

APPLICATION OF REMOTE SENSING TO
UNDERSTANDING THE DESERT ENVIRONMENT

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Little attention has been given to the desert environment in the past due to the lack of basic information. The vastness, aridity, harsh conditions, and meager development potential of most deserts have hampered the collection of needed data. However, during the past decade remote sensing techniques have provided some new tools to study and monitor the desert environment.

Earth orbital photographs from manned space missions and multispectral images from Landsat satellites show that the reflectance properties of desert surfaces are indicative of their composition. The available data allow: (1) mapping of the vast desert regions at 1:250,000 scale; (2) first-order studies of the nature of the desert environment; and (3) site selection of areas for detailed investigation. Such investigations would help in the selection of remote-sensing methods and techniques to be utilized in the Space Shuttle era.

Application of remote sensing techniques allows monitoring of changes to the desert environment over a season, a year or a decade. For example comparison of photographs taken by the Apollo-Soyuz mission in 1975 with those obtained on earlier space missions indicates: (a) an increase in vegetation west of the Nile Delta of approximately 1108 km² in 10 years; (b) an average shift of 2.5 km over a 6-year period in the sand patterns at the border between Egypt, Libya and Sudan; and (c) a considerable reduction in the water level of Lake Chad and dune encroachment upon the lake over a period of 9 years.

Changes in the desert environment with time are always significant to development of arid and semi-arid lands. These changes must be understood, taken into account, and monitored, otherwise they are likely to adversely affect development projects. For example, dune migration is the major cause of "desertification" in the Western Desert of Egypt. Migrating sand dunes inundate roads, railroads, telephone lines, plantations, houses, and whole villages. The measured rate of dune migration in this desert is one to 100 meters per year depending on the size and type of the dune.

Remote sensing techniques can also be useful in the collection of meteorological data in the desert environment; the lack or inadequacy of such data hampers a full understanding of the world's deserts. Meteorological stations can be placed in remote, inhospitable areas to automatically collect the data and transmit them to orbiting satellites. These satellites can retransmit the data to central localities for analysis and synthesis.

I maintain that the generalization that the deserts are "man-made" is too simplistic. Field observations indicate that global climatic conditions control the formation of deserts. Furthermore, our limited understanding of the desert environment has resulted in the misuse of arid and semi-arid lands. Proper applications of remote sensing tools will help us better understand the deserts and utilize more of the land area of the Earth for the benefit of mankind.