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DMG OPEN-FILE REPORT 92-03
FAULT ACTIVITY MAP OF CALIFORNIA

PRELIMINARY
FAULT ACTIVITY MAP OF CALIFORNIA

1992

(Most of the fault data shown on this map and described in the accompanying appendices were compiled in 1990. A few additional data were added in 1992.)

COMPILATION AND INTERPRETATION BY

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This map is a revision of the 1975 FAULT MAP OF CALIFORNIA. It has been extensively updated with new information in many areas and many new features have been added. The fault classification color code has been expanded to distinguish Holocene and late Quaternary faults as well as faults of the Foothills fault system (a Mesozoic fault system with short segments that were reactivated during late Cenozoic time). Recently discovered features such as paleosubduction zones and structural discontinuities along with zones of aligned seismicity have been added.

BULLETIN 201, "An explanatory text to accompany the Fault and Geologic maps of California", published separately, contains detailed source index maps and references to all the published and unpublished reports and information used in compiling the earlier FAULT MAP OF CALIFORNIA. Appendices accompanying this map contain the additional new information that has been incorporated in this new map.

This compilation has benefitted from the comments and new data provided by the geologists of the U.S. Geological Survey, the Division of Mines and Geology and by several consulting geologists. To all these contributors, the author is grateful.

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 a provisional inventory of faults in California.

SCALE 1:750,000
(1 INCH EQUALS APPROXIMATELY 12 MILES)

10 0 10 20 30 40 50 Miles

10 0 10 20 30 40 50 60 Kilometers

EXPLANATION

Fault traces on land 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. Concealed faults in the Great Valley are based on maps of selected subsurface horizons, so locations shown are approximate and may indicate structural trend only. All offshore faults are based on seismic reflection profile records and are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

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: 1934 ▶ ◀ 1915

Date bracketed by triangles indicates local fault break. ▶1924◀

No triangle by date indicates an intermediate point along fault break. 1906

Dot on fault indicates location where fault creep slippage has been observed and recorded.

Square 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. 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). 1966 ■ 1940 ■ 1966

Holocene (Recent) fault displacement (during past 10,000 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting

Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.

Mesozoic Foothills fault system along which short segments of late Cenozoic faulting has taken place, e.g. late Quaternary faulting at Spencerville.

Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.

Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissance nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

Fault segment associated with a significant linear trend of accurately located earthquake epicenters (magnitude 0.2 or greater). Generally aligned along strike slip faults having Quaternary displacement, but not necessarily with historic surface rupture. Lack of seismic activity along any fault is no indication that the fault may not be active in the future (e.g. San Andreas fault north of San Francisco). Epicenter data are derived from closely spaced seismic stations and include either continuing microseismicity or aftershocks associated with relatively large earthquakes.

S-8 Aligned seismicity on fault segments are referenced in Appendices D and E.

ADDITIONAL FAULT SYMBOLS

U = Upthrown side (relative or apparent).
D = Downthrown side (relative or apparent).

Bar and ball on downthrown side (used where space is limited).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened. On offshore faults, barbs simply indicate a reverse fault regardless of steepness of dip.

OTHER SYMBOLS

(209) Numbers refer to annotations listed in the Appendices of the accompanying report. Annotations include fault name, age of fault movement, and pertinent references including Special Studies Zone maps where a fault has been zoned by the Alquist-Priolo Special Studies Zone Act of 1972 (amended 1974 and 1975). This Act requires the State Geologist to delineate zones to encompass all potentially and recently active faults.

Note 1
Ages of faults north of the Mendocino fault zone are, in general, not indicated because of lack of offshore age control, and, in some areas, because of sparse distribution of young strata. Also, youthful faults in this area may not cut through strata in the upper part of the sedimentary section (Clarke and Field, 1989). Some faults that can be traced to deeper faults onshore are assumed to be the same age offshore even though marine evidence may be lacking.
Most of the depicted faults deform the Pliocene and (or) Quaternary sedimentary section, where present, and have subaerial offsets.

Note 2
The age of faults between latitude 35° and 40° are not depicted for similar reasons as indicated on Note 1 for the area north of the Mendocino fault zone. The ages of the faults and the distribution of the offshore formations are not well known and hence are not indicated in the offshore map of this area (McCulloch, 1989).

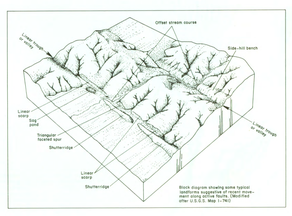
RECENCY OF FAULTING

Data from a large body of literature, published and unpublished, regarding faulting in California have been synthesized on this map. The purpose of the fault map is to depict what is known about the recency of displacement along these faults. Future studies may find additional faults, require relocation of faults, or, in some cases, change the age classification as shown here.

The age classifications are determined by examining geologic evidence to determine the youngest faulted unit and the oldest unfaulted unit along each fault or fault segment. If Quaternary displacement is indicated, the fault is classified into one of the three categories within Quaternary time (Holocene, late Quaternary, Quaternary undifferentiated). Faults with reported surface rupture during historic time are further classified as historically active. Faults having evidence indicating no movement in Quaternary time are classified as pre-Quaternary. If the fault has insufficient evidence to allow classification, it is grouped with the pre-Quaternary faults.

The reliability of the age classifications on this map is dependent upon several factors. First, important fault-related, geomorphic features may have been destroyed by natural or human activities. Second, geologists may differ in their interpretations of certain faults after examining incomplete geologic evidence for recency of faulting. Third, the ages of the rock units used to classify the faults may not be known accurately. Fourth, some of the data used to classify faults on this map were based on studies not directed to the determination of recency of fault movement.

This is a small scale regional map, and should be used only as a first approximation of potential hazard due to faulting in an area. A detailed geologic investigation should be the core of any site-specific study for planning or development purposes.



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION: ON LAND	DESCRIPTION: OFFSHORE
Quaternary	Late Quaternary	Holocene Historic				Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
			10,000			Faults showing evidence of displacement during late Quaternary time.	
	Early Quaternary	Pleistocene				Mesozoic Foothills fault system along which short segments of late Cenozoic faulting has taken place.	Fault cuts strata of late Pleistocene or older Quaternary age.
			700,000			Undivided Quaternary faults – most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	
Pre-Quaternary			1,600,000			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.
			4.5 billion (Age of earth)				

CAUTION

This fault map and accompanying text are for use as a guide only and should not be used to replace site specific evaluations.

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