UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Office of Earthquake Studies

PROCEEDINGS OF

CONFERENCE VIII

ANALYSIS OF ACTUAL FAULT ZONES IN BEDROCK

Convened Under Auspices of

NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM

1-5 April, 1979

OPEN-FILE REPORT 79-1239

Menlo Park, California

1979

CONFERENCES TO DATE

Conference I	Abnormal Animal Behavior Prior to Earthquakes, I
Conference II	Experimental Studies of Rock Friction with Application to Earthquake Prediction
Conference III	Fault Mechanics and Its Relation to Earthquake Prediction
Conference IV	Use of Volunteers in the Earthquake Hazards Reduction Program
Conference V	Communicating Earthquake Hazard Reduction Information
Conference VI	Methodology for Identifying Seismic Gaps and Soon-To Break Gaps
Conference VII	Stress and Strain Measurements Related to Earthquake Prediction
Conference VIII	Analysis of Actual Fault Zones in Bedrock

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PREFACE

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A potential avenue of earthquake research that seems little explored except for the work of one or two individuals is the geologic analysis of actual fault zones to assess the geometry, motions, conditions, mechanisms, and dynamics of the faulting process. In particular, how do these aspects vary with depth and do faults preserve some record of seismic failure at focal depths? Is it possible to construct a generalized global model of depthwise properties of major fault zones in the upper lithosphere? The idea behind the Palm Springs conference was the question whether worldwide observations of active and ancient faults, now exposed in mines and at the surface by erosion, could reveal a set of common depthwise characteristics that could be synthesized into a general model.

The conference, therefore, brought together 25 scientists, chiefly observationalists, who have studied faults at varied exposure depths and employed different interpretive techniques. From these proceedings, the state of the art in understanding the properties of real fault zones may become clearer than was previously possible, and the feasibility of developing a fault model may be established. Because of time limitations, an attempt to develop a concensus fault model was not made at the conference.

The papers fall into two broad topical divisions:

1. Architecture and kinematics of fault zones: geometry of the region of failure; evolution of the larger structures of the zone; distributions of discrete slip and continuum deformation; fracture patterns; effects of lateral heterogeneities; contrasts in the character of the brittle and ductile regions and the nature of the transitional zone.

2. Conditions, mechanisms, and products of faulting: fault rocks and fine structure; origin and significance of cataclasite, mylonite, and pseudo-tachylite; fault plane and faulting-induced wallrock structures in brittle and ductile zones; interpretations from actual fault zones (in the light of experiments and theory) of mineral and failure mechanisms at various depth levels/rheologic zones; failure criteria in brittle and ductile zones and possible interactions between zones; thermal regime; existence and role of pore fluids; retention of fluids; stress differences at failure.