Notice

Shuttle Imaging Radar-A Information and Data Availability

THE SIR-A, launched aboard the second flight of NASA's space shuttle Columbia on 12 November, 1981, was an experiment which had as its primary objective the investigation of spaceborne imaging radars for geologic mapping. The SIR-A was flown as part of NASA's Office of Space and Terrestrial Applications scientific payload (OSTA-1).

The SIR-A was a synthetic aperture radar (SAR) which operated at L-band frequency (1278 MHz), corresponding to a wavelength of 23 cm. The antenna, which consisted of seven panels, had a total length of 9.4 m and was fixed relative to the shuttle at a position 47° to the left of the sub-nadir track. This angle corresponded to an incidence angle of 50° at the center of the swath. The 50° incidence angle alleviated one of the most serious problems encountered in the analysis of Seasat SAR data. In areas of high relief or rugged mountainous terrain, the extreme foreshortening and layover due to the low incidence angle of Seasat (23.6° at center of swath) was greatly reduced, resulting in images which are more geometrically correct (refer to Figure 3).

SIR-A data were optically recorded onto signal film carried in a cassette on board the shuttle. Imagery was acquired over 10 million km² of the Earth's surface from approximately 41°N latitude to 36°S latitude (Figure 1). This includes some coverage of the ocean's surface. The signal film was processed at the JPL Radar Photography Laboratory.

The imagery was optically correlated onto 5-inch wide film and has a swath width of 50 km with a resolution of a little better than 40 m. The scale of the imagery is 1:500,000. An image is identified by data-take number and geographic location.

Data analyses are underway by members of the SIR-A mission science team and the JPL Radar Remote Sensing Team. Preliminary results show the

FIG. 1. SIR-A Coverage.

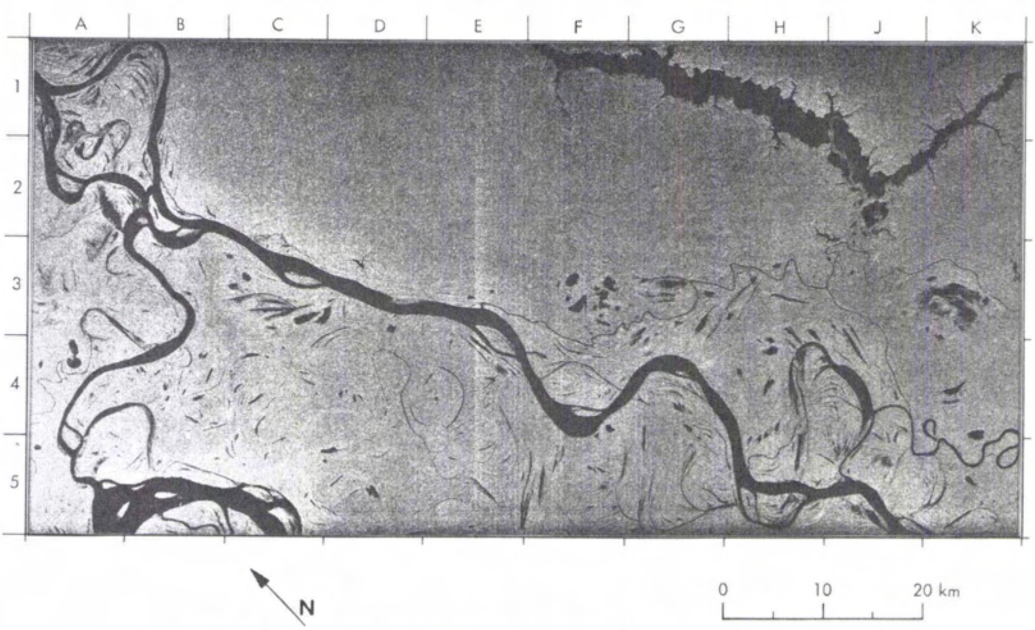


FIG. 2. SIR-A image of Ilhas Macuapanim (central Brazil).

experiment to have been a success, having fulfilled its primary objective.

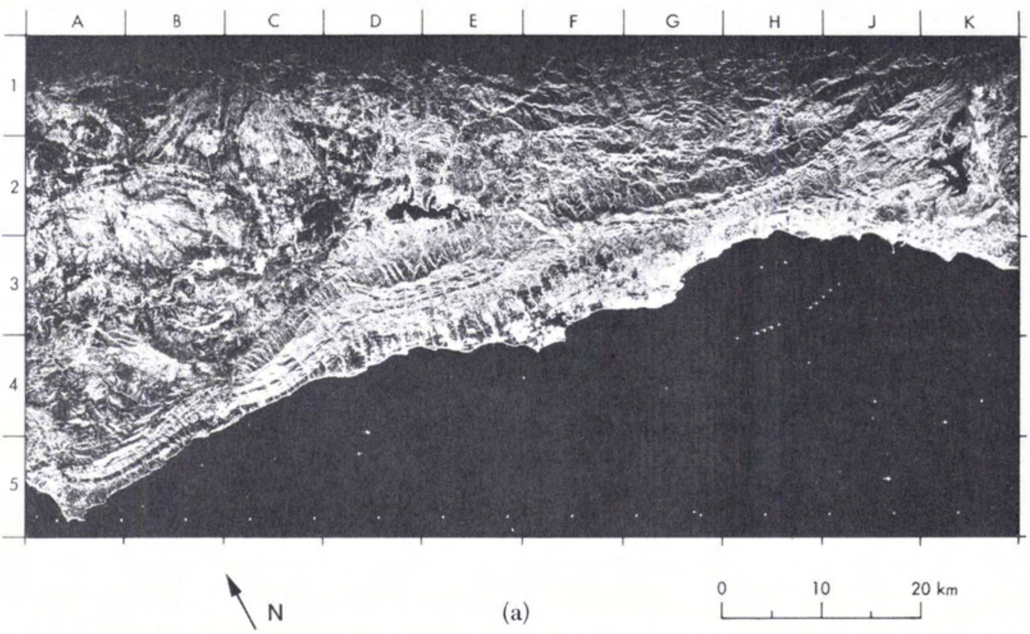
SIR-A data are now available to the general public. Inquiries regarding specific product availability should be directed to

National Space Science
Data Center (NSSDC)
Request Coordination
Code 601
Goddard Space Flight Center
Greenbelt, MD 20771
(301) 344-6695

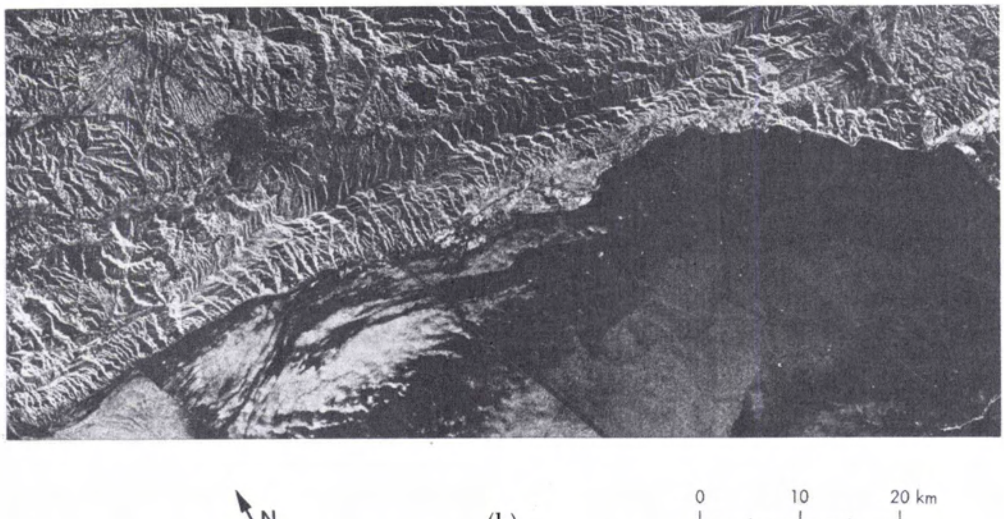
General information can also be obtained by contacting

Annie L. Holmes or
Don L. Harrison
SIR-A Data Center
Mail Stop 183-701
Jet Propulsion Laboratory
Pasadena, CA 91109
(213) 354-2386

Data should be identified by data-take number and a description of the location including latitude, longitude, and geographic feature.



(a)



(b)

FIG. 3. Santa Ynez Range, Santa Barbara, California. (a) SIR-A Image. (b) Seasat SAR image.

Figures 2 and 3 show examples of the SIR-A imagery and, for comparison purposes, a Seasat SAR image.

Figure 2 shows the complex network of rivers which surround the island of Macuapanim (H/J-5) in central Brazil. The Amazon River extends from the lower left to the upper right corners of the image, while the north-south trending river is the Japurá. These two large rivers have numerous tributaries and connection channels. As time passes, new connection points are formed, and old channels abandoned as evidenced by the many oxbows and other small lakes.

This region is a part of the largest rain forest on Earth. Monitoring the courses of these rivers by land is difficult due to the extremely dense foliage. Aerial surveys are practically useless because the area is more often than not obscured by clouds. Therefore, in order to monitor the courses of rivers here and in other cloudy regions of the world, techniques using imaging radars prove highly beneficial.

Figure 3a is a SIR-A image which shows the California coast from Point Conception (A-5) to the city of Ventura (K-3). The geology is dominated by folded, sedimentary layers of the Santa Ynez Range. The stratification is abruptly terminated by the Santa Ynez Fault on the inland side of the mountains (C-4 to K-1). The Santa Clara River traces the Oak Ridge Fault, seen as a bright linear feature east of Ventura (K-1 to K-2). Cachuma and Casitas Lakes are seen as large dark areas at D/E-2 and K-2, respectively. The city of Santa Barbara (G-3) is visible as the bright region along the coastline in the center of the image. The row of bright spots in the ocean (H-3) are oil drilling platforms in the Santa Barbara Channel, while the random bright points in the channel are vessels.

Figure 3b is a mosaicked Seasat SAR image of the same area. Due to the low incidence angle of Seasat, the radar backscatter was dominated mainly by slope or topography; therefore, the rugged topography and steep slopes of the Santa Ynez Range appear extremely foreshortened and in some areas show extensive layover. The 50° incidence angle of SIR-A was more sensitive to local roughness and relatively independent of slopes so that the topography in this region appears more geometrically correct.

References

Cimino, J. B., *et al.*, 1982. *SIR-A Preliminary Report*, in press.

Elachi, C., *et al.*, 1982. Shuttle Imaging Radar (SIR-A) Experiment: Preliminary Results, *Science*, in press.

Elachi, C., 1982. Earth Observations with Spaceborne Imaging Radars, *Scientific American*, in press.

—*Annie L. Holmes*
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, CA 91109

Forthcoming Articles

Peter O. Adeniyi, An Aerial Photographic Method for Estimating Urban Population.
Hubert B. Clements, *Darold E. Ward*, and *Carl W. Adkins*, Measuring Fire Behavior with Photography.
Atef A. Elassal, Generalized Adjustment by Least Squares (GALS).
J. Ronald Eyton, Landsat Multitemporal Color Composites.
W. Frobin and *E. Hierholzer*, Automatic Measurement of Body Surfaces Using Rasterstereography. Part I: Image Scan and Control Point Measurement.
Thomas M. Lillesand, *William L. Johnson*, *Richard L. Deuell*, *Orville M. Lindstrom*, and *Douglas E. Meisner*, Use of Landsat Data to Predict the Trophic State of Minnesota Lakes.
John Grimson Lyon, Landsat-Derived Land-Cover Classifications for Locating Potential Kestrel Nesting Habitat.
P. A. Murtha, Some Air-Photo Scale Effects on Douglas-Fir Damage Type Interpretation.
Manouher Naraghi, *William Stromberg*, and *Mike Daily*, Geometric Rectification of Radar Imagery Using Digital Elevation Models.
Ernest H. H. Shih and *Robert A. Schowengerdt*, Classification of Arid Geomorphic Surfaces Using Landsat Spectral and Textural Features.
S. A. Veress and *R. Munjy*, Spatio-Temporal Position from Mirror Images.
L. Wald and *J. M. Monget*, Reflectance Contrast Observed by Landsat between a Calm and a Rough Sea.
R. Welch and *T. R. Jordan*, Analytical Non-Metric Close-Range Photogrammetry for Monitoring Stream Channel Erosion.