Paper Number: 1717

Development of Interactive Web Applications for Geoscience Education

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We, Earth science educators, teach students about the Earth's history and structure/mechanism in a 4.6 billion years' geological time scale and microscopic (10^{-6} m) to macroscopic (10^{5} to ~ 10^{7} m) spatial scale. Because Earth Science is one of the material science, understanding Earth for students requires an object lesson to observe rocks, strata, fossils, crystal specimens and so on at outcrops and/or in laboratories. The range that can be identified by the human eye is limited to 10^{-3} ~ 10^{4} m, so a (electron) microscope or satellite images are useful. Analogue experiments can also help in understanding the principles of Earth's dynamics.

Furthermore, data visualization is one of the best approaches for students to give intuitive understanding of Earth's phenomena. In 2007, Apple Inc. released iPhone equipped with a wide-screen, multi-touch control and a web browser. These multi-touch devices help not only a new way of data visualization but also interactive experience to find their own speculation. I have developed and released several interactive web applications for geoscience education as follows:

OrbitViewer displays the orbits of planets and comets/asteroids in the solar system (originally developed by Ajiki, O. and Baalke, R. as a JAVA Applet in 2001[1]).

Plate Tectonics displays the distribution of continents during the past 600 million years in a 3D virtual earth (using Ron Blaky's paleogeographic reconstruction maps [2]).

El Nino displays sea surface temperature pattern during 1950-2012. Original data from Japan Meteorological Agency [3].

HypoViewer2 displays earthquake hypocentres during 2002-2012. Original data from USGS [4].

These applications are designed for:
- using popular personal devices such as iPhone and Android,
- running on a general web browser (Web application), and
- interactive user interface that controls times and orientation/viewpoint in a virtual space.

Pedagogical idea using these applications in a classroom will be shown in the presentation. If you have a smartphone, please access with a web browser --- http://www.igeoscience.com/igc35

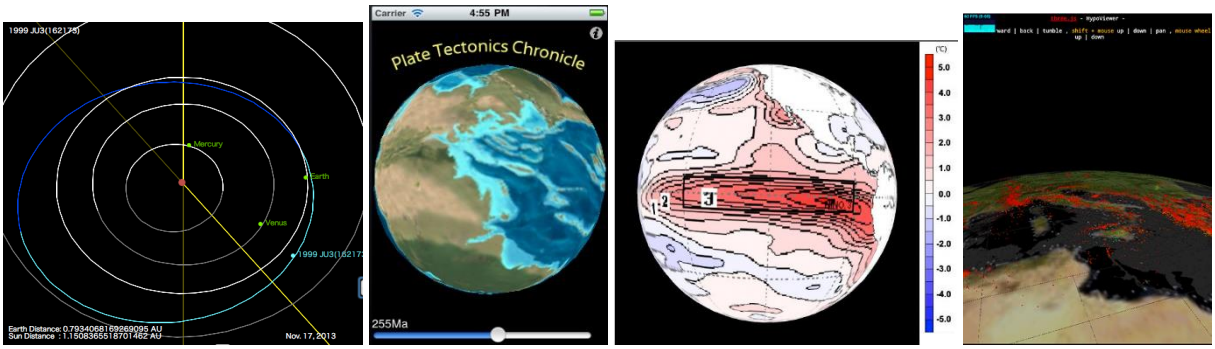

Figure 1: Screenshots of interactive web applications for geoscience education

References:

[1] OrbitViewer, www.astroarts.co.jp/products/orvitviewer/index.html

[2] Colorado Plateau Geosystems, http://cpgeosystems.com/paleomaps.html

[3] Japan Meteorological Agency, http://www.data.jma.go.jp/gmd/cpd/data/elnino/clmrep/sst-global.html

[4] USGS Earthquake Archive Search & URL Builder, http://earthquake.usgs.gov/earthquakes/search/