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What controls the distribution and tectono-magmatic features of oceanic hot spot volcanoes

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Hot spot oceanic volcanoes worldwide show significant deviations from the classic Hawaiian reference model; these mainly concern the distribution of edifices and overall tectono-magmatic features, as the development of the volcanic rift zones and extent of flank instability. Here we try to explain these deviations investigating and comparing the best-known hot spot oceanic volcanoes. At a general scale, these volcanoes show an age-distance progression ranging from focused to scattered. This is here explained as due to several independent factors, as the thermal or mechanical weakening of the plate (due to the lithosphere thickness or regional structures, respectively), or the plume structure. At a more detailed scale, hot spot volcanoes show recurrent features, including mafic shield edifices with summit caldera and volcanic rift zones, often at the head of an unstable flank. However, despite this recurrence, a widespread tectono-magmatic variability is often found. Here we show how this variability depends upon the magma supply and age of the oceanic crust (influencing the thickness of the overlying pelagic sediments). Well-developed rift zones and larger collapses are found on hot spot volcanoes with higher supply rate and older crust, as Hawaii and Canary Islands. Poorly-developed rift zones and limited collapses occur on hot spot volcanoes with lower supply rate and younger crust, as Easter Island and Ascension. Transitional features are observed at hot spots with intermediate productivity (Cape Verde, Reunion, Society Islands and, to a minor extent, the Azores), whereas the scarcity or absence of pelagic sediments may explain the lack of collapses and developed rift zones in the productive Galapagos hot spot.