Correlation of physical properties, logging and lithology at the 45Ma Pacific plate: ODP-Leg 200 H2Osite

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1. Introduction

The ODP leg 200 drilled at H2O site, which is located at a 45 Ma oceanic crust in the eastern Pacific plate. Although so many drillings were carried out in the past DSDP and ODP drilling histories, there are not so many drillings penetrated into oceanic basalt deeper than 100m. During leg 200, the site 1224F was cored down to 172mbsf. As the thickness of sediment layer was 28m, this hole reached to 144 m penetrations into basaltic layer.

The main objective of the H2O site was to drill a hole into the basaltic layer for a downhole seismometer installation. The hole required to install a reentry corn and to be cased and cemented for the casing. The Hole 1224-D was drilled down to 34 m into the basalt, and this hlole is going to use for the seismometer installation. After the installation of seismometers in the Hole 1224-D, the seismometer will be connected to HAW-2 submarine cable, which will be able to make a real-time telemetry.

Beside Hole 1224-D, other five holes (1224-A, B, C, E and F) were also drilled nearby the hole 1224-D. Among these holes, Hole 1224-F is the deepest one, 172mbsf. The upper 28 was found to be brown color sediments, which contains high population of radiolarian in the upper 10m. The lower half is clay layer.

2. Results and discussions

Physical properties, logging, lithology and seismic reflection data were compared. All data show that 4-6 distinct units were identified. Logging data and physical properties give six distinct units: 1) 0-28 mbsf, 2) 28-40mbsf, 3) 40-65 mbsf, 4) 65-100 mbsf, 5)100-140mbsf, and 6) deeper than 140 mbsf. The first unit (0-28 mbsf) is brown clay layer with radiolarians at the shallow depth. The mean velocities by physical property measurements give ~ 1500 m/s. Two units between 28 and 65 mbsf, is characterized by massive basalts with thin fractured zones around 40 mbsf. The compressional wave velocities by physical property measurements is 5700 +/- 500 m/s. Smectite veins were found at these units. The fourth unit (65-100 mbsf) was characterized by fractured basalt layers. Many small fractures were also identified by FMS/DSI logging tool. The calcite veins were found in this unit. The compessional velocity is ~ 5000 m/s. The fifth unit (100-140mbsf) was characterized by stacks of small piece of pillows lavas. This layer has slightly higher compressional velocities 5.0 km/s shown by physical properties. Porosities by logging data, however, show highly porous zones for this unit. This unit also indicates the presence of smectite veins. Just below the unit 5, sudden large variations on caliper, resistivities, compressional and shear velocities, U, and Th contents, and temperature measurements were found by logging data. Physical property measurements also indicated that this unit is highly fractured. The presence of high U and Th contents suggests that this unit is highly altered zone. Below ~140mbsf, basalt sheet flows were found.

Although we could not drill below this depth, the SCS data suggests that this is the top of massive basalt. In comparison the above units to the SCS records, these unit boundaries are widely identified. This might give great possibilities to understand the lithological boundary and its nature of oceanic 2A and 2B at ~45 Ma fast spreading oceanic crust.