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NOTES ON A GEOMORPHOLOGICAL STUDY OF CHRISTMAS ISLAND, INDIAN OCEAN.

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INDIAN OCEAN

(From air photographs)

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SUMMARY

The morphology of the island has been mapped from air photographs and is shown in the accompanying plan; relative uplift of the island in an irregular way is suggested by the arrangement of the terraces.

INTRODUCTION

The structure and geology of Christmas Island (lat. 10°30'S; long. 105°40'E) have previously been treated in other reports (White & Warin, 1964; Warin, 1958) and these notes are limited to observations arising from the study of air photographs. The air photographs examined were taken in November 1964 with a 6 inch lens from an altitude of 13,500', and are of good quality.

GEOMORPHOLOGY

The island has, in outline, the shape of three points (east, west and south) joined by concave arcs which give coastlines facing three principal directions: north, south-west and east-south-east. The central part has the form of a plateau, with higher areas in the north-east, at Murray Hill in the west and at Limestone Hill in the south; from the coast the island rises in a number of terraces to the central plateau.

The south-west and particularly the east-south-east coastlines are affected by a closely-spaced network of step faults and joints which cause a breaking down into compartments like "piano keys"; in contrast, the north coast is little affected by faulting.

This fact makes it difficult to follow the different terrace levels for, in many places with faults parallel or sub-parallel to the terraces, it is not possible to tell whether a particular scarp is the edge of a terrace or a fault scarp or a combination of these elements.

There are two important directions in this network of faults: approximately east-west and north-north-west/south-south-east. Moreover, it is possible the south-east coast is bordered by a big fault.

We have been able to distinguish 7 main benches on the island numbered from bottom to top 1, 2, 3, 4, 5, 6 and 7. Benches 5 and 6 are, in places, difficult to distinguish from one another.

These terraces are due either to uplifts of the island in stages, or to a fall of sea level in the same way. The first hypothesis seems the more likely, for otherwise it is difficult to explain why there are four terraces on the north coast (1, 2, 3 and 4) the least faulted, and only two benches (1-2 and 3-4) on the other coastlines; benches 5, 6 and 7 form the top tableland of the island.

Therefore, it seems that the island did not rise in one movement but in two oscillations in the south corresponding with four in the north.

The lowest terrace 1 or 1-2 is regular and may be caused by a fall of sea level. The shape of the coastlines is affected by faults (Flying Fish Cove, Steep Point, Wright Point etc ....). Around Egeria Point two or three later secondary benches in the lowest terrace can be distinguished.

The Gladys' Beach fault (Warin, 1958, p.2) cannot be followed on the tableland but it may be represented by the thalweg in the centre of the island. It seems logical to suppose that this fault, if it exists, was contemporaneous with the uplifts of the island, the other faults taking place at the end of the uplifts and just before the formation of the last terrace; they are readjustment faults on an unstable basement.

It is considered that the different benches, except for the lowest terrace, are due to uplifts of the island in an irregular way.

REFERENCES

Warin, O.N., 1958 - Notes on the geology and the phosphate deposits of Christmas Island, Indian Ocean. Bur. Min. Resour. Aust. Rec. 1958/98.

White, W.C., 1964 - A survey of phosphate deposits in the south-west Pacific and Australian waters. Bur. Min. Resour. Aust. Bull. 69.

CHRISTMAS ISLAND

GEOMORPHOLOGICAL SKETCH MAP

SCALE

2000 0 2000 4000 6000 FEET

REFERENCE

- Scarp
- Strong break in slope
- Medium break in slope
- Gentle break in slope
- Dividing ridge
- Fault
- Supposed fault or lineation
- 1, 2, 3 Numbering of terraces
- Slope of surface
- \+ Horizontal
- Very low
- Low
- Medium
- Road or track
- Railway
- Buildings
- Creek
- Quarry scarp and workings
- Contour interval 20 Feet

N

True North ?

Interpreted by: J.C. Rivereau, Institut Français Du Pétrole

Topographical base supplied by: The British Phosphate Commissioners

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O/X/8

INDIAN OCEAN

N.W. Point

N.E. Point

Rocky Point

Flying Fish Cove

Egeria Point

Waterfall Bay

Steep Point

Gladys Beach

Wright Point

Smithsons Bight

MURRAY HILL

SYDNEYS

DALE

TAITS

VALE

LIMESTONE HILL