DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED ON BEHALF OF THE MINISTRY OF MINES, GOVERNMENT OF INDONESIA,
AND THE AGENCY FOR INTERNATIONAL DEVELOPMENT, U.S. DEPARTMENT OF STATE
IN COOPERATION WITH THE GEOLOGICAL SURVEY OF INDONESIA

FOLIO OF THE
INDONESIAN REGION
MAP I-875-C

EPICENTERS
Depth of focus in kilometers
• 0–99
• 100–199 ▲ 200–299
○ 300–399 • 400–499
• 500–599 ▲ 600–699

Epicentral locations and focal depths are those for earthquakes recorded by 10 or more stations within the period 1 January 1961–31 August 1971, and published in the Preliminary Determination of Epicenters reports of the National Earthquake Information Service (NEIS) of the U.S. Geological Survey. (This office was previously the National Earthquake Information Center of, in order of increasing age within the reporting period, the National Oceanographic and Atmospheric Administration, the Environmental Science Services Administration, and the U.S. Coast and Geodetic Survey.) This map was prepared from computer plots made from NEIS tapes by Allen Lowrie, using a program written by John C. Pennylegion and Louis G. Hemler, all of Code 6120, U.S. Naval Oceanographic Office. Some earthquakes are relocated according to the first-motion studies cited subsequently.

Nearly all earthquakes of Richter magnitude greater than 5.0 are shown; the lower magnitude limit for any of the earthquakes is about 4.5. The locations are subject to both random and systematic errors. Random errors in epicentral locations are typically 25 km (node value) and in depth typically 50 km.Systematic errors, varying from region to region about the map area, are due to velocity distributions that depart from those of a concentrically layered model earth. Irregular distribution of continental, intermediate, old and new oceanic crust, and, more importantly, anomalous upper mantle structure, account for these departures. Although systematic errors have not been defined in this area, the maximum epicentral error is probably about 30 km, judging from errors in computed locations of nuclear tests in the Aleutian Islands region and from consideration of distribution of stations in the Indonesian region. (This statement is based on information provided by Thomas J. Fitch, Australian National University, and Arthur C. Tarr and Carl W. Stover, U.S. Geological Survey.)

FOCAL MECHANISMS

Lower-hemisphere equal-area plots show radiation fields of earthquakes. Black quadrants, first arrivals compressional; white quadrants, first arrivals dilatational. Each plot provides 2 possible fault-plane solutions. The following examples illustrate mechanisms, assuming simple faulting as the cause.

Thrust faulting – Fault plane dips either gently westward or steeply eastward

Normal faulting – Fault plane dips moderately either to northeast or southwest

Strike-slip faulting – Vertical fault either strikes westward and is left lateral, or strikes northward and is right lateral

Oblique faulting

Thrust faulting with strike-slip component

Normal faulting with strike-slip compnenet

The strikes and dips of the fault planes should in general be located to within 20° of their true positions. The type of mechanism should be identified correctly in nearly all cases. A double-couple model is assumed in these determinations, although it is possible that normal-fault solutions for earthquakes deeper than 300 km record changes in pressure phase rather than simple faulting.

SOURCES OF FOCAL-MECHANISM DETERMINATIONS

Curtis, J. W., 1973, Plate tectonics and the Papua-New Guinea-Solomon Islands region: Geol. Soc. Australia Jour., v. 20, pt. 1, p. 21–36. (Includes determinations by I. D. Ripper.)

Fitch, T. J., 1970, Earthquake mechanisms and island arc tectonics in the Indonesian-Philippine region: Seismol. Soc. America Bull., v. 60, no. 2, p. 565–591.

———1972, Plate convergence, transcurrent faults, and internal deformation adjacent to Southeast Asia and the western Pacific: Jour. Geophys. Research, v. 77, no. 23, p. 4432–4460.

Fitch, T. J., and Molnar, Peter, 1970, Focal mechanisms along inclined earthquake zones in the Indonesia-Philippine region: Jour. Geophys. Research, v. 75, no. 8, p. 1431–1444.

Johnson, Tracy, and Molnar, Peter, 1972, Focal mechanisms and plate tectonics of the southwest Pacific: Jour. Geophys. Research, v. 77, no. 26, p. 5000–5032.

Katsumata, Mamoru, and Sykes, L. R., 1969, Seismicity and tectonics of the western Pacific–Izu-Mariana-Caroline and Ryukyu-Taiwan regions: Jour. Geophys. Research, v. 74, no. 25, p. 5923–5948.

TECTONIC FEATURES

Most of the structures shown either are active now or became inactive only within Quaternary time. Structures inactivated within middle or late Tertiary time are included where they are particularly important for tectonic understanding. Ambiguities in interpretation are most numerous in the complex region of the Molucca Sea and northern New Guinea. Queries at ends of faults indicate uncertainties regarding continuations.

Trace of subduction zone – Solid where active; long dashed where inactive; short dashed where overridden by another zone. Barbs on overriding side. Wedges, more than 100 km wide and 10 km thick, of imbricated sediments, crystalline rocks, and mélange lie upon the subducting plates and hide the actual lithosphere-plate subduction contacts around the Java Trench-Ceram Trough subduction system and in the Molucca Sea region. The subduction-zone symbols are placed in the gentle-sided trenches at the fronts of these wedges where present

Line of collision between subduction zones of opposite polarity

Benioff seismic zone – Contours, in kilometers, of approximate depth to inclined zones of mantle earthquakes. Ticks on down-dip sides. Contours are inferred to mark the tops of subducting lithosphere plates at shallow depths but the interiors of them at greater depth. The contouring is based on the assumption that the plates are continuous for long distances laterally rather than fragmented into tongues of different dips and sizes

Strike-slip fault – Showing relative direction of movement. Solid where active; dashed where inactive

Fault of unspecified type – Solid where active; dashed where inactive

Volcanoes
Active
Inactivated within Quaternary time

Bathymetry compiled by Warren Hamilton, U.S. Geological Survey, in cooperation with the Scripps Institution of Oceanography (SIO) of the University of California. Indian Ocean and Andaman and Banda Seas contoured by Robert L. Fisher, SIO, *in* Udintsev, G. B., ed., Geological-Geophysical Atlas of Indian Ocean (IIOE): State Dept. of Cartography and Geodesy (GUGK), Moscow, USSR (in press). Region north of Equator and east of 100° East Longitude: T. E. Chase and H. W. Menard, SIO, 1969, U.S. Navy Hydrographic Office Pub. 1301. Region between Equator and New Guinea: Jacqueline Mammerickx, T. E. Chase, S. M. Smith, and I. L. Taylor, SIO, 1971, Bathymetry of the South Pacific, Chart 11, University of California. Coral Sea: J. V. Gardner, 1970, Geological Society of America Bulletin, v. 71, no. 9, fig. 3. Minor corrections in various areas by Hamilton.

MERCATOR PROJECTION EQUATORIAL SCALE 1:5 000 000

100 0 100 200 300 400 500 600 700 800 900 1000 KILOMETERS
100 0 100 200 300 400 500 STATUTE MILES
100 0 100 200 300 400 NAUTICAL MILES

BATHYMETRIC CONTOURS
CONTOUR INTERVAL 1000 METERS, WITH
200-METER CONTOUR ADDED

EARTHQUAKE MAP OF THE INDONESIAN REGION

Compiled by
Warren Hamilton
1974

☆ Interior—Geological Survey, Reston, Va.—1974

INTERNATIONAL BOUNDARIES SHOWN ON THIS MAP ARE NOT NECESSARILY AUTHORITATIVE

GLOSSARY OF INDONESIAN GEOGRAPHICAL TERMS

Jazirah		peninsula
Kepulauan	Kep.	island group
Pulau	P.	island
Sungai		river
Teluk		bay
Danau		lake

For sale by U. S. Geological Survey
Denver, Colo. 80225 and Reston, Va. 22092, price $ 1.00