

PROPOSAL

REGIONAL CHRONOSTRATIGRAPHY AND PALEOENVIRONMENTS OF THE CRETACEOUS TO NEOGENE SECTION OF THE SIRT BASIN, LIBYA

**A joint multi-sponsored project by the
Energy & Geoscience Institute (EGI)
in cooperation with the Libyan Petroleum Institute (LPI)**

The Energy & Geoscience Institute (EGI) at the University of Utah in partnership with the Libyan Petroleum Institute (LPI) of the National Oil Company of Libya have initiated a research project to delineate the regional chronostratigraphy and depositional facies of the Cretaceous to Neogene section of the Sirt Basin of Libya. In the first phase of the study, existing paleontologic distribution data obtained from LPI is being calibrated via graphic correlation to absolute time against the proprietary EGI Libya Composite Standard Database. In the second phase, new multidisciplinary micropaleontologic analyses will be performed on several wells, which will then also be calibrated against the Libya Composite Standard Database. In both phases, detailed paleoenvironmental analyses will be conducted on each section, with the resulting depositional facies calibrated to absolute time via the graphic interpretations. The overall result will be a high resolution, chronostratigraphic and depositional model across the Sirt Basin, both within and between sub-basins and structural highs and lows. Such stratigraphic and paleoenvironmental control will provide the means for superior tectonic and depositional modeling.

Well Selection Process

Detailed paleontologic distribution data for foraminifera, nannofossils and palynology for 15 wells (i.e., Data Set 1, Figure 1; Table 1) have been provided to EGI by LPI for absolute time calibration via graphic interpretation against the EGI proprietary Libyan Composite Standard Database. Analysis of these wells constitutes Phase 1 of the study, which began in May 2006 and will be completed in July 2007. In addition, LPI has obtained ditch-cuttings samples from an additional 7 wells (Figure 1; Table 2), which they have provided to EGI in Salt Lake City for processing for new foraminifer, nannofossil and palynologic analyses. Processing of these samples will be completed in August 2007. Well analyses at EGI will then be conducted into the 1st quarter 2008. In addition, approval from NOC has been obtained for LPI to obtain from the Arabian Gulf Oil Company (AGOCO) samples from an additional 2 wells in Block 65 of the southern Hameimet Trough. Well selection has been based upon three criteria:

1. Data Type – for successful graphic calibration, full paleontologic distribution data must be available. Assemblage descriptions across broad intervals or top summaries are insufficient for use in the study.

2. Sponsor Interest – although this is a regional study designed to provide a chronostratigraphic framework for the entire Sirt Basin, wells that are applicable to study goals that are also of local specific interest to one or more of the study sponsors have been given priority.
3. Completeness of Section – no one area of the Sirt Basin possesses a complete record of the section of interest. Therefore, individual wells have been chosen based upon having a good record of at least one major portion of the overall study interval; e.g., pre-Upper Cretaceous sandstone (“Nubian”), Paleogene platform carbonates, etc.).

Figure 1: Locality map of study wells for Phase 1 (Data Set 1) and Phase 2 (Data Set 2) of the Sirt Basin Study.

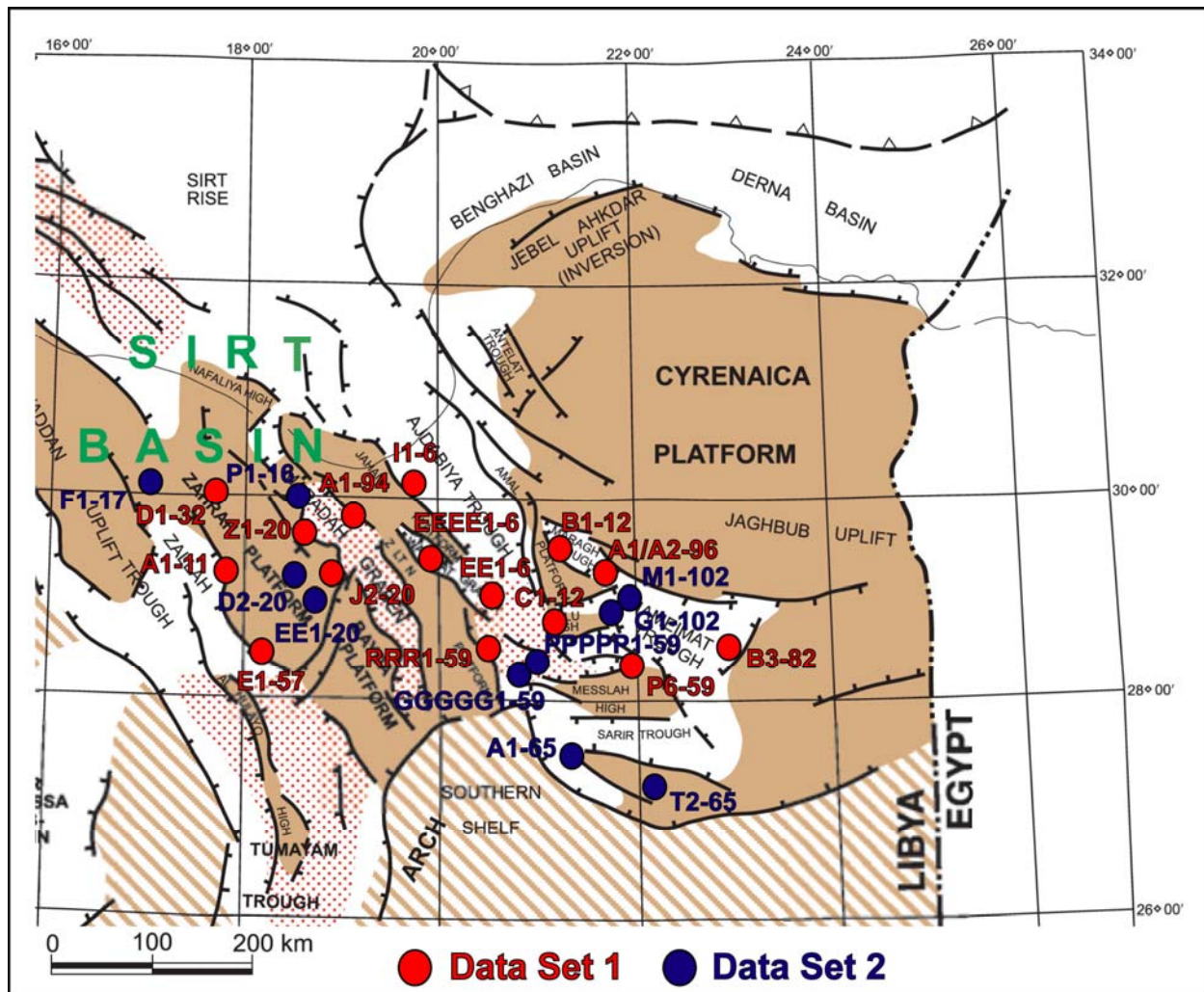


Table 1: Data set 1 wells for Phase 1 of the Sirt Basin Study. Analyses completed for all wells (see figure 2 for deliverable format).

Well	Location
A1-11	West-central margin of Zahrah Platform with the Zallah Trough
A1-94	West-central margin of Jahama Platform with Maradah Trough
A1/A2-96	Saddle between Maragh and Hameimet Troughs
B1-12	East-central margin of Amal Platform with the Maragh Trough
B3-82	Southwest margin of Cyrenaica Platform with Hameimet Trough
C1-12	NW margin of Jalu High with the Ajdabiya Trough
D1-32	Northern Zahrah Platform
E1-57	Southwest margin of Zahrah Platform with Zallah Trough
EE1-6	Southern Ajdabiya Trough
EEEE1-6	Central Wadayat Trough
I1-6	East-central margin of Jahama Platform with Ajdabiya Trough
J2-20	Southeast Zahrah Platform
P6-59	North-central margin of Messlah High with Ajdabiya Trough
RRR1-59	Southeast margin of Zaltan Platform with Ajdabiya Trough
Z1-20	East-central margin of Zahrah Platform with Maradah Trough

Table 2: Data Set 2 wells for new paleontologic analyses, phase 2 of Sirt Basin Study; samples have been obtained by EGI for wells in bold font; NOC permission has been given to obtain samples for A1-65 and T2-65 wells from AGOCO; P1-16 well is being studied at LPI with results to be provided to EGI.

Well	Location
D2-20	Southeast Zahrah Platform
EE1-20	Southeast Zahrah Platform
F1-17	Northern Zallah Trough
G1-102	NE Hameimet Trough near SE margin of Amal Platform
GGGGG1-59	Southern Ajdabiya Trough
M1-102	NE Hameimet Trough near SE margin of Amal Platform
P1-16	Northern Maradah Trough
PPPPP1-59	Southern Ajdabiya Trough
A1-65	S. Hameimet Trough
T2-65	S. Hameimet Trough

Work Plan

Hard copy distribution charts for the Data Set 1 wells were provided to EGI by LPI in May 2006. EGI personnel digitized and loaded these data to the Libya Composite Standard Database. Graphic analysis of the data (begun in November 2006 and completed in May 2007 has resulted in new insights to: the correlation of the sections; the distribution of coeval depositional facies between structural highs and lows; the timing of rifting events; and, regional lithostratigraphy and formation definitions. The format for the graphic interpretation results is illustrated in Figure 2.

In addition to utilization of the existing biostratigraphic data of Data Set 1 (Table 1), new multidisciplinary paleontologic analyses (foraminifera, nannofossils, palynomorphs) will be conducted for as many as 10 wells listed in Table 2 (Data Set 2) to further resolve the regional chronostratigraphy and paleoenvironments of the Sirt Basin. Specifically, the Data Set 2 analyses will be conducted to elucidate two historically difficult portions of the study interval to correlate: i.e., the Lower Cretaceous “Nubian” sandstone; and, Paleocene to lower Eocene shallow-water platform carbonate facies. The Lower Cretaceous clastic section is often poorly fossiliferous due to rapidly deposited, expanded sections and complex, abrupt variation between continental and marginal marine facies. We will conduct a multidisciplinary, facies-based reanalysis of this interval utilizing primarily palynomorphs, but also ostracodes and/or foraminifera where present. In addition, in consultation with the study sponsors, we are also considering a feasibility study integrating biostratigraphic, chemostratigraphic and magnetic susceptibility analyses for the correlation of two well-developed “Nubian” sections (from AGOCO wells to be obtained from Block 65 in the southern Hameimet Trough). Sponsor approval for such a study is currently pending.

Stratigraphic correlation in expanded, shallow-water, Paleocene-lower Eocene carbonate sections is often difficult due to extensive diagenetic alteration (e.g., dolomitization) and problematic correlations between *in situ* platform deposits and coeval allochthonous section in neighboring troughs marked by down-gradient sediment transport. We plan to reanalyze these sections using nannofossil, foraminifer and thin section studies combined with genetic sequence stratigraphy to define regional flooding surfaces.

LPI is providing complete sets of unprocessed well samples for the wells of Data Set 2 (Table 2). EGI will process and analyze these samples at approximately a 100ft interval for foraminifer nannofossils and, in the Cretaceous section, palynology. Data generated by these analyses will be loaded to the Libya Composite Standard Database for graphic interpretation and absolute time calibration. This process will also provide opportunities for technologic training and technology transfer between EGI and LPI personnel (e.g., EGI working with Libyan students studying the P1-16 section. In addition to chronostratigraphic correlation, detailed paleoenvironmental interpretations will be done for all study wells, with facies then scaled in absolute time via the graphic interpretations (Figure 2). This will include estimates for paleobathymetry and productivity/oxygenation, as well as recognition of intervals of down-gradient sediment displacement. Absolute time calibration of the stratigraphy and paleoenvironments of the study

sections will allow construction of chronostratigraphic cross-sections (Figure 3) that will reveal regional stratigraphic discontinuities and the spatial and temporal distributions of depositional facies. In addition, combination of paleoenvironmental calibration from both Data Sets 1 and 2 will be used to construct distribution maps for paleoenvironments from several time horizons through Cretaceous and Cenozoic time. Overall, the results will provide high chronostratigraphic resolution that will result in a better correlation of the complex stratigraphy of the Cretaceous and Cenozoic section as well as provide better time constraints for clearer understanding of the structural and tectonic history of the region.

Deliverables

- Annotated graphic correlation charts for each study well showing biostratigraphic datums calibrated against the EGI Libya Composite Standard Database (Figure 2).
- Charts will include paleoenvironment interpretations and a chronostratigraphic representation of the well illustrating the absolute age range of depositional packages and hiatuses noted (Figure 2).
- Wheeler diagrams (chronostratigraphic cross-sections) will illustrate the regional chronostratigraphy and distribution of facies throughout the Cretaceous and Cenozoic sections (Figure 3).
- Provisional graphs and well reports will be available via a project web site for downloading by sponsors as analyses proceed throughout the course of the project
- A text report with enclosures will be provided in hardcopy and digital format.
- Four sponsor meetings will be held during the course of the project at which interim results will be presented and sponsor feedback sought.

Cost and Timing

- **Per sponsor cost of the study is US\$61,608.**
- The project will continue through May 31, 2008, but interim results will be available to the sponsors as completed.

Contacts

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Figure 2: Major components of graphic correlation interpretation of a well

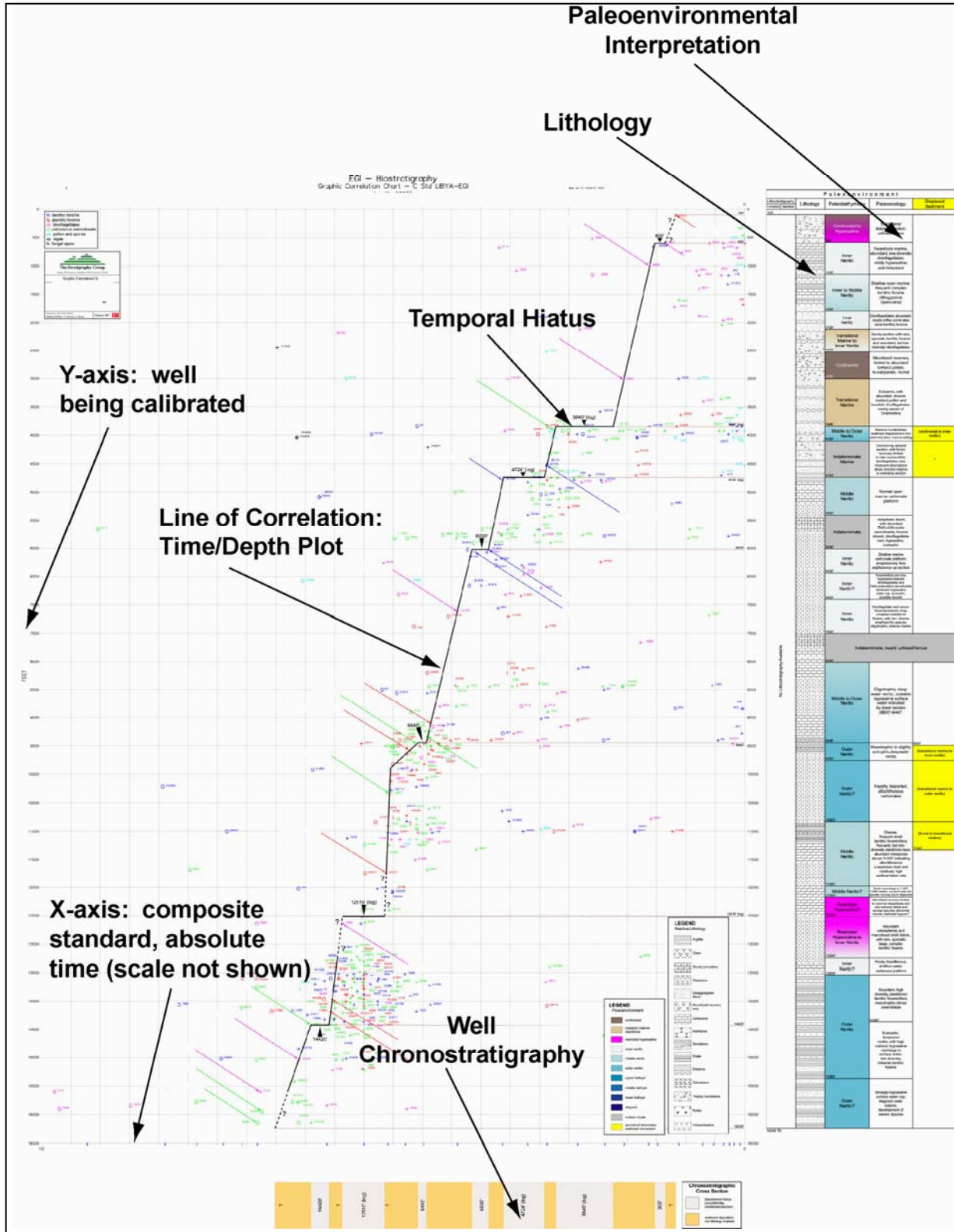


Figure 3: Example of chronostratigraphic cross-section (vertical scale = time), with paleoenvironmental overlay.

