

# Side-looking Airborne Radar Mosaic of Puerto Rico

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## Introduction

This high-resolution, cartographically accurate side-looking airborne radar (SLAR) image mosaic of Puerto Rico (Fig. 1) was completed in 1987 and is the first of its kind of a Caribbean island. A SLAR image mosaic differs from an aerial photographic mosaic in several important ways. Unlike visible and near-infrared wavelengths, radar energy (at the correct wavelength) can penetrate most clouds, making it an especially useful tool in Puerto Rico, where a persistent cloud cover generally obscures parts of the island. With SLAR, the terrain is illuminated at an oblique angle to enhance subtle geologic structures such as folds and faults. Light and dark areas on the image are caused by high and low radar reflectivity, respectively. For additional information about radar fundamentals and imaging radar systems, see chapters 9 and 10 in the second edition of the *Manual of Remote Sensing* (Moore, 1983 and Moore and others, 1983).

## Technical information

The SLAR digital image data of Puerto Rico were acquired in March 1987 by INTERA Technologies, Inc. (USGS contract 14-08-0001-23065) using the X-band (3.1-cm wavelength) STAR-1 synthetic aperture radar (SAR) system. The SLAR data were acquired in flight lines oriented N. 20° W. at 8,230 m above mean sea level and having a N. 70° E. look direction and average depression angle of 14° (far range). Sections from eleven 46-kilometer-wide image strips were mosaicked and photogrammetrically controlled to the USGS 1:25,000-scale Universal Transverse Mercator (UTM) topographic maps of Puerto Rico. Using the Mini Image Processing System (MIPS) at the USGS laboratory in Woods Hole, Mass., the mosaic was digitized and reprojected at

the polyconic projection (central meridian = 67° W., latitude of true scale = 18° N.), used throughout this mineral resource assessment of Puerto Rico. A linear spectral stretch and an edge enhancement filter were also used.

### Major features

The most striking lineaments visible in the SLAR mosaic are long northwest-trending ones that cross the southern two-thirds of the island. They represent the surface expression of the Great Southern Puerto Rico Fault Zone (Scanlon and Southworth, 1989). The Utuado Batholith in the west-central part of the island is almost devoid of lineaments, whereas the San Lorenzo Batholith in southeastern Puerto Rico shows lineaments trending north-south and east-west. This lineament pattern is distinctly different from that of the surrounding terrain and may represent fracturing caused by cooling of the intrusive rocks.

The long east-west scarp separating the Tertiary carbonate rocks of northern Puerto Rico from the mountainous central core of volcanic rocks and intrusive granodiorites of Cretaceous and early Tertiary age (Briggs, 1964) is clearly visible in the mosaic. The generally east-west lineaments north of the scarp represent bedding planes and contacts in the limestone. The sinkholes and mogotes of the rugged karst topography in the limestones (Monroe, 1976) are also evident in the SLAR mosaic.

### Availability of SLAR data

For precise analysis of the SLAR data, the flight-line strips should be used because these have not been cosmetically altered to produce an attractive mosaic. Some resolution is lost in the process of changing projections, as was done for this publication. The SLAR image mosaic of the main island of Puerto Rico (UTM projection) and unmosaicked strips covering Puerto Rico and all of its satellite islands are available from the USGS EROS Data Center, Sioux Falls, SD 57198.

### References

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Moore, R.K., Chastant, L.J., Porcello, L. and Stevenson, J., 1983, Imaging radar systems: in Colwell, R.N., ed., Manual of Remote Sensing, second edition, v.1, p. 429-474.

Scanlon, K.M. and Southworth, C.S., 1989: Combined radar and GLORIA mosaics of Puerto Rico, The U.S. Virgin Islands, and surrounding deep ocean areas: Tectonic interpretations. 12th Caribbean Geological Conference, Abstracts, p. 151.

Figures:

Figure 1: Side-looking airborne radar (SLAR) mosaic of Puerto Rico. Scale: 1:200,000; Projection: Polyconic.