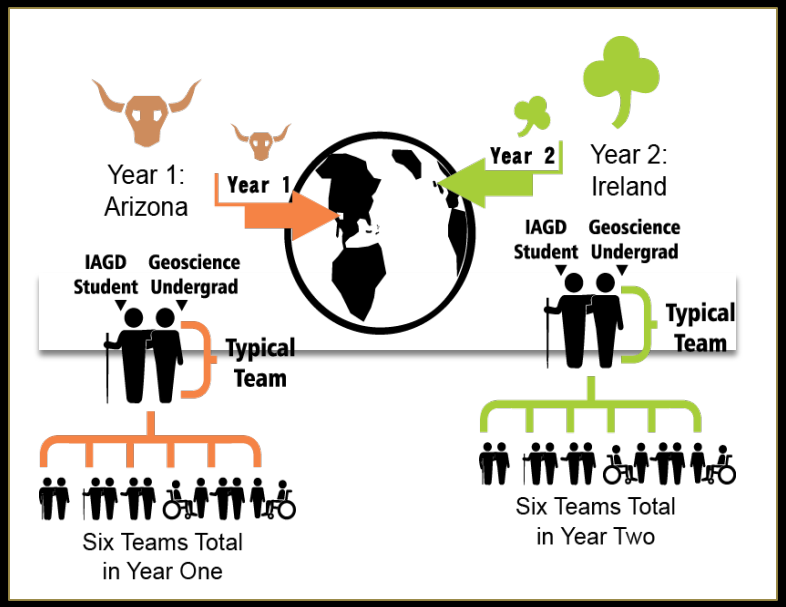
Smart glasses can pair wheelchair students with agile students at the outcrop

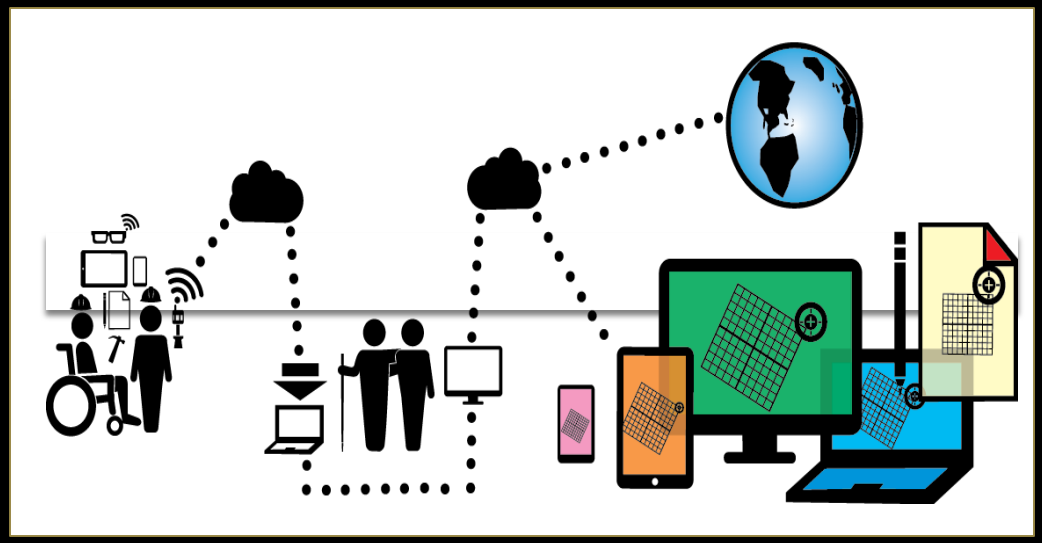
MiKayla Briere

Real-time video conferencing in the field – Facilitating field access for SWD

Technology-Enhanced Field Access

GEOPATH: Inclusive Field-Based Geoscience Undergraduate Research Opportunities for All





The program will feature a cohort of six teams over two years conducting field research in Arizona and Ireland.

Learn more and apply to participate at:
www.theiagd.org/geopath

This project is funded by the National Science Foundation (Award 1540652)