Chronostratigraphy vs. Biostratigraphy –the value of absolute ages in Gulf of Mexico regional geologic studies

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Chronostratigraphy is the analysis of geologic strata using any time-significant event (paleobiologic, isotopic, isotopic-ratio, paleomagnetic). The Minerals Management Service (MMS) currently employs biostratigraphic markers, representing paleobioevents (datum events), such as foraminiferal and calcareous nannofossil extinctions, abundance increases, and acmes, as an integral part of chronozonal determinations found on the MMS Biostratigraphic Chart. By using these biostratigraphic markers with seismic and well log correlatives, geoscientists can create a relative age reconstruction (a geologic history without chronologic dates) of the Gulf of Mexico (GOM) basin. We do not, however, know how much time occurred between two biostratigraphic markers. We only know that one event took place before the other.

To assemble an absolute age reconstruction (a geologic history with chronologic dates), the age of each chronostratigraphic (paleobiologic) event needs to be assigned. The paleobioevent dated with its chronologic age (as on the standardized MMS Chronostratigraphic Chart) permits precise determination of the amount of geologic time between chronostratigraphic markers. Subsequent correlations of the ages of paleobiologic events with seismic horizons and well logs will allow geoscientists to calculate geologic rate processes such as sedimentation rates. Chronostratigraphic markers are necessary for reconstructing burial history for hydrocarbon systems modeling (timing of hydrocarbon generation and expulsion), for dating the timing of trap formation relative to hydrocarbon migration, and for constructing time-dependent paleoenvironmental maps used to predict reservoir distribution. Chronostratigraphic calibration of key depositional surfaces (sequence boundaries, maximum flooding surfaces) within the sequence stratigraphic framework enables the GOM geologic history to be accurately determined. Isotopic-ratio variability can be applied to these chronostratigraphic events to form a paleoclimatic history of the GOM.