

Visualizing Large-Scale Earth Processes and Abstract Concepts

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Goals

- 1) *Conceptualize and develop at least one simple apparatus or model which will accurately model an abstract or large-scale Earth process.*
- 2) *Further refine the apparatus to ensure that it is safe, easy to use, inexpensive, and constructed from materials that are readily available.*
- 3) *Disseminate information regarding the developed apparatus to in-service teachers*

Suggested Models and Problematic Labs

1. Mantle convection - Largely done with Convection Model, but labs could be developed.
2. Plate tectonic motions and plate interactions - see # 1 above.
3. Safe container (vapor control) and viable crystallization nuclei for thymol/salol modeling of igneous textures - could be refined further.
4. Hot-spot volcanism and seamount chains - a relatively unimportant point?
5. Magnetic anomalies associated with mid-ocean ridges
6. Radioactive decay - check old ESCP coins-in-a-shoebox lab, also computer animation at <http://explorelearning.com/gizmos/science/Halflife.htm>. Others use M&Ms or Skittles. Others have students replace heads-up pennies with plastic chips. Actual radiation source - NSTA paper?
7. Lithification - some success with one model, try powdered hobby glue next. Other rock cycle processes too.
8. Movement of P and S waves within Earth's crust
9. Dynamic evaporation/condensation systems. Capacity of air to hold moisture - "bad demo" using beakers, etc. - best handled with simulation software?
10. Absorption and radiation of solar radiation by land and water (Vorwald lab manual - doesn't produce good results). Also UPCO's Terrestrial Radiation Lab, plastic domes are used incorrectly to represent "trapping of heat" - reinforces concept of living in a dome and clouds act as blankets.
11. Conduction lab. Absorption and radiation with other materials (e.g., black and silver cans). Some students get opposite results. Teacher has tried varying the distance from the light and the wattage.
12. Physical models of porosity and permeability that avoid student misconceptions (e.g., larger particles have higher porosity).
13. Magma viscosity - bubble tubes? - application of existing apparatus
14. Angle of insolation - inconsistent and/or incorrect results - Refine model developed in 2005 and add extensions.
15. Rock abrasion - extensive variations in results with marble chips. Greatest abrasion should occur in initial shaking, but it doesn't always. Teacher has used 2-3 cm, presoaked marble chips which are shaken in a plastic food container. Are problems due to the way students pour out sample for weighing between shaking intervals?
16. Seasons and distance from Sun - student misconceptions persist - largely solved with model of 2005.
17. Eggs sucked into jars - explained as a result of oxygen consumption (more appropriate to chemistry?)
18. Ways to demonstrate Surface Area.
19. Ways to illustrate/model Nebular Hypothesis - star formation.