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Neotectonics of the  
San Andreas Fault System - Basin and Range Province  
Juncture

NASA Grant NAG 5-177

Semi-Annual Progress Report  
May-October 1981



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Introduction

This report briefly summarizes the progress of researchers at the University of California, Santa Barbara, on NASA Grant NAG 5-177. Structured as a three-year study, our investigation has progressed on many fronts during its initial six-month period, May 1 - October 31, 1981.

Data Acquisition and Organization

Data acquisition has been a major emphasis of our efforts to date. After a thorough evaluation of all Landsat coverage of the study area (considering atmospheric clarity, seasonal aspects, specific swath location, digital quality, etc.), two consecutive (continuously recorded) scenes were selected for detailed analysis. These scenes, acquired 25 November 1977 by Landsat-2, were not yet archived by the EROS Data Center as computer compatible tapes. This required us to wait for their production, a wait that ended just last week. We remain pleased with our choice of scenes. Numerous features are distinctly depicted both in rugged areas and across alluvial plains in all four bands. We look forward to active utilization of this imagery soon.

Analyses of Seasat and Heat Capacity Mapping Mission (HCMM) imagery were listed as possibilities in our proposal. We have explored these possibilities through verbal, written, and in-person communication with the appropriate agencies. This has led to the cost-free acquisition of several print and transparency images. As a result, we have submitted a request to NASA Headquarters (Dr. Mark Settle, Non-Renewable Resources Branch) for the cost-free production of a new Seasat digital scene covering the heart of our study area. We hope to utilize the northeast look-direction of the requested and adjacent scenes to provide across-trend enhancement of structural features, especially those transversing alluvial plains and other low-relief terrain. In such areas, Seasat imagery may provide significant information that is complementary to the detail seen in the northwestwardly illuminated Landsat imagery.

We have also submitted a request for digital data of a selected (13 May 1978) HCMM night thermal scene. Although HCMM data is of rather low resolution, it may (especially after enhancement) display significant feature patterns not evident on other imagery types. Boundaries between bedrock and alluviated areas appear much more distinct on our transparency HCMM night thermal imagery than on any Landsat band, where reflective signatures of detritus commonly blend with those of the parent bedrock.

High-altitude U-2 imagery of our study area was inspected at NASA-Ames Research Center and piecemeal coverage of various qualities was found to be available. We have not as yet decided whether or not to request a special U-2 flight, flown to our specifications, providing uniform coverage. Such a decision will be forthcoming shortly so that we may, with NASA-Ames cooperation, retain an option for low sun angle acquisition. Airborne photographic coverage is not available in the north central part of our study area due to the security restrictions of the Mojave Desert Marine Corps Training Center. Good quality Skylab stereo coverage is available, however, and this imagery was purchased to augment that which was already available in our University Map and Imagery Collection.

Digital terrain ("arc-second") data of all but the southeast quadrant of our study area was obtained for our collateral topographic studies. The missing data will be obtained when available, or if need be, will be substituted for with Defense Mapping Agency (DMA) data of a somewhat lesser quality. Complete topographic map coverage has also been acquired.

The large size of our study area and our desire to aggregate a variety of technical approaches have necessitated the compilation of an extensive bibliography of previous geologic studies and methodological examples.

We estimate that this compilation is seventy percent complete, currently consisting of more than 450 references. In order to efficiently utilize and update such a large bibliography, a computerized referencing system was developed that provides access with "and/or/except" keywords, used in any combination and quantity. This system is fully operational and will continue to be heavily used throughout the study.

#### Information Exchange

Incorporation of geophysical data in our analyses will come later. At present we are delaying acquisition of such data until needed so as to obtain the best information available at that time. Contacts with Dr. Robert Smith at the University of Utah, Dr. Don Stierman at the University of California, Riverside, Dr. Clarence Allen and others at the California Institute of Technology, and the National Oceanographic and Atmospheric Administration at Boulder, Colorado, have been established to increase our awareness of the availability of the seismic, geomagnetic, and gravitational data that we will seek.

Attendance at the John Muir Geophysical Society meeting (by Robert Crippen), organized to discuss geologic problems of a region including our study area, provided an opportunity to discuss pertinent topics with researchers from other institutions and agencies.

Additional communication with other researchers has commenced as awareness of their current work has been acquired. Notably this includes Dr. A.E.J. Engel at the Geological Research Division of Scripps Institution of Oceanography, who is leading a detailed study of the Peninsular Range - Salton Trough interface from our area south into Baja California.

#### Budget Status

Utilization of our financial resources has proceeded approximately as planned and no significant budgetary changes or problems are anticipated at this time. A brief budget summary is included at the end of this report.

#### Future Directions

Our plans for the near future include the expansion of our large bibliography, continued acquisition of selected imagery (as discussed above), initiation of topographic analyses including development of geomorphometric algorithms, initial processing of Landsat (and possibly Seasat and HCMM) data, and preliminary field studies during the winter field season. We plan to concentrate our early efforts in the Yucca Valley - Twentynine Palms area in order to test and evaluate our procedures while simultaneously obtaining valuable

results for a critical area. This will also provide us with some "showpieces" long before the completion of our entire regional study.

John E. Estes  
John C. Crowell  
Robert E. Crippen

10 November 1981

Appendix: Budget Status

First Year Funding

Salaries

Benefits

Supplies and Equipment

Landsat Band Negatives (8)

Landsat CCTs (2)

Topographic Maps

Office Supplies

Mail

Xerox

Telephone

Computer

Travel

Data Collection, Los Angeles

John Muir Geophysical Conference

31% Overhead (full year)

Balance