



Digital Coordinates and Age of More Than 13,000 Foraminifers Samples Collected by Chevron Petroleum Geologists in California

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Chevron Database 1 – Latitude, Longitude, and Age of Samples

http://pubs.usgs.gov/of/2008/1187/of2008-1187_database_1.xls

Chevron Database 2 – Number of Samples in each quadrangle

http://pubs.usgs.gov/of/2008/1187/of2008-1187_database_2.xls

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1. Introduction

The general location and age of more than 33,500 mostly foraminifer samples from Chevron surface localities in nearly 600 U.S. Geological Survey (USGS) 7.5' quadrangles from California were provided by Brabb and Parker (2003). Barren and non-diagnostic samples plus many that have no paleontologic information were omitted to provide a revised list for more than 27,000 of these samples by Brabb and Parker (2005). The locations for many of these samples were recorded by Chevron geoscientists on topographic maps (originals now in the USGS Library in Menlo Park, Calif.). The recent availability of digital databases for geologic and topographic maps has provided the opportunity to prepare a database of the locations of these Chevron samples so that the information can be combined with geology and topography for plotting or geospatial analysis. This report provides specific locations for more than 13,000 samples in central California that have enough paleontologic information to determine their age but omits thousands of samples that are too closely spaced to differentiate or those that have only a general location.

2. Preparation of the Database

2.1 General Procedures

The database prepared by Brabb and Parker (2003) was used as a framework to establish digital latitude and longitude for each sample that could be located and dated. The coordinates were obtained from TopoZone.com, an incorporated business with a map database invented in 1999 in cooperation with the U.S. Geological Survey. This company was recently acquired by Hillclimb Media and is now located at www.trails.com. The map location of each sample is compared with an on-screen image of a topographic map to determine the latitude and longitude.

2.2 Maps Originally Used to Plot Samples

All of the topographic maps used by Chevron geologists are obsolete, some of them going back into the 19th century. Most of them are U.S. Army Map Service and (or) USGS 1:62,500-scale topographic maps prepared from aerial photographs taken in the 1930's and 1940's. A few are 1:24,000-scale USGS maps prepared in the 1940's that may have contours in very different places than those in the TopoZone images. Two are 1:125,000-scale USGS maps prepared around the turn of the 20th Century from surveying in the late 1800's or early 1900's. Therefore, considerable care was required to transfer localities accurately from the

original maps to the modern maps in TopoZone, and some imprecision was undoubtedly introduced.

2.3 Map Accuracy

No tests were conducted to determine the amount of error in latitude and longitude from using obsolete maps, but four decimal places in the figures (360 feet ground distance) implies precision that is not warranted for most localities. Our impression is that the figures are reasonably good for localities along roads and waterways, perhaps less than 200 feet ground distance, but may be in error as much as a few thousand feet if a locality is on terrain with no cultural features or rounded topography.

3. Sources of Age Provided

The age of each sample is the same as reported by Brabb and Parker (2003), using the zonation of Goudkoff (1945) as modified by Berry (1974) for the Cretaceous and Jurassic; Laiming (1940), Mallory (1959), and Schenck and Kleinpell (1936) for the Eocene; and Kleinpell (1938) for the Oligocene and Miocene. Reports by Almgren and others (1988) and Prothero (2001) were used to update some of the terminology. For example, the Refugian Stage is now generally regarded as late Eocene and the Zemorrian Stage as Oligocene. All the ages are from foraminifers unless stated otherwise. The ages were obtained from reports prepared by Chevron paleontologists, from stratigraphic columns, and from notes on locality and geologic maps, so the quality of the ages may be uneven. Many ages from stratigraphic columns could not be used because the specific locations of even the beginning and ending points of the measurements were not provided.

4. Summary

An age, latitude, and longitude are provided for the first time for more than 13,000 foraminifer samples collected by Chevron geologists from surface localities in California. The localities are in the equivalent of 428 U.S. Geological Survey 7.5 minute quadrangle maps extending from Crescent City to Los Angeles and east into desert areas of Imperial County. Several quadrangles have more than 400 localities and Van Nuys has 703. The new information provided by Chevron will help any new geologic mapping projects and will assist in the evaluation of older geologic maps in areas where paleontologic information has been sparse or missing in the past.

5. Acknowledgments

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6. References Cited

- Almgren, A.A., Filewicz, M.V., and Heitman, H.L., 1988, Lower Tertiary foraminiferal and calcareous nannofossil zonation of California—an overview: Society of Economic Paleontologists, Pacific Section, v. 58, p. 83-105.
- Berry, K.D., 1974, Mesozoic foraminiferal zonation, Turonian to Tithonian stages, Pacific Coast Province: Society of Economic Paleontologists, Pacific Section, Proceedings, p. 1-24.
- Brabb, E.E., and Parker, J.M., 2003, Location and age of foraminifer samples collected by Chevron petroleum geologists in California: U.S. Geological Survey Open File Report 03-167 [http://pubs.usgs.gov/of/2003/of03-167/archive_version1/].
- Brabb, E.E., and Parker, J.M., 2005, Location and age of foraminifer samples collected by Chevron petroleum geologists in California: U.S. Geological Survey Open File Report 03-167, version 2.0 [<http://pubs.usgs.gov/of/2003/of03-167/>].
- Goudkoff, O.S., 1945, Stratigraphic relations of the Upper Cretaceous in the Great Valley of California: American Association of Petroleum Geologists Bulletin, v. 29, p. 956-1007.
- Kleinpell, R.M., 1938, Miocene stratigraphy of California: Tulsa, Okla., American Association of Petroleum Geologists, 450 p.
- Laiming, Boris, 1940, Foraminiferal correlations in Eocene of San Joaquin Valley, California: American Association of Petroleum Geologists Bulletin v. 24, p. 1923-1939.
- Mallory, V.S., 1959, Lower Tertiary stratigraphy of the California Coast Ranges: Tulsa, Okla., American Association of Petroleum Geologists, 416 p.
- Prothero, D.R., 2001, Magnetic stratigraphy of the Pacific Coast Cenozoic: Society of Economic Paleontologists, Pacific Section, 394 p.
- Shenck, H.G., and Kleinpell, R.M., 1936, Refugian stage of Pacific Coast Tertiary: American Association of Petroleum Geologists, v. 20, no. 2, p. 215-225.