CIRCUM-PACIFIC MAP SERIES
MAP CP-35
Explanatory pamphlet accompanies map

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

CIRCUM - PACIFIC COUNCIL FOR ENERGY AND MINERAL RESOURCES

NATURAL HAZARDS MAP OF THE CIRCUM-PACIFIC REGION

PACIFIC BASIN SHEET

THIS MAP IS A CONTRIBUTION TO THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION (IDNDR)

CIRCUM-PACIFIC MAP PROJECT

The Circum-Pacific Map Project (CPMP) is a cooperative international effort to show the relation of mineral and energy resources to such phenomena as geology, tectonics, and crustal dynamics. The project is one of the activities of the Circum-Pacific Council for Energy and Mineral Resources. For most CPMP map series, six overlapping maps cover the Pacific Basin at a scale of 1:10 million, and a seventh map covers the entire region at a scale of 1:17 million. All are plotted on the Lambert azimuthal equal-area projection.

The Natural Hazards Map is a special sheet on the 1:17-million base prepared in cooperation with the U.S. National Oceanic and Atmospheric Administration. It also includes data from the Geographic, Plate-Tectonic, and Geodynamic Maps of the regular series of the Circum-Pacific Map Project.

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MAP PRODUCTION BY U.S. GEOLOGICAL SURVEY
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SCALE 1:17 000 000

500 0 500 1000 1500 2000 KILOMETERS
500 0 500 1000 MILES
400 200 0 400 800 NAUTICAL MILES

Lambert Azimuthal Equal-Area Projection
(Map center point: Equator, 160°W.)

1992

Base by U.S. Geological Survey, 1978.
Modified in 1992.

EXPLANATION

WEATHER HAZARDS

TROPICAL STORMS

Tropical storm tracks—Preferred tracks for tropical storms (wind speeds equal to or greater than 34 knots). The width of the arrow indicates the approximate probability of having at least one tropical storm within a given 5-degree square in any given year. The greatest width represents a 100% probability, and the least a 10% probability. The preferred tracks are based on storms for the following periods: western North Pacific (1953-1986); eastern North Pacific (1965-1986); southwest Pacific and Australia (1956-1986); North Atlantic (1899-1986).

Tropical storm probability in percent—The isolines define the general areas of 10%, 50%, and maximum probability of having at least one tropical storm within a given 5-degree square during any one year.

TORNADOES

Frequency of tornadoes—Triangles indicate general regions where tornadoes occur, and patterns, which show where they are especially abundant, indicate the average period in years between repeat passes of tornado paths, typically 100 meters in diameter; from World Map of Natural Hazards, ed. 2, Münchener Rückversicherungs-Gesellschaft, 1988.

Recurrence interval (years)
1500
2500
5000
15000

WINTERTIME WAVE HEIGHTS

Percent frequency of heights equal to or greater than 6 meters (20 feet)—Waves are selected on the basis of the higher of the sea or the swell when both are reported. If the heights are equal, the wave with the longer period is selected. Most of the observations were collected by ships of opportunity from the various maritime nations. The winter season is defined as for the ice limits below.

ICE LIMITS

Derived from weekly analyses, 1973 through 1982.

Maximum ice edge during winter—December, January, February in the northern hemisphere, and June, July, August in the southern hemisphere.

Maximum ice edge during summer—June, July, August in the northern hemisphere, and December, January, February in the southern hemisphere.

Probability of wintertime superstructure icing—Freezing of sea spray or precipitation on marine structures can build up rapidly and increase the height of a ship's center of gravity to become a serious threat, especially to smaller craft. In general the greater the wind speed and the lower the air temperature the greater the potential for superstructure icing. Isolines are based on ship-of-opportunity observations archived at the National Climatic Data Center (NOAA) using the following discriminant function for the critical wind speed necessary to produce superstructure icing for a given temperature. The equations are based on T. Suwada's relationship published in 1962:

$$V = \frac{A}{\sin(BxT)}$$

Potential superstructure icing when W-V>0; none if <0;
where W = wind speed in knots
T = temperature in °C
V = computed critical wind speed (knots) based on T
A = 0.0180
B = -0.0113

Approximate Limit of Superstructure Icing

Maximum Ice Edge (Summer)

Maximum Ice Edge (Winter)

Minimum Ice Edge (Winter)

50%

GEOLOGIC HAZARDS

TSUNAMIS (1900-1988)

Maximum Runup Height
2 to 6 meters — More than 6 meters

Earthquake that caused tsunami

Volcanic eruption, landslide, or explosion that caused tsunami

Location of reported tsunami runup

EARTHQUAKE EPICENTERS

1906 ▼ •

Earthquakes—Dots indicate 1964 through 1979 shallow-focus (0 to 70 km) events of magnitude 5.0 through 7.4; triangles labeled by date indicate 1899 through 1982 shallow-focus events of magnitude 7.5 or greater (generally surface-wave magnitude).

ACTIVE TECTONIC PLATES

Transform fault
Subduction zone
Spreading axis

Plate boundaries—Interrupted where coincident with historic faulting; teeth on upper plate at subduction zones.

VOLCANIC CENTERS

Active in historic time—Generally within past 1,000 years, and documented during or soon after eruption; volcano named if active 1964 through 1991.

Active in Holocene time—Within past 10,000 years; not documented historically.

Holocene activity uncertain—Includes solfataras and volcano-related thermal springs; no direct evidence for Holocene eruption.

HISTORICAL FAULTING

1915

Faults—Labels indicate date of rupture.

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