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Wide-angle seismic investigation of the central Java subduction zone

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Offshore wide-angle data acquired by ocean bottom instruments of a combined onshore-offshore investigation of the tectonic framework of central Java are presented in this study. The joint interdisciplinary project MERAMEX (Merapi Amphibious Experiment) was carried out to characterize the subduction of the Indo-Australian plate beneath Eurasia. The interpretation of three marine wide-angle data profiles, modelled with forward raytracing, indicates that the subduction of the Roo Rise, located south of central Java, with its thickened oceanic crust strongly influences the subduction zone. Large scale forearc uplift is manifested in isolated forearc highs, reaching water depths of only 1000 m compared to 2000 m water depth off western Java, and results from oceanic basement relief subduction. The eastern dip profile is strongly disturbed with a heterogenous velocity distribution in the forearc region as a result of compressible forces in N-S direction. The dip angle of the downthrusting oceanic plate is 10° and its crustal thickness increases eastward from 8 km to 9 km over a distance of 100 km between both dip profiles off central Java. A broad band of seamounts trends E-W at approximately 10°S. Its incipient subduction off central Java causes frontal erosion of the margin here and leads to mass wasting due to oversteepening of the upper trench wall. A suite of wide-angle profiles off southern Sumatra to central Java indicates a conspicuous change in the tectonic environment between longitudes 108°E and 109°E. The well-developed accretionary wedge off southern Sumatra and western Java diminishes into a small frontal prism with steep slope angles of the upper plate off central Java.