SC543.11PR

E7.4-10409

CR-137254

IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES ERTS-A IMAGERY

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April 4, 1974

Type 1 Progress Report for Period February 1 through March 31, 1974

Prepared for

GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland 20771

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(E74-10409) IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM ERTS-1 IMAGERY Progress Report, 1 Feb. - 31 Mar. 1974 (Rockwell International Science Center) 3 p HC $4.00 CSCL 08G

N74-19944

G3/13

Unclas
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TYPE I PROGRESS REPORT FOR PERIOD FEBRUARY 1 TO MARCH 31, 1974

TITLE: Identification and Interpretation of Tectonic Features from ERTS-1 Imagery

NASA Contract No. NAS5-21767

GSFC ID No.: PR001, Dr. Monem Abdel-Gawad
Principal Investigator

Problems: To date we have not received color or black and white prints of the western side of the Red Sea requested since August 21, 1973. We have been receiving imagery for the eastern side of the Red Sea. Lack of color data on the western side of the Red Sea has seriously affected our plans to analyze the Red Sea structures which is one objective of this investigation.

Accomplishments

1. Structural similarities between the San Gabriel, San Bernardino and the San Jacinto Mountains were identified.

2. Based upon Kye structural similarities, we developed a three stage reconstruction model which explains the lateral displacement history of the mountain blocks.

Significant Results

ERTS-1 imagery show that the southern segment of the San Gabriel fault which controls the west fork of the San Gabriel River in the San Gabriel Mountain block is strikingly similar to the Mill Creek Fault in the San Bernardino Mountains.

We have also noted the similarity of the Sierra Madre thrust zone of the San Gabriel Mountains to the Banning thrust of the San Bernardino Mountains. These and other physiographic similarities suggest that the southern San Gabriel fault was once continuous with the Mill Creek fault. Similarly the Sierra Madre fault zone probably continued eastward along the Banning fault zone.

When the San Bernardino Mountain block is theoretically moved to the northwest along the San Jacinto fault so that the Mill Creek fault is aligned with the southern part of the San Gabriel fault, it was found that the four transverse fault segments become aligned with the Pinto Fault on the east and with the Raymond-Santa Monica Malibu Fault zone on the west.

The reconstruction thus identifies a continuous zone of transverse faulting extending from the Colorado River Desert to the Pacific. Considering that the Pinto fault on one end and the Malibu fault on the other are both characterized by left-lateral strike-slip movement it seems likely that the entire fault zone was once a continuous left-lateral shear. For future reference we shall refer to this fault as the Anacapa

shear since it probably extends to the Anacapa, Santa Cruz, and Santa Rosa Islands in the Santa Barbara Channel.

We suggest that 50 km left lateral movement has taken place on the Anacapa Shear. Reconstruction based upon this figure would bring the Triassic Bedford Canyon formation of the Santa Ana Mountains in juxtaposition with the strikingly similar Santa Monica slate in the Santa Monica Mountains.

This analysis strongly indicates that the tectonic history of the Transverse Range has been characterized by episodes of left lateral shear on transverse faults and right lateral shear on the San Andreas fault system. This conclusion is consistent with the fault model we developed for southern California.

Published Work

M. Abdel-Gawad, 1974, Studies of Geologic Structures in Southern California Using Skylab and ERTS Imagery: Seminar on Remote Sensing in Geology, March 7-8, 1974, NASA ARC, Moffett Field, California.

M. Abdel-Gawad and Linda Tubbesing, 1974, ERTS Study of Ancient River Gravels of Sierra Nevada: Third Annual Remote Sensing of Earth Resources Conf., 25 March 1974: Tullahoma, Tenn., Univ. Tennessee Space Institute.

Recommendations

We request prompt delivery of color prints of the western side of the Red Sea in order that we can accomplish all objectives of the investigation.

Plans for Next Period

We plan to carry out ground truth field work during the spring season.

Practical Applications

This work is applicable to earthquake hazard research.