DYNAMIC PLANET

Read the General Rules in the manuals and on www.soinc.org as they apply to every event.

1. **DESCRIPTION**: Students will use process skills to complete tasks related to earthquakes and 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 form from any source. Each **participant** may bring any kind of (non-graphing) calculator, but no other resources.

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-source: AAAS) for any or all of the following topics:
   a. Types of volcanoes: shield, cinder cone, composite (stratovolcano), lava dome
   b. Relate volcano type to kinds of eruptions: explosive, effusive, submarine
   c. Volcanic hazards including pyroclastic flows, lahars, volcanic gases, lava flows, ash, landslides
   d. Volcanic features including calderas, crater lakes, lava plateaus, geysers, hot springs, volcanic plugs
   e. Relate rock type to kinds of eruptions, plate boundaries, and hot spots
   f. Seismograms and characteristics of Primary (P), Secondary (S), Love (L) seismic waves
   g. Earth's interior: boundaries and characteristics of inner core, outer core, mantle, lithosphere, Moho
   h. Features and characteristics of thrust, normal, and reverse faults
   i. Measuring ground movement and assessing damage: Mercalli Scale, Richter Scale (Seismic Moment)
   j. Emergency preparedness
   k. Climate change as related to volcanic activity
   l. Topographic map skills as related to earthquake and volcanic hazards
   m. Plate boundaries: convergent, divergent, transform
   n. Features at various plate boundaries including earthquake patterns, mid-ocean ridges, subduction zones, volcanic arcs and mountains, trenches, mountain ranges
   o. Evidence of continental drift including, but not limited to, matching fossils, rock types, shape of continents, mountain ranges
   p. Evidence of sea floor spreading including the age of rocks and patterns of magnetic reversals on either side of mid ocean ridges
   q. Tsunamis: generation, propagation and risk

4. **REPRESENTATIVE TASKS**:
   a. Calculate the rate of sea floor spreading using information found on the map of Hawaii, i.e. age of island vs. distance from hot spot; or age and distance from mid ocean ridge
   b. Interpret isoseismic lines to determine damage and location of epicenter
   c. Calculate velocity of P wave given travel time and distance
   d. Use graphs of P & S wave travel time to determine epicenter distance and location of epicenter
   e. Calculate origin time of an earthquake based on travel time and arrival times of P & S waves
   f. Topographic map skills - calculate gradient of slope of volcano; draw profile of Mt. St. Helens before and after the 1980 eruption, formation of new features
   g. Match a cross sectional model of a plate boundary with type of plate boundary observed on world map
   h. Predict likely path of mud or pyroclastic flows given a map with historic data

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: Websites: http://earthquake.usgs.gov/learning/; http://nemo.sciencecourseware.org/VirtualEarthquake/; http://www.earth2class.org/; http://pubs.usgs.gov/gip/dynamic/dynamic.html; http://vulcan.wr.usgs.gov/;
Books: 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

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