TERTIARY AND QUATERNARY SEDIMENTS

OF THE ONTONG JAVA PLATEAU AREA

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN OCEANOGRAPHY

DECEMBER 1972

By

Mark John Valencia

Dissertation Committee:

James E. Andrews, Chairman
S. A. Cattell
S. A. Margolis
Johanna Resig
H. H. Veeh

ABSTRACT

Forty-seven free-fall, trigger-weight and piston-core tops from an area in the western equatorial Pacific (155°E-175°E, 10°N-10°S) were separated into three size-fractions (<44, 44-246, >246 μ) and the calcium carbonate content of the total sample and of each fraction determined. Subaerial volcanic dilution from the direction of the Solomon Islands prompted exclusion of some samples from calcium carbonate and size-fraction profiles. The initial abrupt decrease in calcium carbonate content in the western equatorial Pacific occurs at 3500 m, whereas the compensation depth is found at 5250 meters. Comparisons of previous work and examination of the present data prompt the assertion that under specified conditions, the sedimentary lysocline may be approximated by the slope break in plots of calcium carbonate versus depth. The less than 44 μ fraction demonstrates a strong positive correlation (0.92,P <.001) with depth, and may be a useful paleosolution indicator as well as a marker of displaced surface sediments in this region.

Paleomagnetic and C^{14} dated correlations of fluctuations in the frequency of the Globorotalia cultrata complex and other faunal and lithologic parameters in seven carbonate cores establish a paleoclimatic stratigraphy for the last 700,000 years in the western equatorial Pacific.

The parameter oscillations are interpreted as being due to variations in surface productivity which are linked to waxing and waning of upwelling intensity. The western equatorial Pacific stratigraphy exhibits eight upwelling-intensity cycles in the Brunhes normal polarity series, preceded by an abrupt climatic change recognizable across the entire equatorial Pacific.

Published chronostratigraphies from the southeastern, eastern, and north Pacific show approximate synchroneity with the cycles in the western equatorial Pacific. The Southern Ocean record exhibits fewer and consistently older climatic variations. Arctic climatic change also consistently preceded that at lower latitudes prior to approximately 250×10^3 yrs. B.P.

Map and statistical interpretation of the distribution of collected pre-Quaternary microfossils from the western equatorial Pacific add support to the concept of stability of the equatorial current system during the Cenozoic Era.