



Which future for global earthquakes and volcanoes pattern? Insights on Mt. Etna volcano (Sicily)

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Understanding one of the most complex geological theories as plate tectonic and continental drift which are a sort of puzzle even for many scientists of today, is not easy. Also, it should be considered that, especially for students who are dealing with earth sciences for the first time, the meaning of geologic time is an extremely far concept. Since I teach in a city very close to Mount Etna, the highest European active volcano, I have consciously chosen to utilize the topic of plate tectonic as an instructive tool to understand earthquakes and volcanic eruptions (students are really curious and interested in seismic and volcanic events occurred at the end of december 2018, because they could really feel and see it with their eyes!). Indeed, understanding the future evolution of tectonically active landscapes is one of the most important goal for the comprehension of changing phenomena which could impact society by affecting the distribution of mineral and geothermal resources, controlling basin development and groundwater resources, and posing significant risk via seismic and volcanic hazards.

In order to catch the concepts of crust, mantle, convection cells and the three general categories of plate boundaries recognized by scientists (convergent, divergent, and transform) 11-12 years-old students are asked to practice with simple models of Play-Doh floating in a tank full of marmalade. This would help them to easily understand the different materials which mantle and crust are made of.

After discussing about the past evolution of plate tectonic during the ages, students are asked to construct a 3D model of a plates tectonic structure with oceans and continents using simple material like styrofoam or cork. Then, with different coloured drawing pins, students place on the 3D model the occurrence of the most important seismic events in Earth's history and the position of volcanoes. Changing the shape of the 3D model, students have to imagine different possible scenarios of evolution of plate tectonic, adapting the new position of earthquakes and volcanoes and drawing an imaginary earth's map of a far future.

Last focus is on the role of regional faults system and the discussed origin of Mount Etna: if volcanoes follow plates' boundaries somehow, how can plate tectonic explain the unusual location of Mount Etna on the nonvolcanic side of the eolian island arc? Indeed, it is a common knowledge that volcanism of Etna is not directly related to the slab subduction system (as the eolian arc islands is, even though they are very close) but it is in some way linked to it. To answer this question many authors have proposed that Etna is sourced by a transtensional window associated with different movements of the Apennine subduction zone between Sicily and the Ionian Sea. With the help of teacher, student reflect on the extremely complex geological setting where Mount Etna is located, trying to critically deduce the possible processes involved in and to formulate a hypothesis on its origin, linked to global tectonic.