Microearthquake seismicity of the central Mariana Spreading Center

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We report the results of a microearthquake survey using an ocean bottom seismometer array in the central Mariana Trough. Twelve seismographs of the Margins Mariana Subduction Factory Imaging Experiment were located within 40 km of the spreading center between 17 45' N and 18 15' N. A total of 292 earthquakes were located from June 2003 to April 2004 using a double-difference relative relocation method. Seismic activity appears to be concentrated on nontransform offsets and ridge segment centers. Two clusters of seismic events are located at nontransform offsets: (1)17 33-39' N 144 42-54' E at 0-8 km depth and (2)17 54-59' N 144 45-54' E at 0-12 km depth. Three seismic event clusters are located at ridge segment centers: (3)17 45-48' N 144 53-56' E at 0-3 km depth, and (4)18 3-10' N 144 42-57' E at 0-3 km depth (5)18 29-46' N 144 35-43' E at 0-10 km depth. Most (82%) of the best-located nontransform offset events are located at 5-11 km depth. This implies that earthquakes in the nontransform offset area are predominantly in the mantle, whereas the events on ridge segments are located at very shallow depths (0-3 km) in the oceanic crust. Most of the seismic events in cluster #5 are aftershocks of Mw 5.4 and 5.7 events on March 23, 2004 with normal-faulting Harvard CMT solutions. These earthquakes also triggered substantial very shallow seismicity at cluster #4 within the hours following the mainshocks, along a ridge segment at a distance of 50-60 km. Distribution of seismic events in cluster #3 is focused along a 5 by 5 km plane which is parallel to a flank uplift located westward of the spreading center. Event depth distribution in cross section is compatible with flank dip (about 30 degrees). Most events occurred on July 19 and 25, 2003 and continued a few hours duration. The seismic plane could denote activity on a low angle detachment fault forming the flank uplift. Seismic event cluster #2 consists of four sub-clusters. Two sub-clusters are located at the segment end, and another two are on the segment boundary.