Hot Spots and Mantle Plumes

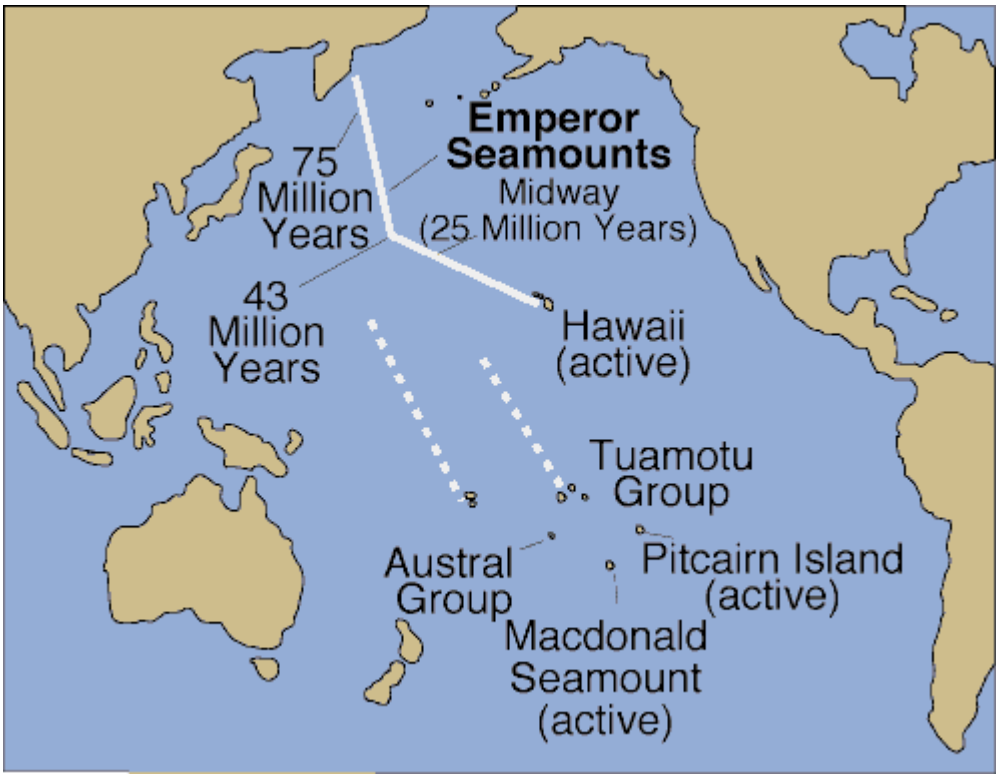
Lesson at a glance, Key Concepts, and Lesson Outcomes are available by clicking here.

If you would like to see a list of useful references please click here.

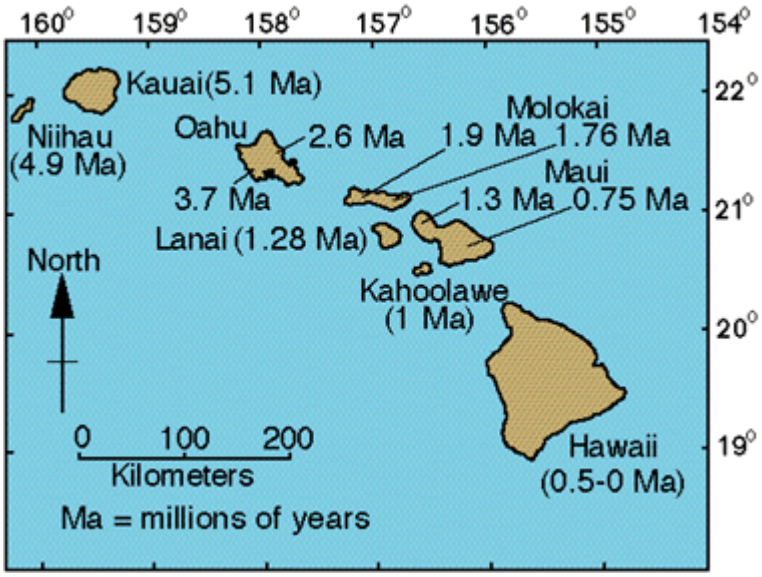
Click here for activities and teaching suggestions about hot spots.

History of Concepts

In the 1960s, geologists were seeking ways to prove or disprove the new idea of moving plates. Exploration of magnetic anomalies at mid-ocean ridges provided strong support for seafloor spreading . Geologists studied other ocean features to see how they related to plate tectonics. While visiting Hawaii, Tuzo Wilson, one of the founders of the theory of plate tectonics, noticed some interesting features about ocean islands. On a map of the Pacific basin, he found three linear chains of volcanoes and submarine volcanoes (seamounts).



Although separated by thousands of miles, the three linear chains are parallel to each other. Of the three, the Hawaii-Emperor seamount chain was the most well known. Wilson reviewed the reports that had been published on these island chains and recorded the age of each island. An interesting pattern emerged. For each chain, the islands become progressively younger to the southeast. The extreme southeast end of each chain is marked by active volcanoes.



Wilson proposed that the Hawaiian islands formed successively over a common source of magma called a hot spot. The Island of Hawaii is currently located above the hot spot.

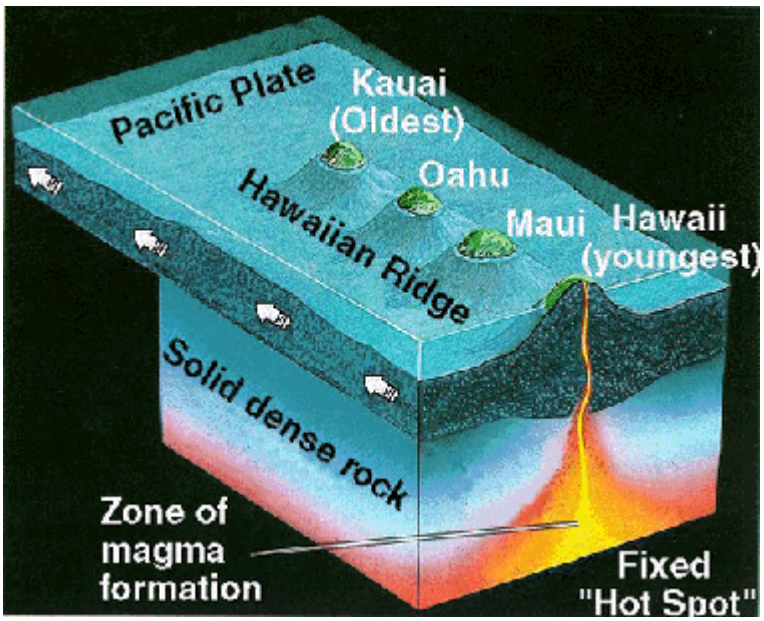


Image Source: Eruptions of Hawaiian Volcanoes: Past, Present, and Future: U.S. Geological Survey General Interest Publication.

Hot, solid rock rises to the hot spot from greater depths. Due to the lower pressure at the shallower depth, the rock begins to melt, forming magma. The magma rises through the Pacific Plate to supply the active volcanoes. The older islands were once located above the stationary hot spot but were carried away as the Pacific Plate drifted to the northwest .

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