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Side-Looking Airborne Radar (SLAR) is a form of imagery obtained by recording the reflections of radar waves pulsed at right angles to the flight-line of the aircraft and obliquely to the terrain.

The imagery discussed here was prepared by Westinghouse-Raytheon Corporation for the Department of the Army.

Although definition is not as good as conventional aerial photography, radar imagery has several advantages for geological interpretation:

1. It is possible to obtain SLAR imagery through all types of cloud cover except severe rain-storms, whereas cloud is a problem with conventional photography in areas such as the highlands of Papua New Guinea.

2. Major geological structures are often more obvious on SLAR imagery than conventional aerial photographs because of the larger area covered by each strip and the constant 'illumination'.

Generally the most informative geological interpretation would be reached after reference to both SLAR and conventional photography, but for most purposes this is not economical.

In 1971, the Bureau of Mineral Resources carried out geological mapping in the west central ranges of Papua New Guinea. SLAR imagery was used in the preparation of topographical bases and for geological interpretation of more than half of the 22 500 km^2 survey area.

The contractor, Westinghouse-Raytheon, provided SLAR mosaics and form-line topographic maps, but inaccuracies, such as repetition and obliteration of drainage due to the method of mosaicing, rendered them unsuitable for geological mapping.

The Bureau of Mineral Resources prepared topographic bases from 1:218 000 (average) scale radar strips of opposite-"look" direction; the problems encountered are outlined below:

1. The horizontal control had been established on high points as is standard triangulation practice. This meant that, plotted on the SLAR imagery, horizontal control points were in the area of maximum "layover" distortion (see 3, below) making it difficult to accurately locate them relative to adjacent drainage.

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2. Radar reflectors were not placed at control points, so difficulty was found in identifying horizontal control points on the SLAR imagery.

3. Radar layover is caused by the radar signal intercepting the top of a terrain feature before it intercepts the bottom. As a result, features appear to lean toward the nadir of the aircraft. Layover distortion and shadow were accentuated by the relatively low altitude of the aircraft. Although the imagery was flown from 6 000 m, the terrain height varied from 50 to 3 500 m above sea level.

4. In many cases, the imagery was flown so that adjacent strips were imaged from opposite-look directions and with little overlap, thus creating a difficulty in joining adjacent strips in the area of maximum distortion.

5. Scale variation was perhaps the most difficult to overcome, as in many cases there is no method of correction or in fact of recognition. Scale variations were noted in both the along-track or azimuth scale, and the cross-track or range scale. Scale problems were complicated by rapid changes in other factors,e.g. aircraft anomalies such as flying a curved path. Figure 1 shows an example of along-track distortion.

Topographic base maps compiled from SLAR strip imagery by the method described above can only be classified as fair. Accuracy could be greatly increased by:

(1) Establishment of survey control at "low" terrain points such as stream junctions.

(2) Placement of radar reflectors at control points thus established.

(3) Flying the SLAR imagery from a constant "look" direction, with approximately 30% overlap.

These measures would add considerably to the cost of any survey, especially in areas of difficult access like Papua New Guinea.

REFERENCE

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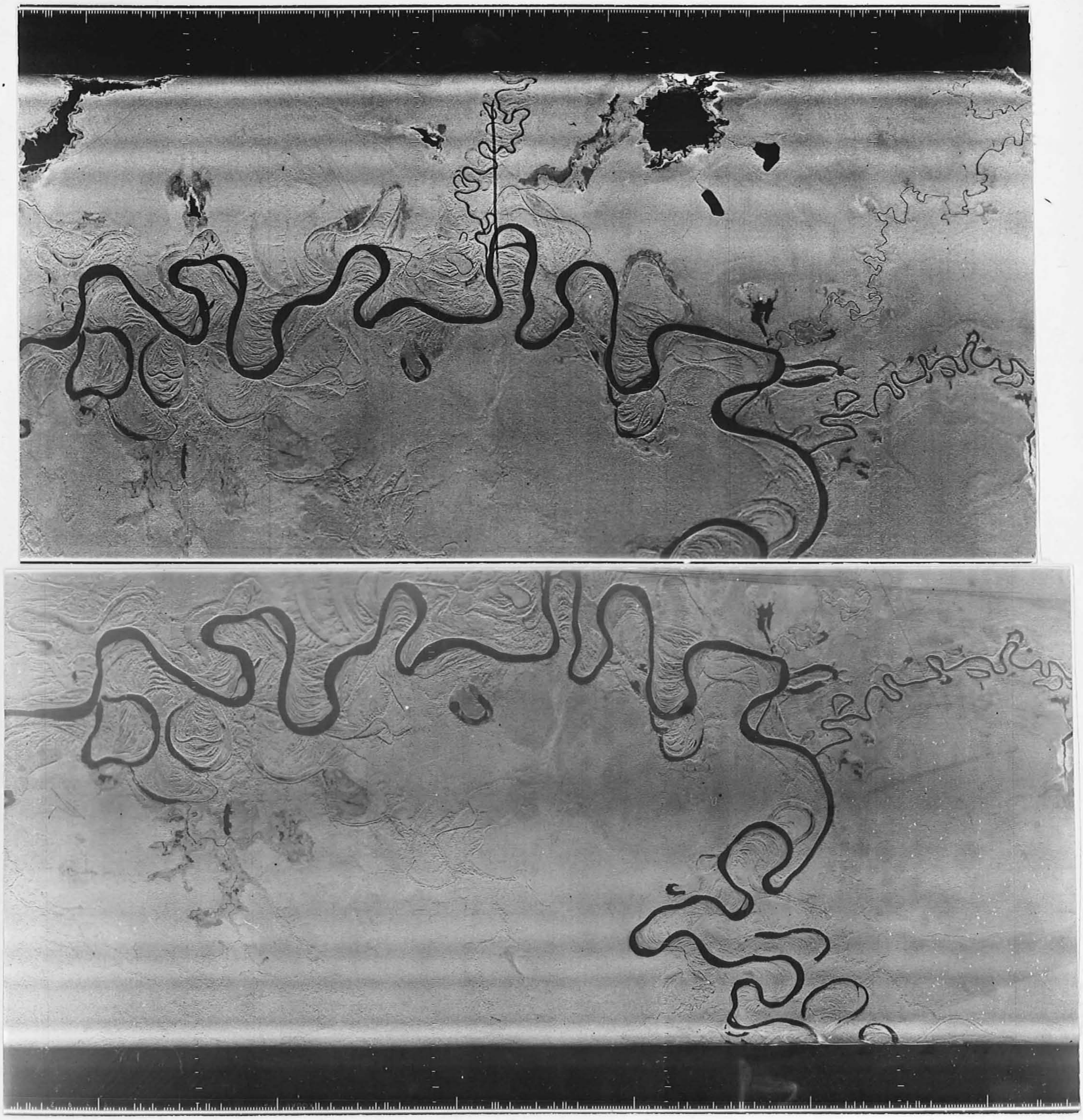

Fig. 1 SLAR imagery on adjacent runs. Note the variation in along-track (or azimuth) scale. This distortion was not expected in areas of low relief and low elevation.