Pecora file

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August 7, 1983

Mr. Allen H. Watkins
Chief, EROS Data Center
Sioux Falls, South Dakota

Dear Mr. Watkins,

Thank you for your invitation to participate in Pecora VIII, and I apologize for the tardiness of this reply.

Enclosed is the abstract for Charles Elachi and my paper entitled "Shuttle Digital Topographic Mapper", for the special session on future space shuttle experiments. I am looking forward to a successful symposium.

If there are any questions I can be reached at (213)354-4631 or -2111 for messages. Our FTS prefix is 792.

Sincerely,

Mike Kobrick

Dr. Michael Kobrick

SHUTTLE DIGITAL TOPOGRAPHIC MAPPER

M. Kobrick and C. Elachi
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109

In the geosciences digital topographic data sets are in great demand for geophysical and morphological analyses and for combination with other types of digitized information such as photographic, seismic, magnetic, gravity and geochemical data. The Committee on Earth Sciences of the Space Science Board has identified the determination of terrain morphology and structural fabric through the acquisition of digital topographic data as the primary objective for the study of continental geology during the coming decade. Despite its usefulness and the resulting demand, however, digital topographic data for most of the world are unavailable, and the data bases that have been developed (covering mostly the United States) vary widely in quality.

We have completed a technical analysis of the methods available for collecting digital topographic data from orbit; conventional photographic stereo, imaging radar stereo, radar interferometry, laser altimetry and radar altimetry as well as a few hybrid techniques. Our results, combined with the requirements of the user community, have resulted in a recommended approach for acquiring digital topo data from orbit in the most cost-effective and expeditious way. In general, we find that techniques employing direct altimetric measurement are favored over conventional stereogrammetric methods where data reduction is extremely labor and computer intensive.

The most promising technique for acquiring a world-wide data base at medium resolution is scanning radar altimetry. Technology is available for the construction of a high frequency (35-40 GHz) real aperture radar altimeter raster scanned in the cross-track direction to map a 75 km swath with 150 meter horizontal and 10 meter vertical resolution. The scanning radar altimeter (SRA) could produce a digital topographic map of the world in only three Shuttle flights, representing a three order of magnitude improvement in the world-wide data base.

For higher resolution data (of the order of Thematic Mapper or SPOT resolution) we conclude that laser altimetry is preferred. A laser pulsed at 25 KHz or faster and mechanically scanned in the cross track direction can map specific target areas at very high resolution, although acquiring a world-wide data base is not feasible because of weather and time considerations. We suggest, therefore, that the scanning laser altimeter (SLA) operate from a long term orbital platform and acquire targeted data in a manner similar to LANDSAT.