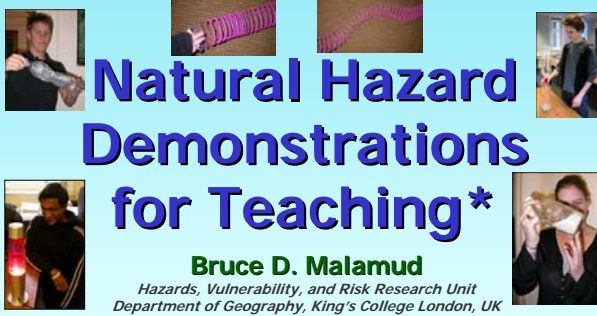


EGU Annual Meeting, Vienna, 3–7 April 2006
Education Session ES3
 Global Geoscience Education: Projects and Best Practices



Natural Hazard Demonstrations for Teaching*

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 Acknowledgments to: Simon Hoggart, James Millington, Alex Noake, Catherine Tomlinson.

Teaching Large Classes


- Many methods to actively involve students while teaching:
 - Break up students into small groups.
 - Actively encourage comments, questions, 'show of hands'.
 - Group 'role' playing exercises.
 - Hands on activities.
 - Class demonstrations.

Teaching Large Classes

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In This Talk

- Present several 'inexpensive' natural hazard demonstrations:
 - I. Weather
 - II. Earthquakes
 - III. Mass Movements
 - IV. Tsunamis
 - V. Volcanoes



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I. Weather Demos

IA. Hot Water in Bottle

Pour hot water in plastic bottle and empty it out.

Immediately put cap on bottle.



I. Weather Demos
IA. Hot Water in Bottle



Heated air cools, pressure changes and bottle collapses. (See About 500\$ and many other sources for air pressure demos).

King's College London Student Matthew Blackett

I. Weather Demos
IB. Tornado Tube



'Tornado Tube'

I. Weather Demos
IB. Tornado Tube



'Tornado Tube'



Red 'tornado tube' (hole in middle).

No water escaping down through hole in tornado tube due to air pressure in bottom bottle.

I. Weather Demos
IB. Tornado Tube



'Tornado Tube'



Adding glitter to water in 2 litre soda pop bottle

King's College London, Students Luke McDougall & Muhammed Ebrahimisa.

I. Weather Demos
IB. Tornado Tube



Gentle circular twist of bottles causes vortex.

I. Weather Demos
IB. Tornado Tube

Tornado Tubes are inexpensive and available from many science museum and 'educational' shops.



Gentle circular twist of bottles causes vortex.

Natural Hazard Demonstrations for Teaching

I. Weather Demos
IC. Tame Tornado

Called 'Tame Tornado' (House of Twisters) in the USA and 'Toyway Tornado' (Toyway Science) in the UK.

Natural Hazard Demonstrations for Teaching

I. Weather Demos
ID. References

utahweather.org
Home · Climatology · Meteorology · Hydrology · Geography · Education · Research
Photos · UCCW
Great Weather Experiments

Natural Hazard Demonstrations for Teaching

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Kobe, 1995

Natural Hazard Demonstrations for Teaching

II. Earthquake Demos
IIA. Slinky & EQ waves

Transverse Waves (S-waves)

Compression Waves (P-waves)

See extensive guide: Braille, L. (2005). *Seismic Waves & the Slinky: A guide for teachers.* [Online].
[www.eas.purdue.edu/~braille/edumod/slinky/slinky.doc]

Natural Hazard Demonstrations for Teaching

II. Earthquake Demos
IIB. Earthquake Stick-Slip

Spring (small slinky)

Sand paper

Natural Hazard Demonstrations for Teaching

II. Earthquake Demos
IIB. Earthquake Stick-Slip

Student slowly pulling cord + mass + spring + mass towards left

Natural Hazard Demonstrations for Teaching

II. Earthquake Demos
IIB. Earthquake Stick-Slip

Amount of 'Slip'

For in-depth discussion of an earthquake demonstration involving stick-slip see: Stein, R. (2000) *Earthquake Model* [Online] [<http://quake.wr.usgs.gov/research/deformation/modeling/eqmodel.html>]

Natural Hazard Demonstrations for Teaching

II. Earthquake Demos
IIC. References

Braille, L. (2005). Seismic Waves & the Slinky: A guide for teachers. [Online]. Available from: www.eas.purdue.edu/~braille/edumod/slinky/slinky.doc [Accessed 30 Oct 2005].

Exploratorium (2005) *Earthquake Experiments* (liquefaction, seismic slinky, high-way seismograph) [Online] Available at: <http://www.exploratorium.edu/faultline/activities> [Accessed 29 Oct 2005].

Stein, R. (2000) *Earthquake Model* [Online] Available at: <http://quake.wr.usgs.gov/research/deformation/modeling/eqmodel.html> [Accessed 25 Nov 2005].

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La Conchata
California, USA

Natural Hazard Demonstrations for Teaching

III. Mass Movement Demos
IIIA. Sand, Bottle, Water

Dry sand in bottle, 30-37° angle of repose.

King's College
London Student
Jennifer Holden

Natural Hazard Demonstrations for Teaching

III. Mass Movement Demos
IIIA. Sand, Bottle, Water

Add a little water, angle of repose very high, observation of sudden 'landslides' as bottle tilted.

Natural Hazard Demonstrations for Teaching

III. Mass Movement Demos
IIIA. Sand, Bottle, Water

Add more water. Sediment saturated (bottle far left) and angle of repose very low; sediment flows like a fluid. Sediment not saturated in right of bottle; angle of repose still high.

III. Mass Movement Demos
 IIIB. Colored Sand & Water



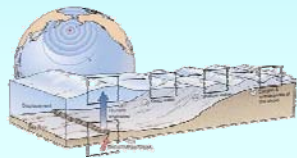
III. Mass Movement Demos
 IIIB. Colored Sand & Water



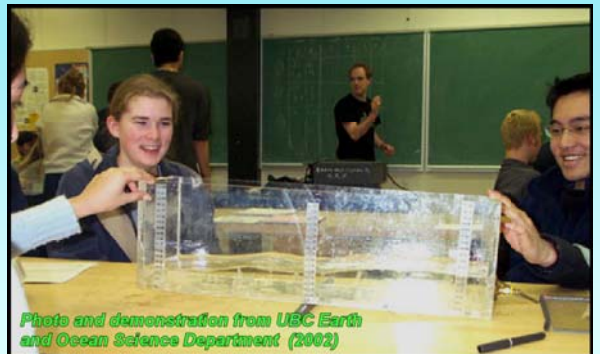
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IV. Tsunami Demos
 IVA. Wave Tank



Not easy to make a tsunami demonstration so it is ‘inexpensive’ and also shows a run-up that is easy for people to see. [Demonstrations include using different density liquids.]

IV. Tsunami Demos
 IVB. References

Bold Inventions (2005) *Tsunami Simulator Project* [Online] Available at: http://www.boldinventions.com/tsun_sim_2.html [Accessed 25 Nov 2005].
 EHP Online (2005) *Tsunami Simulation Experiment* [Online] Available at: <http://ehp.niehs.nih.gov/science-ed/2005/tsunami.pdf> [Accessed 24 Nov 2005].
 Mofjeld, H. (2004) *How can we make a homemade simulation of a tsunami?* *TsuInfo Alert*, 6(6), 15. Available online at: <http://www.dnr.wa.gov/geology/tsuinfo/2004-06.pdf> and http://www.pmel.noaa.gov/tsunami/Faq/x011_homemade_tsunami [Accessed 20 Nov 2005].
 NASA Observatorium (2005) *Tsunamis* [Online] Available at: http://observe.arc.nasa.gov/nasa/education/teach_guide/tsunami.html [Accessed 25 Nov 2005].
 UBC Earth and Ocean Science Department (2002) *Wave Propagation Lab, E114, Natural Disasters* [Online] Available at: <http://www.eos.ubc.ca/courses/eosc114/EOSC114home/HandsOnWavePhotos/WaveLabImages.html> [Accessed 10 Nov 2005].

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Natural Hazard Demonstrations for Teaching

V. Volcano Demos
 VA. Lava Lamp
 VB. Explosive Volcano

'Lava Lamp'



'Explosive Volcano' from Volcano World (2005)




Natural Hazard Demonstrations for Teaching


V. Volcano Demos
 VC. References

Barker, J (1996) Demonstrations of geophysical principles applicable to the properties and processes of the Earth's interior. [Online]. Available from: www.geol.binghamton.edu/faculty/barker/demos.html [Accessed 25 Nov 2005].

Volcano World (2005) *Volcano Models* [Online] Available at: http://volcano.und.nodak.edu/vwdocs/volc_models/models.html [Accessed 25 Oct 2005].



VolcanoWorld



Natural Hazard Demonstrations for Teaching

Poster Available

NATURAL HAZARD DEMONSTRATIONS FOR TEACHING
 Bruce Malamud, University of London, Kings College London
 Poster ED13C-1159

I. Summary
 This poster provides an overview of the demonstrations for teaching natural hazard demonstrations for teaching. The poster is available in PDF format and can be downloaded from the following URL: <http://www.kcl.ac.uk/~geog/teaching/nhd/>

II. Teaching Large Classes
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III. Actively Involving Students?
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IV. Class Demonstrations
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V. Do you have natural hazard demonstrations? Please send them to me!
 I am looking for natural hazard demonstrations for teaching. If you have any, please send them to me. I will be happy to include them in the poster. Please email me at bruce@malamud.com

e-mail bruce@malamud.com for pdf