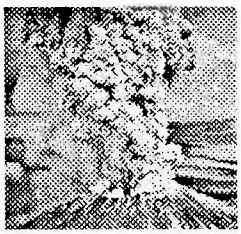
DYNAMIC PLANET

1. **DESCRIPTION**: Students will use process skills to complete tasks related to earthquakes & volcanoes.
   A TEAM OF UP TO: 2 **APPROXIMATE TIME**: 50 minutes
2. **EVENT PARAMETERS:** Each team may bring one 8.5" x 11" two-sided page of notes containing information in any from any source and up to two "non-graphing" calculators.
3. **THE COMPETITION:** Participants will be presented with one or more tasks, many requiring the use of process skills (i.e., observing, classifying, measuring, inferring, predicting, communicating, and using number relationships) from the following topics:
   a. Worldwide distribution patterns of earthquakes and volcanoes
   b. Types of volcanoes: shield, stratovolcanoes (composite), cinder cones; active, dormant, extinct
   c. Volcanic hazards: primary hazards including pyroclastic flows, lahars, tephra and gases, lava flows, flood basalts; secondary hazards including flooding and famine
   d. Types of earthquakes: spreading center, subduction zone, transform fault, intraplate
   e. Earthquake hazards: primary hazards including rapid ground shaking causing structural damage, buckled roads and rail tracks; secondary hazards including landslides and avalanches, alterations to water courses, flooding and fire
   f. Volcanic monitoring: geologic history, associated earthquake activity, magma movement, satellite data, hazard maps
   g. Earthquake monitoring: geologic history, identification of faultlines, remote seismograph positioning, changes in groundwater levels, observations of strange behaviors in animals
   h. Volcanism: at plate boundaries, over hot spots (oceanic and continental); hydrothermal vents
   i. Plate boundaries: ocean-ocean convergence, ocean-continent convergence, divergent plate boundaries at ocean ridge spreading centers and continental rift valleys, transform plate boundaries at mid-ocean ridges; rifting of continental plates
   j. Plate tectonics: seafloor spreading, features formed at plate boundaries, evidence of sea floor spreading including magnetic reversals, age of seafloor as opposed to continents, fossil evidence, density differences between continental and oceanic plates
   k. Faults: dip-slip, both normal and reverse; strike-slip, or transform
   l. Climatic effects of volcanic ejecta, both solid particles and gases, released into the atmosphere
   m. Tsunamis: origin, wave characteristics, warning system, "life" stages
   n. Seismic waves: primary (P)/secondary (S), surface; measurement: magnitude/intensity/focal depth
4. **REPRESENTATIVE TASKS**:
   a. Given a map of selected islands and seamounts of the Hawaiian chain accompanied by the approximate age and distance from the Island of Hawaii for each, participants will plot the movement of the Pacific Plate on a graph. They will then respond to a number of interpretative questions, including calculations, related to the information plotted on the graph.
   b. Given pre and post May 18, 1980 Topographic Profiles of the eruption of Mt. St. Helens, participants will respond to a series of questions identifying where no changes were made, where material has been removed, and where material has been added (deposited). They will then be given a series of questions to determine their ability to interpret observations and draw conclusions about that eruption.
   c. Calculate the location of an epicenter of an earthquake by triangulation using travel time of P and S waves.



5. **SCORING**: Points will be awarded for the quality and accuracy of responses. Ties will be broken by the accuracy and/or quality of answers to pre-selected questions.

SUGGESTED RESOURCES: http://pubs.usgs.gov/gip/dynamic/dynamic.html; Tarbuck, Edward J. and Frederick K. Lutgens, *Earth Science*. Prentice Hall, 2006.ISBN-10: 0131258524; Spaulding, Nancy E. and Samuel N. Namowitz. *Earth Science*. McDougal Littel. 2005. ISBN 0- 618-49938-5; Decker, Robert and Barbara Decker, *Volcanoes*, W. H. Freeman. 1997. ISBN 0716724405; Bolt, Bruce A. *Earthquakes*. W. H. Freeman. 1992, ISBN 0716722364; Chester, Roy. Furnace of Creation; Cradle of Destruction. Amacom. 2008 ISBN 13:978-0-8144-0920-6 http://earthquake.usgs.gov/learning/; http://nemo.sciencecourseware.org/VirtualEarthquake/; http://www.earth2class.org/; http://vulcan.wr.usgs.gov/

NATIONAL SCIENCE EDUCATION STANDARDS: Content Standard D. Structure of the Earth System; Earth's history.