

## Auto contact metamorphism at the base of an off-axial lava pond off the East Pacific Rise, Site 1256, ODP Leg 206

# Susumu Umino[1], Leg 206 Shipboard Scientific Party

[1] Dept. Bio. and Geosci., Shizuoka Univ.

[http://www.shizuoka.ac.jp/~geo/Staff/Umino\\_j.html](http://www.shizuoka.ac.jp/~geo/Staff/Umino_j.html)

Leg 206 is the initial phase of a planned two leg project to drill in situ ocean crust at Site 1256 on the Cocos plate, which formed at a superfast spreading rate ca. 15-m.y-ago. To fully characterize the sedimentary overburden and establish depths for the casing strings, a series of pilot holes were cored that recovered a nearly complete section of the 250.7 m of sediment overlying basement and penetrated 88.5 m into basement in Hole 1256C with very good recovery (61.3%). A total of 32 m of thick massive lava was cored in Hole 1256C, of which 29 m was recovered. This massive lava is correlatable with more than 75-m thick lava encountered in top of the adjacent Hole 1256D, which drilled over 500 meters of extrusive lavas into basement. Sheet flows with subordinate pillow lavas, hyaloclastites, and dikes are capped by the more evolved, massive lava.

We interpret the thick massive units encountered in Holes 1256C and 1256D to be a thick ponded lava and not an inflated sheet flow on the following grounds: 1) the absence of inflation-related structures on the upper surface of and within the massive lava, which were uncommonly observed in deeper parts of drill cores as in-situ fragmented hyaloclastite along subvertical cracks, 2) the absence of fine-grained seal zones or lenses which suggest coalesced flow lobe contacts, 3) the largest groundmass grain size and incompatible element concentration in the upper part of the massive lava body suggest the presence of a more differentiated, late solidified melt horizon in the upper one third of the lava body, 4) the absence or scarcity of subhorizontal vesicle-rich layers and segregated melt lenses that are commonly observed in lower middle of inflated sheet flows elsewhere in the Hole 1256D.

In Hole 1256C, the basal 1.6-m thick lava of the ponded flow has a unusual texture consisting of recrystallized variolitic groundmass and magmatic veins, which shows synmetamorphic ductile deformation textures. Both clinopyroxene and magnetite in the recrystallized basal lava show rapid increases in grain size toward the ponded lava above, which was the apparent heat source of recrystallization. However, plagioclase tends to preserve its igneous texture at least in the core even in the most intensely recrystallized sample. Magmatic veins are composed of plagioclase, quartz, magnetite, brownish clinopyroxene with pale to dark green rims, and granophyric to vermicular intergrowths of sodic plagioclase and quartz. This is an identical mineral assemblage to the mesostasis in the coarse-grained massive lava pond. A thin section taken from 206-1256C-11R-7, 32-35 cm, shows progressive recrystallization of earlier, more intensely deformed vein minerals that are cut by later, planar veins with chilled margins against the host basalt. Earlier veins are more progressively recrystallized into equigranular neoblasts and shows any evidence of subsolidus intracrystalline deformation such as undulose extinction and kink bands. This, together with the undulating margins of the veins, suggests that either the deformation took place under hypersolidus conditions or the rate of replacement of deformed crystals with neoblasts always exceeded the rate of intracrystalline deformation.

The complete lava sequence formed over a sufficient time period to catch the transition from a stable shallowly dipping magnetic field in the axial lavas to a more steeply dipping field (Inc. over 70 degrees) in the overlying ponded flow. If our interpretation is correct approximately 20% of the extrusive sequence, cored so far, formed from lava flows that were emplaced significant off axis. The lava pond was probably formed in small faulted depressions on the near ridge flanks (ca. 5 km).