



FAULT MAP OF CALIFORNIA

WITH LOCATIONS OF VOLCANOES, THERMAL SPRINGS AND THERMAL WELLS

COMPILATION AND INTERPRETATION BY
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WITH ASSISTANCE FROM
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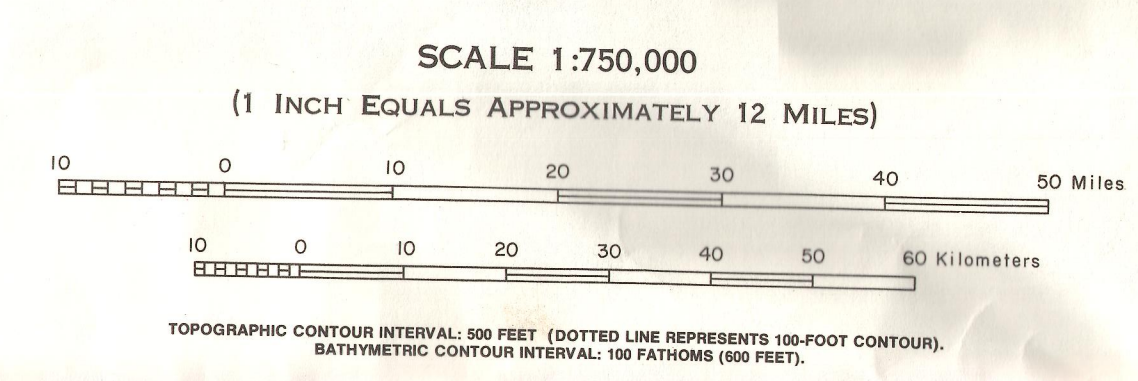
GRAPHICS BY R. R. MOOR
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This map is based on a generalization of the 1:250,000 scale Geologic Atlas of California (1958-1969), but has been extensively updated with new information in many areas. A fault classification color code and the location of thermal springs and thermal wells have been added. This map supersedes earlier versions, including STATE OF CALIFORNIA, PRELIMINARY FAULT AND GEOLOGIC MAP, 1973, published as PRELIMINARY REPORT 13. Data are essentially complete to 1973, during scribbling and preparation for printing, only data for selected areas were added.

BULLETIN 201, published separately, includes acknowledgments, source index maps, and bibliographic references to all the published and unpublished reports and information used in the geologic compilation and the classification of the historic and older Quaternary faults. BULLETIN 201 also contains a tabulated list describing the thermal springs and thermal wells plotted on this map.

Users of this map should be aware that active faults and earthquakes are the subject of very intensive research and that refinements of the interpretations given here are sure to come within a few years. Therefore, this map should be considered to impart this information to geologists, engineers, planners, and others who use this map.

Persons having additional pertinent data concerning faults of this area are urged to notify C. W. Jennings, California Division of Mines & Geology, Ferry Building, San Francisco, 94111, in order that future editions may be corrected.



ACKNOWLEDGEMENTS

This compilation has benefited by the comments and new data generously provided during careful review of earlier unpublished versions of this map by numerous Federal, State, and independent geologists familiar with California geology. In particular, many constructive suggestions and contributions of detailed new data covering large areas of the state were made by the following individuals and contributed significantly toward improving the present map: E. H. Bailey, E. E. Brabb, T. W. Dibble, Jr., R. D. Hesse, H. C. Wegner, C. A. Wernworth, and J. L. Zany of the U.S. Geological Survey; Professors C. R. Allen, California Institute of Technology, J. C. Crowell, University of California, Santa Barbara, C. A. Hall, University of California, Los Angeles, B. M. Page, Stanford University, and C. Wahrhaftig, University of California, Berkeley; and Drs. Mason L. Hill, Whittier, and A. O. Woodford, Claremont, California. To all these geologists and many other unnamed contributors, the State is especially grateful.

ABBREVIATED GEOLOGIC TIME SCALE AND FAULT AGE CLASSIFICATION

GEOLOGIC AGE	FAULT CLASSES	REGENCY OF MOVEMENT (Years before present)
Quaternary	red	Historic
	orange	approximately 200
Pre-Quaternary	black	approximately 2 million
		approximately 4.5 billion (Age of earth)

*Most of the recognized Quaternary faults shown on this map are probably of late Quaternary age (about 300,000-500,000 years old).

EXPLANATION

FAULTS
 Fault traces are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. Many concealed faults approximate and may indicate structural trend only. All dashed offshore faults are based on acoustic-reflection profile reports.

FAULT CLASSIFICATION COLOR CODE (Indicating Recency of Movement)
 Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:
 (a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g., extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952.) The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.
 (b) fault creep slippage—slow ground displacement usually without accompanying earthquakes.
 (c) displaced survey lines.

SPECIAL NOTATIONS
 A triangle to the right or left of the date indicates termination point of observed surface displacement.
 Date bracketed by triangles indicates local fault break.
 No triangle by date indicates an intermediate point along fault break.
 Red dot on fault indicates location where fault creep slippage has been observed and recorded.
 Red squares on fault indicates where fault creep slippage has occurred that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated.
 Red squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).
 Pink band added to emphasize location of historic fault displacements. Width of band has no particular significance and is not intended to indicate the zones of the Alquist-Priolo Special Studies Zones Act of 1972 (amended 1974 and 1975)—this Act requires the State Geologist to delineate zones by encompassing all potentially and recently active faults. (Chapter 7.5, Division 2, California Public Resources Code).

Quaternary fault displacement (during past 2 million years), without historic (approximately 200 years) record. Recognized by scarps in alluvium, terraces, or other Quaternary units; off-set stream courses; alignment of fault-caused depressions, e.g., sag ponds, fault troughs, and fault traces; includes concealed fault-controlled ground water barriers in Quaternary sediments as indicated by well data. (Note: Where local evidence indicates that a fault has had displacement during Quaternary time, the entire length of the fault is generally shown as Quaternary unless contrary evidence is available.)

SPECIAL NOTATION
 Pale orange band added to emphasize major Quaternary faults on fault zones, some of which are mainly concealed or otherwise appear relatively obscure on this fault map. A Quaternary fault or fault zone selected for such emphasis is characterized by one or more of the following factors: considerable length, e.g., usually over 30 miles (48 km); association with an alignment of numerous earthquake epicenters; continuity with faults having historic displacement; association with youthful major mountain ranges or mountain ranges; correlation with strong geophysical anomalies. Width of band has no particular significance and is not intended to indicate the zones of the Alquist-Priolo Special Studies Zones Act of 1972 (amended 1974 and 1975)—this Act requires the State Geologist to

Generalized zones to encompass or previously and recently active faults (Chapter 7, Division 2, California Public Resources Code). In building site evaluations, all Quaternary faults, whether designated as major or not, should be carefully considered.

Pre-Quaternary fault (older than 2 million years) or fault without recognized Quaternary displacement. (Some faults shown bounding Quaternary rocks and older rocks are included in the pre-Quaternary category because the source of mapping used was of a reconnaissance nature, or the mapping was not done with the object of dating fault displacements.)
 Faults shown in this category should not necessarily be considered "dead". Evidence for recent activity may not have been observed, or it may be lacking because the fault may not be in contact with Quaternary deposits. In many cases, the evidence may have been destroyed by erosion, covered by vegetation, or by works of man.

ADDITIONAL FAULT SYMBOLS

- Upthrown side (relative or apparent).
- Downthrown side (relative or apparent).
- Arrows along fault indicate relative or apparent direction of lateral movement.
- Arrow on fault indicates direction of dip.
- Thrust fault (faults on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently stepped.
- Coast Range thrust, the upper boundary of a long-tract, late Miocene subduction zone (faults on upper plate). Extends from northern border of the State southward nearly to Santa Barbara, but has discontinuous outcrop owing to its modification by younger faults and concealment by overlying deposits; locally, Coast Range thrust is very steep.

OTHER SYMBOLS

- Volcano of Quaternary or Pliocene age.
 - Thermal spring
 - Thermal well
- More than 15°F (8.3°C) above mean annual air temperature; and in the case of drilled wells, a thermal gradient greater than about 2°F per each 100 feet (0.6°C per each 100 meters) increase in depth.

The topographic base map is a reduction of the 1:500,000-scale map published by the U. S. Geological Survey, 1970. 1927 North American datum. Lambert conformal conic projection based on standard parallels 33° and 45°. Highways corrected to 1969.

- County boundary
- POPULATION KEY**
- LOS ANGELES more than 200,000
 - PASADENA 100,000 to 200,000
 - CONROE 20,000 to 100,000
 - WATSON 5,000 to 25,000
 - Population indicated by size of letters

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