Subsurface Structure of the Philippine Fault in Ragay Gulf, Southern Luzon

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Very high-resolution seismic reflection profiles reveal the sub-surface deformation produced by repeated earthquakes along the Philippine fault in the Holocene sediments of Ragay Gulf, Southern Luzon, where the Ragay Gulf earthquake (Ms = 7.0) took place on March 17, 1973 (Allen, 1973). The surface fault rupture associated with the earthquake extended for about 30 km on land between Ragay Gulf to Calauag Bay. A 3.4 meters left-lateral offset of the shoreline was observed in Barrio Cabong on the western coast of Ragay Gulf.

The instrument we used for the study, employs magnetostrictive boomer sound sources with pulse energy of 100 joules, and produces a source pulse of 3 kHz to 10 kHz. The return energy is captured by a hull-mounted laterally-shielded receiver. The high fidelity of this equipment proved to be superb in soft fine subsurface sediments less than 140m deep with low bottom roughness. The greatest depth of Holocene deposits in most of Ragay Gulf is about 30m.

We made 30 cross sections across the submarine part of the earthquake fault about 15km off Capuliam. The records are surprisingly clear and the maximum recording depth with this VHR system was 50 m in the Gulf. The fault in the Gulf extending NW- SE, is almost vertical reflecting its strike-slip focal mechanism of the earthquake. Sharp depressions on the sea bottom along the fault have not been filled up, suggesting recent activity of the fault. The pressure ridges and depressions are arranged alternatively every several kilometers as observed on land where the fault traces exhibited moletracks with ground fissures arranged in enchelon.

From the displacement of the well-defined acoustic layers, repeated vertical separations across the active faults is suggested that three or more major earthquakes during Holocene. We plan to conduct piston coring to collect datable materials to reveal paeloseismological activities of the fault.

Thus, the geophysical imaging of shallow deformation provides new insight into the recent behavior of the submarine portion of the Philippine fault and advances methodology for active fault studies.