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STRUCTURE OF THE ST. FRANCOIS MOUNTAINS AND
SURROUNDING LEAD BELT, S.E. MISSOURI:
INFERENCES FROM THERMAL IR
AND OTHER DATA SETS

Quarterly Report 5/13/81 to 7/31/81
NAS5 - 26533

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TFR II

1. PROBLEMS: No problems impeded the progress of our investigation
2. ACCOMPLISHMENTS: All digital HCMM data received from Goddard were read and reformatted to our data base characteristics. HCMM engineering data (frame I.D., Lat., Lon., time of day, etc.) were reformatted into our BIRP cataloguing program. Searches through the HCMM data bases were made available to the scientific community. Apparent thermal inertia maps were constructed for several scenes. The inertia maps were digitally merged with several other data sets - Bouguer gravity and shaded relief maps, in particular. For the next quarter we expect to examine subtle topographic linears that are quite apparent on these data products. Some of the linears correspond to mapped faults, while some do not. John Strebeck, a graduate student, is writing his Master's Thesis based on these analyses.
3. SIGNIFICANT RESULTS AND PUBLICATIONS: HCMM data in the form of an apparent thermal inertia image merged with a shaded relief map form an integral part of a paper submitted to the Journal of Geophysical Research. The HCMM data show very well that the dominant structural grain in Missouri strikes in a northwesterly direction. The strike is the same as a major basement fault or flexure that we identified on the basis of Bouguer gravity images. The paper is attached.
4. RECOMMENDATIONS: None - everything is proceeding according to plan.
5. TOTAL FUNDS EXPENDED 5/12/81 - 7/31/81: \$2,729.00
6. DATA UTILITY: We find that HCMM data in the form of prints, transparencies, or raw digital data from Goddard is not very useful as compared to filtered, contrast enhanced data in the form of daytime thermal IR, nighttime thermal IR, and apparent thermal inertia images. We have not found the application of detailed thermal modeling of atmospheric contributions to yield much more information than is inherent in the apparent thermal inertia images. Finally, merging HCMM processed data with other data sets can produce some remarkable products (see last figure in attached paper).

STRUCTURE OF THE MIDCONTINENT BASEMENT -
TOPOGRAPHY, GRAVITY, SEISMIC, AND REMOTE SENSING DATA

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ABSTRACT

Some 600,000 discrete estimates of the Bouguer gravity of the continental United States have been spatially filtered to produce a continuous tone image. The filtered data were also digitally painted in color-coded form onto a shaded relief map. The resultant image is a colored shaded relief map where the hue and saturation of a given image element is controlled by the value of the Bouguer anomaly. Major structural features (e.g. midcontinent gravity high) are readily discernible in these data, as are a number of subtle and previously unrecognized features. A linear gravity low that is approximately 120 to 150 km wide extends from southeastern Nebraska, at a break in the midcontinent gravity high, through the Ozark Plateau, and across the Mississippi embayment. The low is also aligned with the Lewis and Clark lineament (Montana to Washington), forming a linear feature of approximately 2800 km in length. In southeastern Missouri the gravity low has an amplitude of 30 milligals, a value that is too high to be explained by simple valley fill by sedimentary rocks. Rather, the feature must be a basement structure. In fact, faults, fold axes, dikes and basement topography in Missouri trend in directions that are approximately parallel to the gravity low. Also, the New Madrid seismic activity is concentrated at the intersection of the gravity low with another linear low defining the Reelfoot rift within the Mississippi embayment. The seismic data indicate preferential movement along directions parallel to these two major trends. The origin of the linear gravity feature is problematical - it may be a rift, a

transcurrent fault, or some combination.