Depositional History of the West Nile Delta - Upper Oligocene to Upper Pliocene*

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Abstract

Several Nile Delta publications in recent years have used very good quality data to illustrate and discuss depositional systems in great detail. The data presented in this study adds regional context to the common understanding.

Recently acquired 3D seismic surveys in the onshore, offshore and transition zone were interpreted as part of a Nile Delta Prospectivity Study. Well data from more than 40 years of hydrocarbon exploration were intergrated. These data provided the basis for a regional understanding of the sedimentary and structural evolution during the past 30 million years.

A robust biostratigraphic zonation scheme was adopted and consistently implemented to more than 60 wells throughout the study area. Integration of seismic surfaces and facies analysis using a variety of seismic attribute extractions and sedimentary facies, calibrated by well data and stacking pattern analysis, were done on a sequence by sequence level. A seismic facies catalogue was generated for different depositional environments.

Paleo-depositional systems maps were constructed and serve as snapshots, mostly of lowstand systems, for each timeframe. These maps illustrate the regional depositional history for the West Nile Delta. They reflect, for instance, the relation between lowstand prograding deltas and relict shelf breaks at type one unconformities to the generally more distal and productive offshore slope settings. The different positions of the mapped relict shelfbreak and facies distribution in different sequences reflects the evolution of the deltaic geometry over the timeframe investigated as well as the sedimentary response to regional tectonic events at the time of

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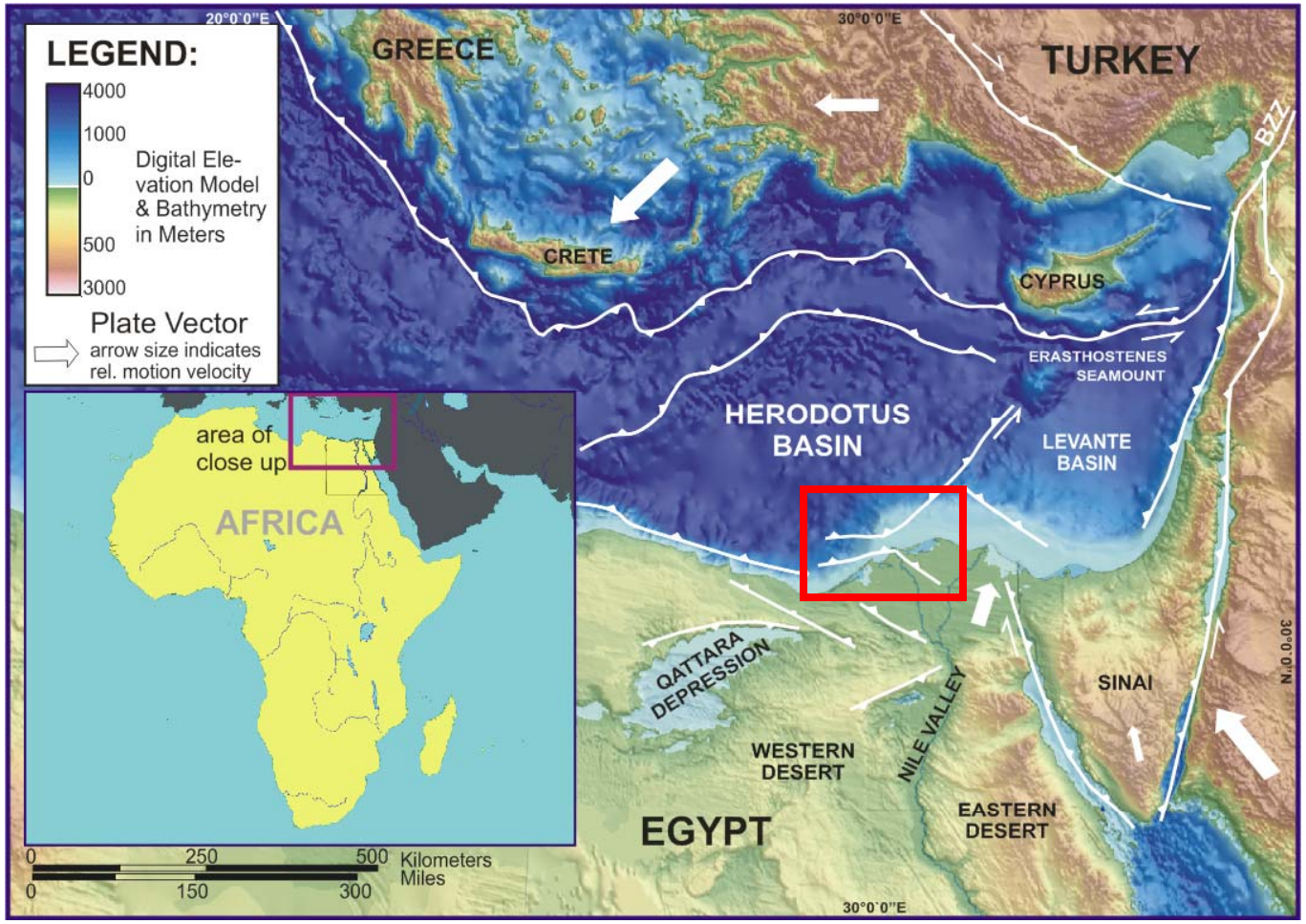
Location Map and current plate tectonic setting of the study area



> Bathymetry and DEM data after: IOC, IHO and BODC, 2003. Centenary Edition of the GEBCO Digital Atlas, published on CD-ROM on behalf of the Intergovernmental Oceanographic Commission and the International Hydrographic Organization as part of the General Bathymetric Chart of the Oceans, British Oceanographic Data Centre, Liverpool, U.K.

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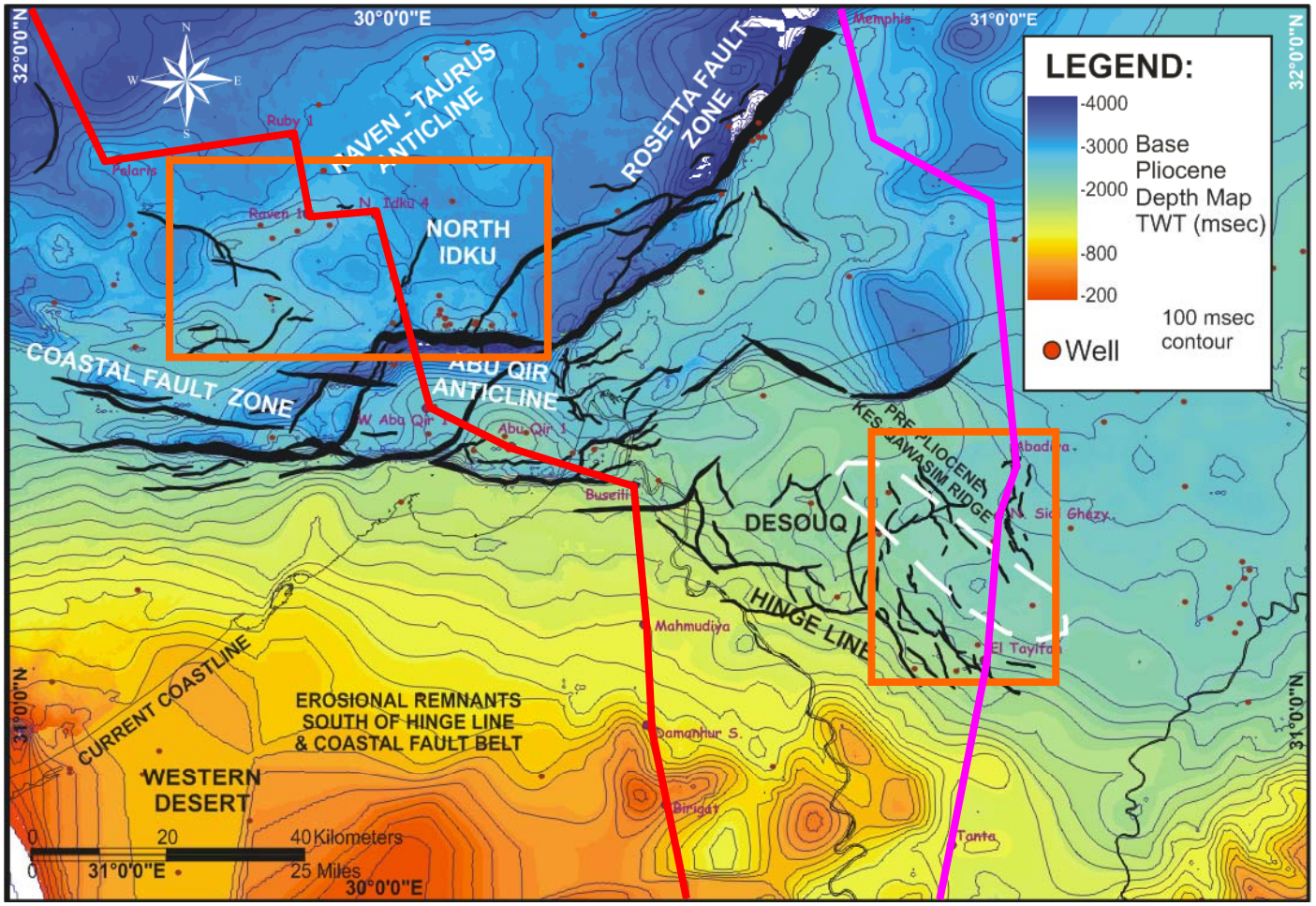
Base Pliocene Depth Map throughout the study area



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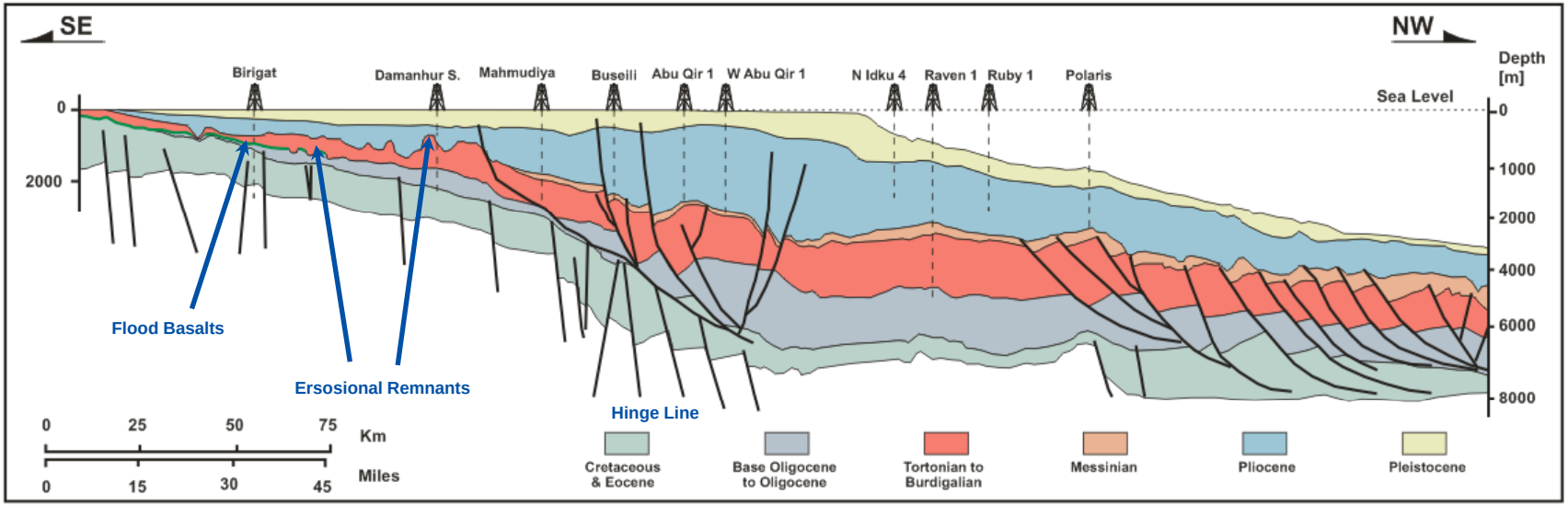
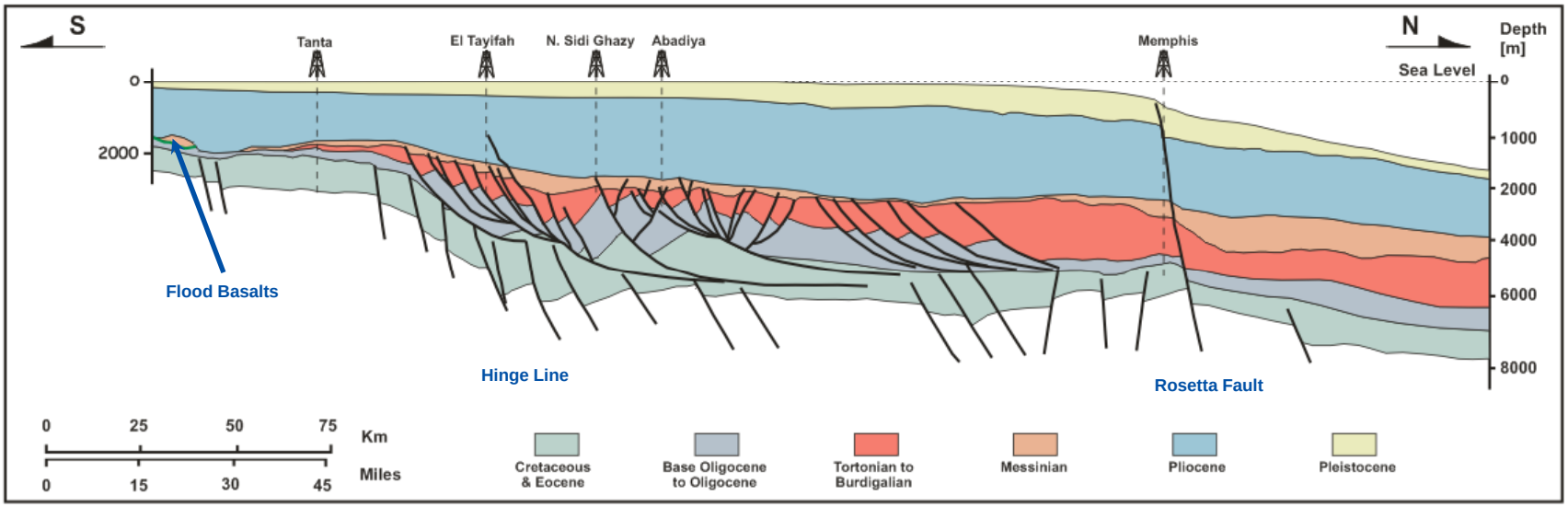
Regional Cross Sections within the study area





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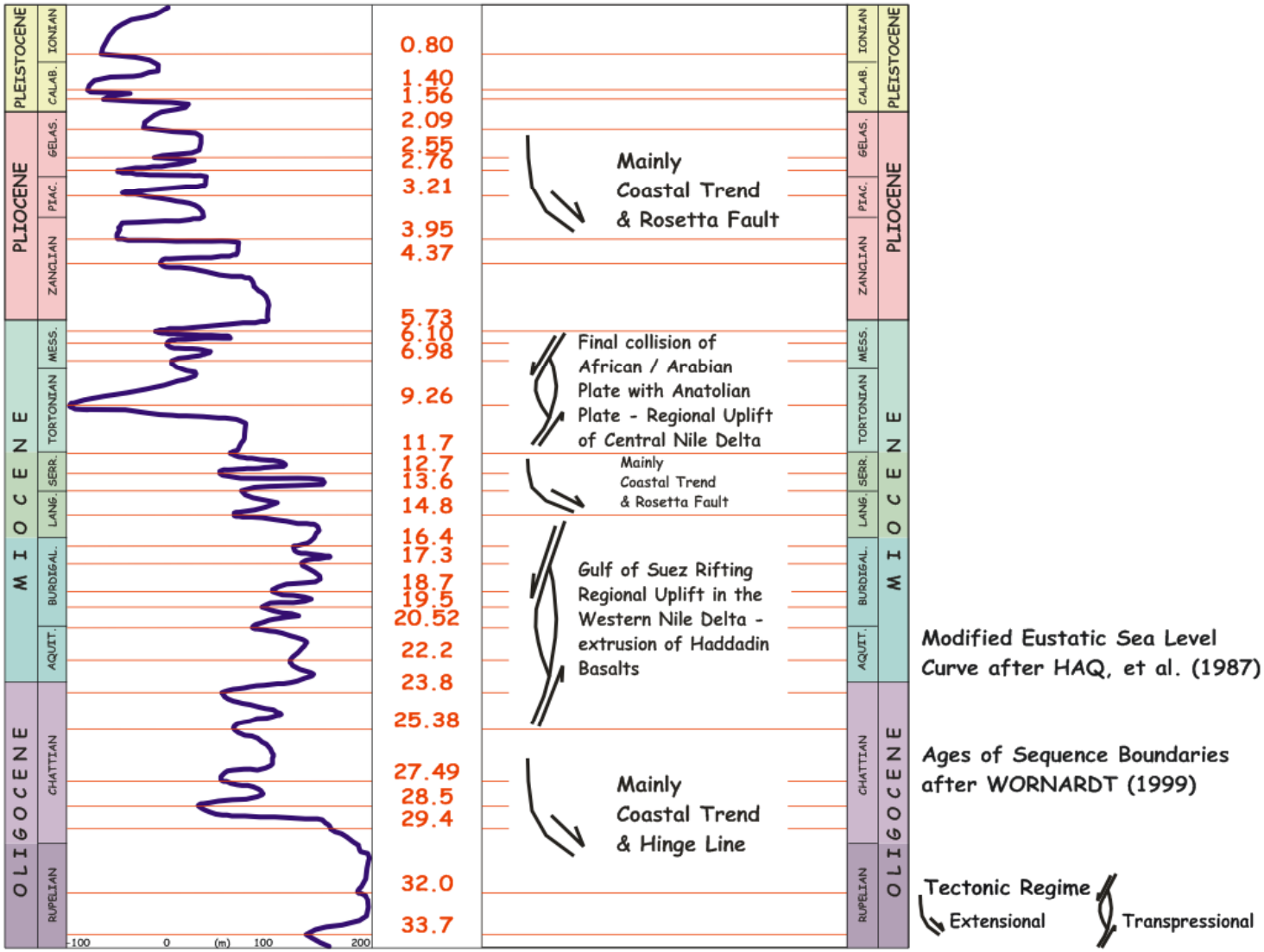
Timing of Tectonic Events and relative Sea Level Changes in WND



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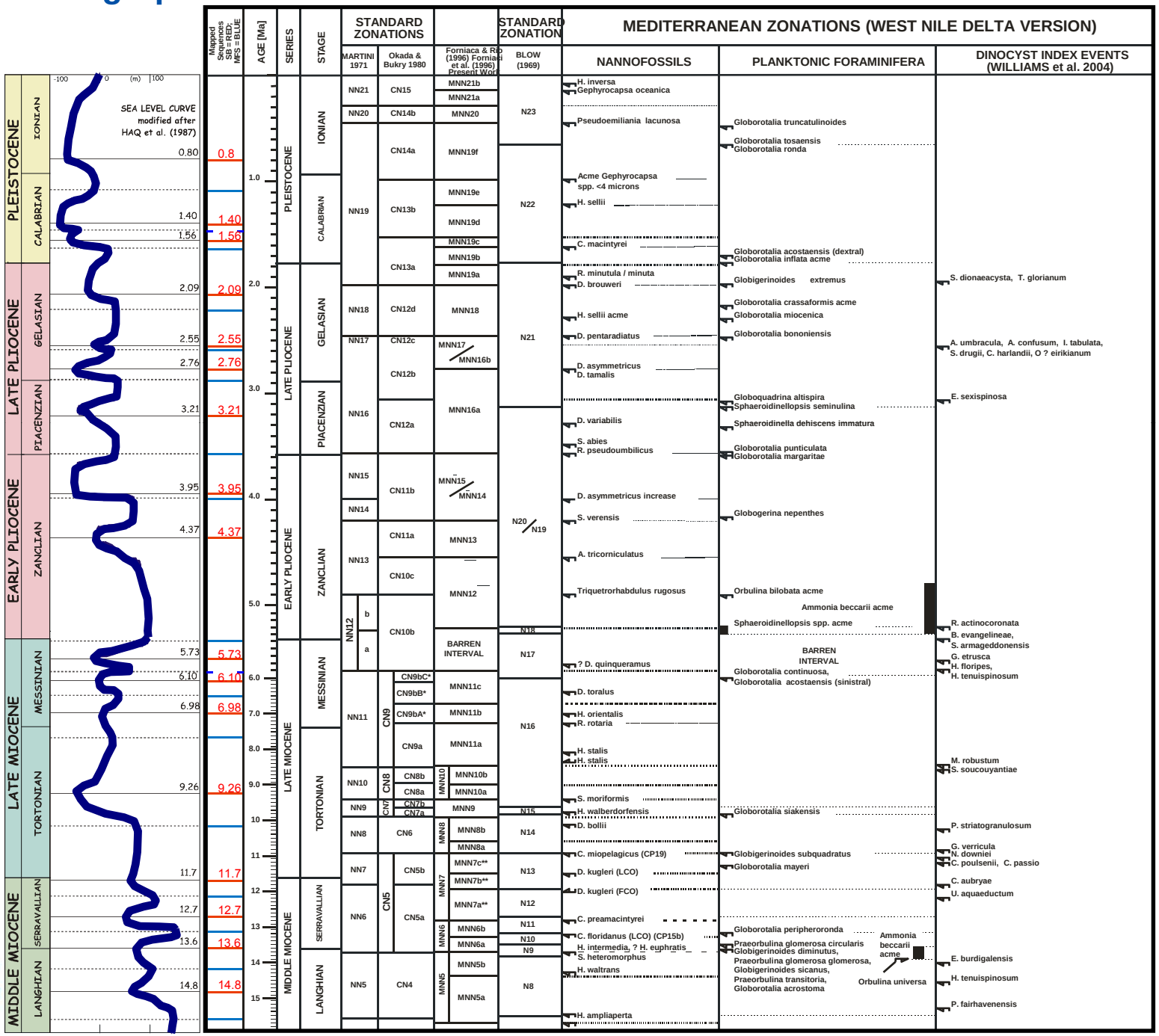
Biostratigraphical zonation scheme for the Eastern Mediterranean



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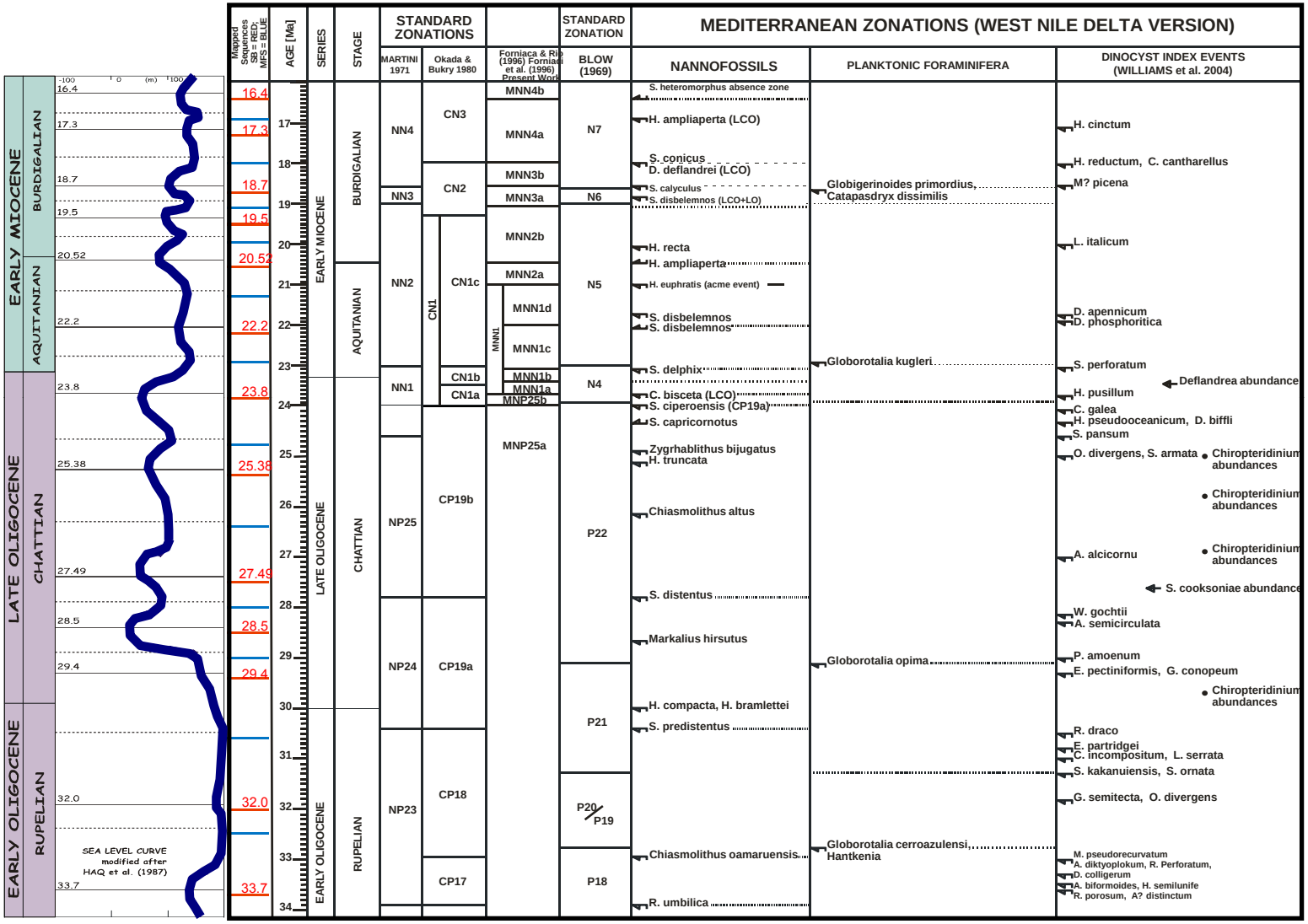

> Age of major sequence stratigraphic units after WORNARDT (1999); RWE Dea inhouse work by JUTSON D., YOUNG H. & KELLNER A. (2006).

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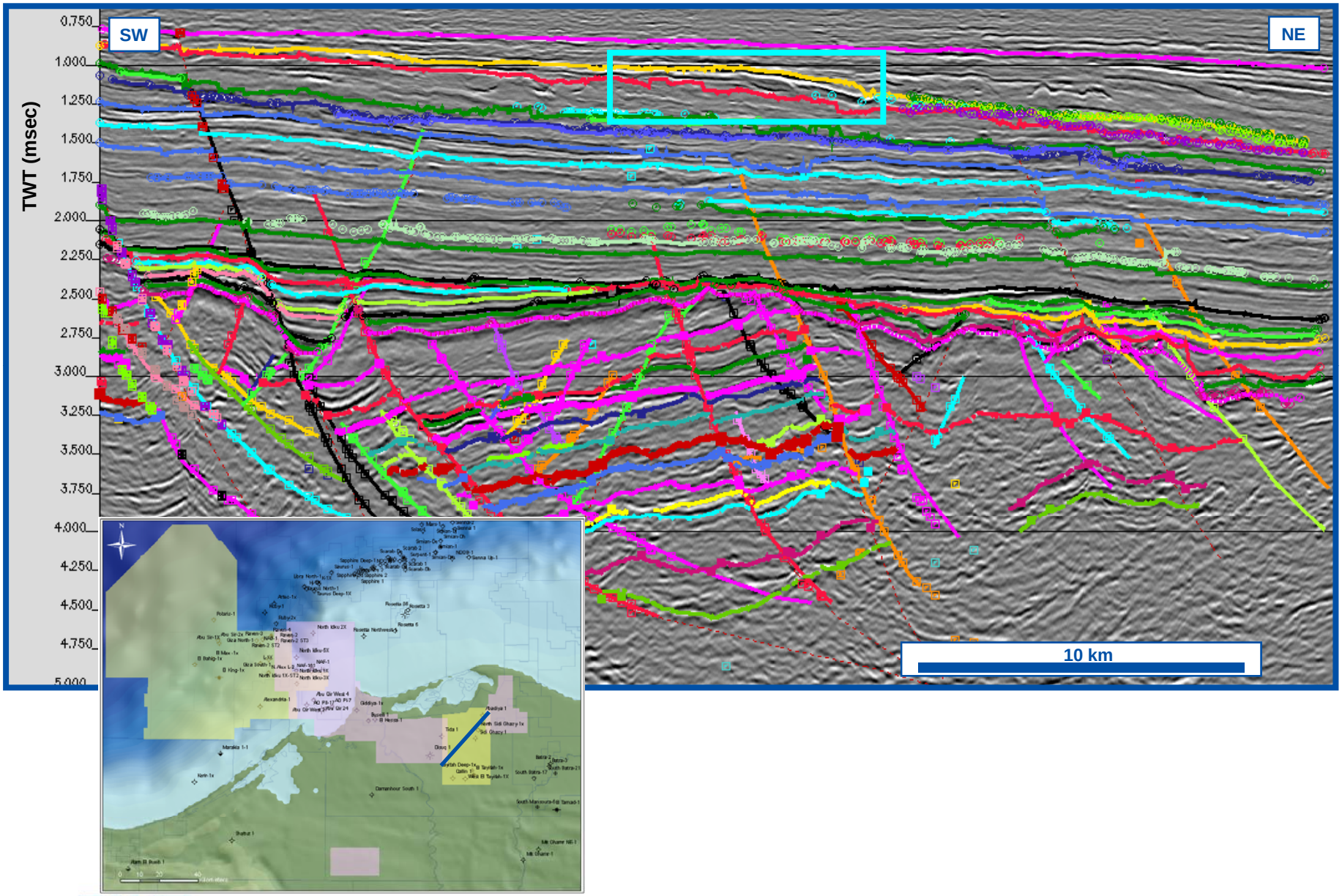
Seismic Cross Section as Example



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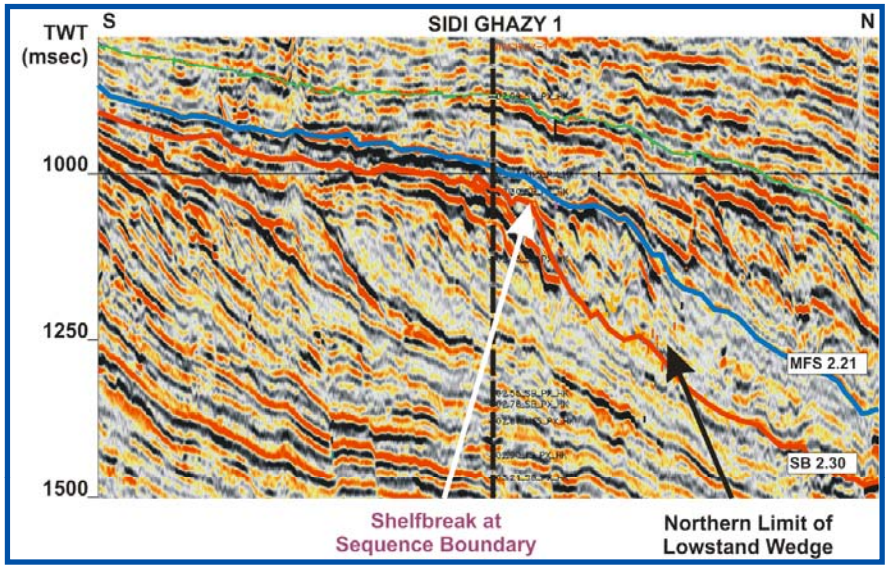
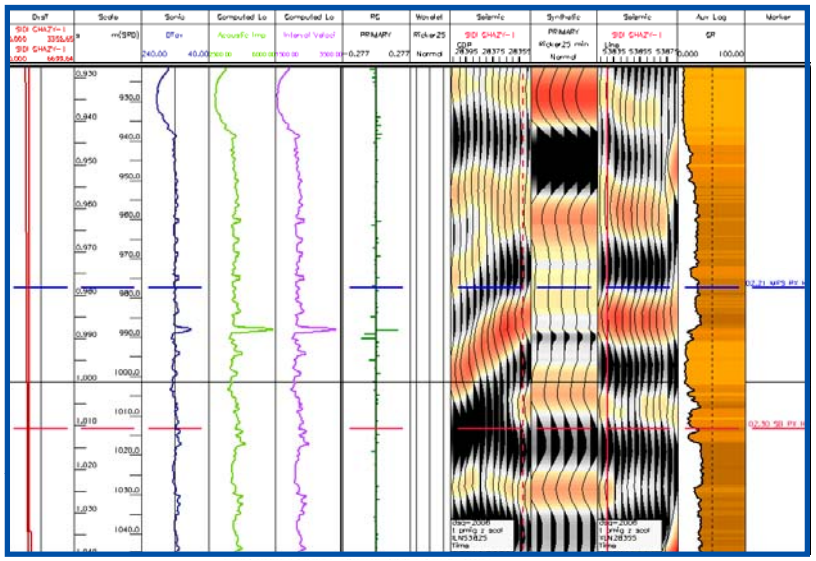
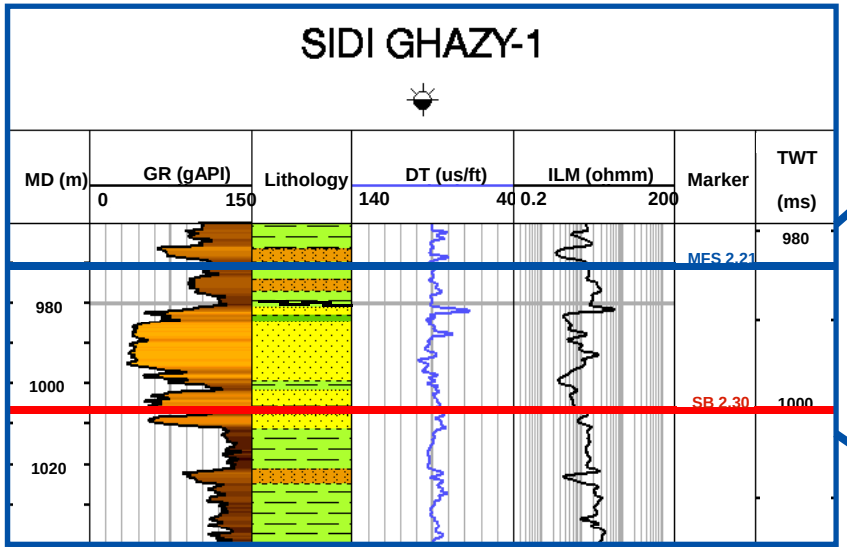
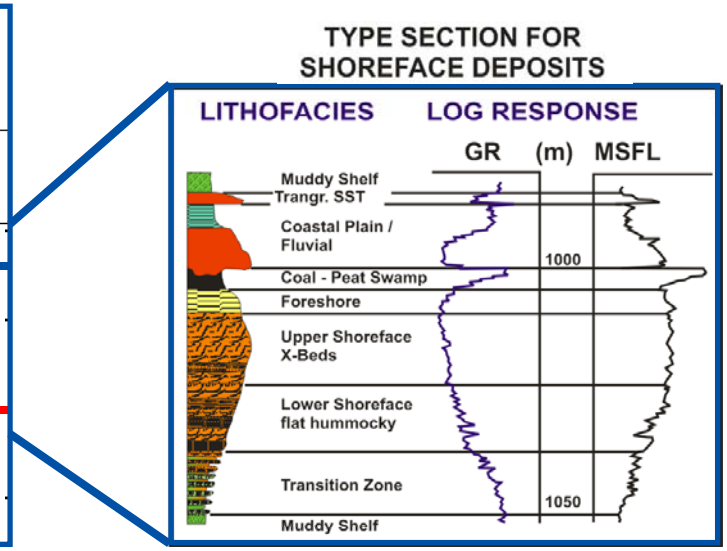
Facies Interpretation using Seismic & Borehole Data









> Type log modified after KRYSTINIK (pers. comm. 2007) and BALSLEY & PARKER (1983).

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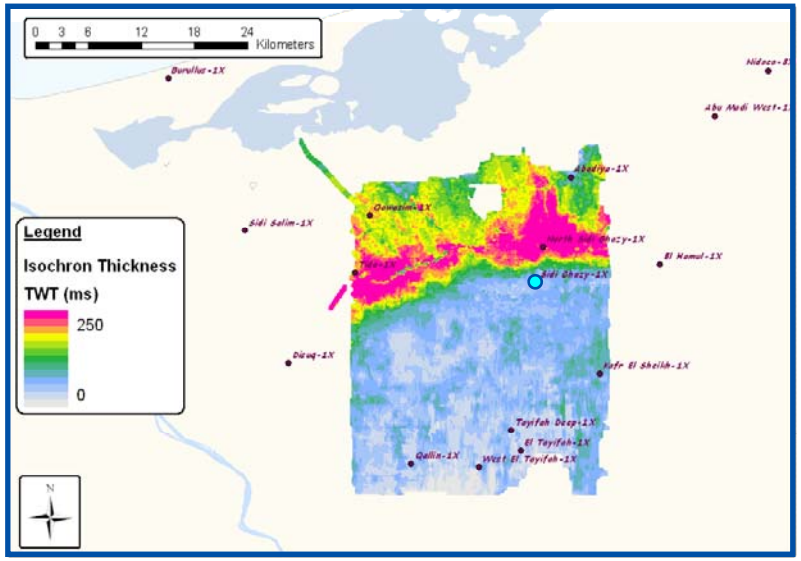
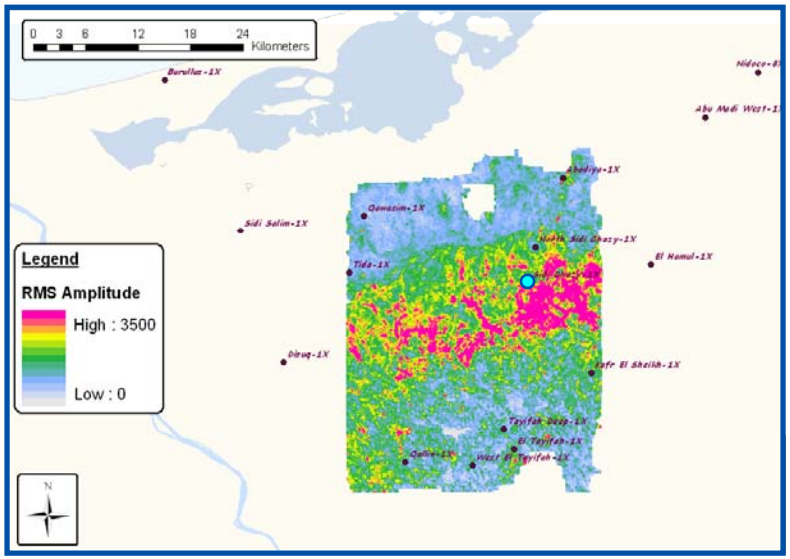
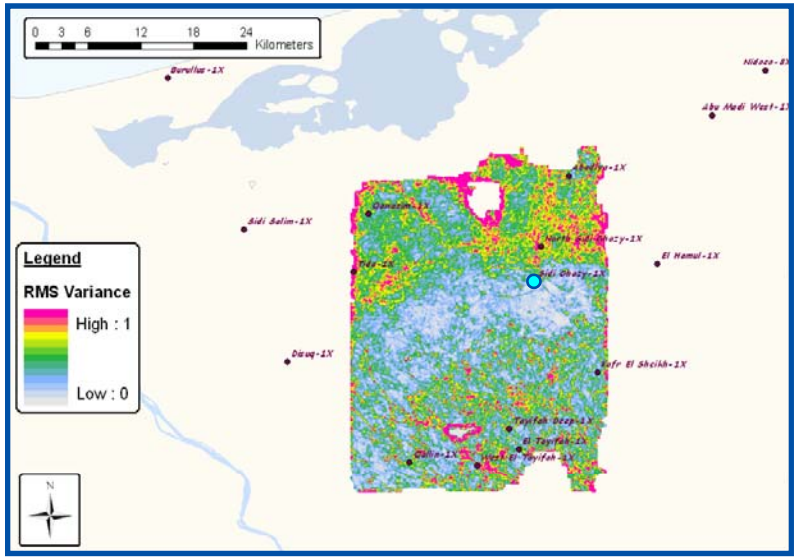
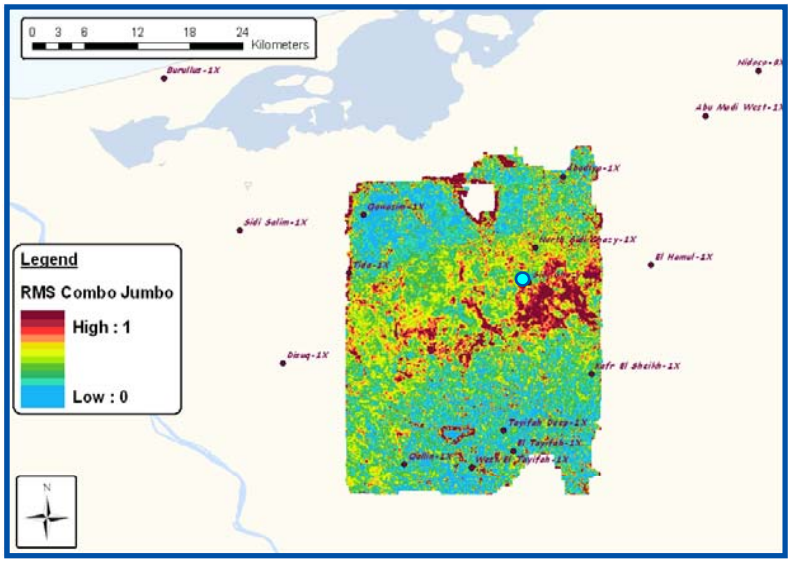
Thickness and Attribute Extraction of Correlative Intervals









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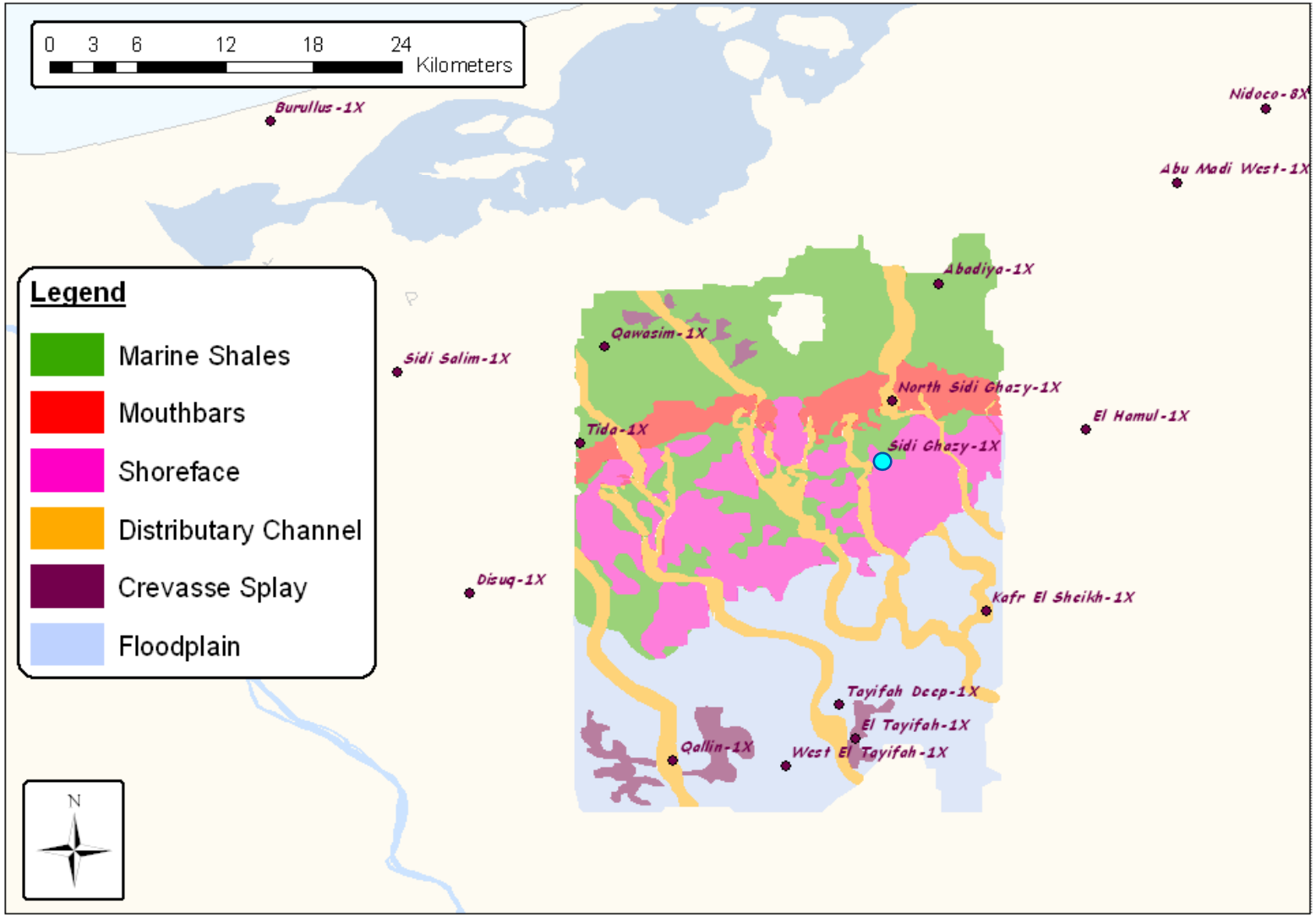
Facies Map for the Lowstand & Transgressive Depositional Systems



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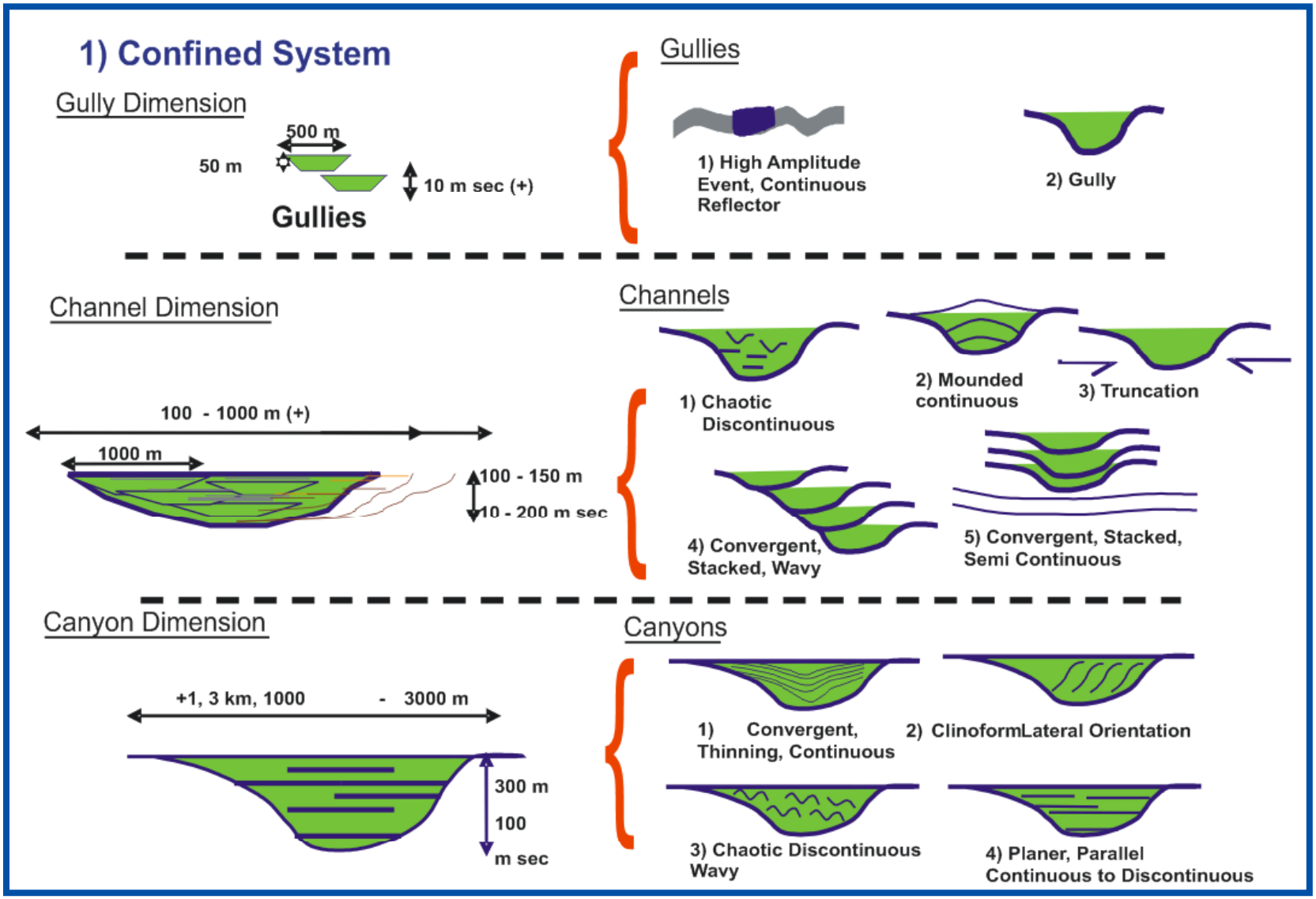
Seismic facies catalogue for depositional facies interpretation



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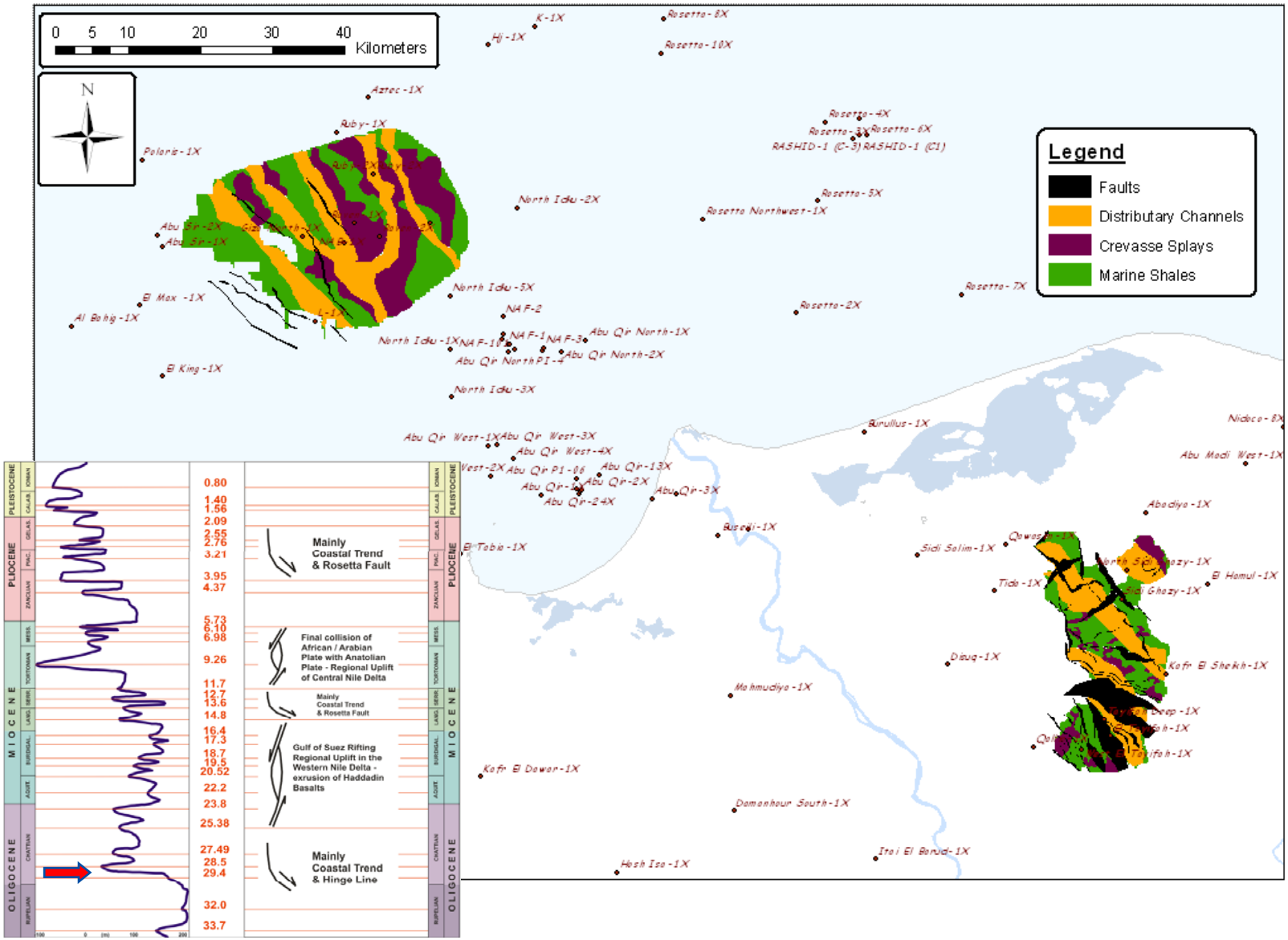
Gross Depositional Environment Map for SB 29.4



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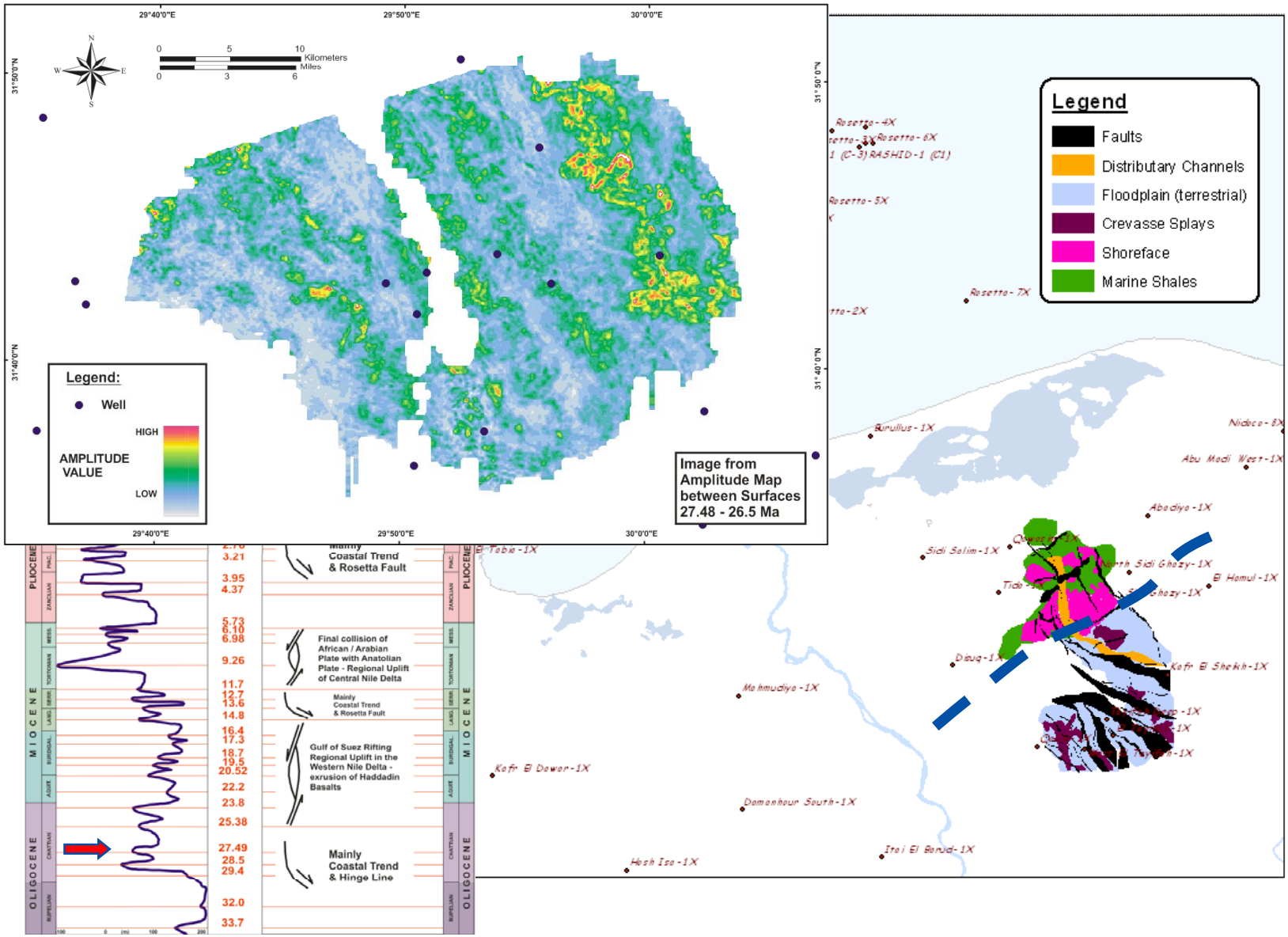
Gross Depositional Environment Map for SB 27.49



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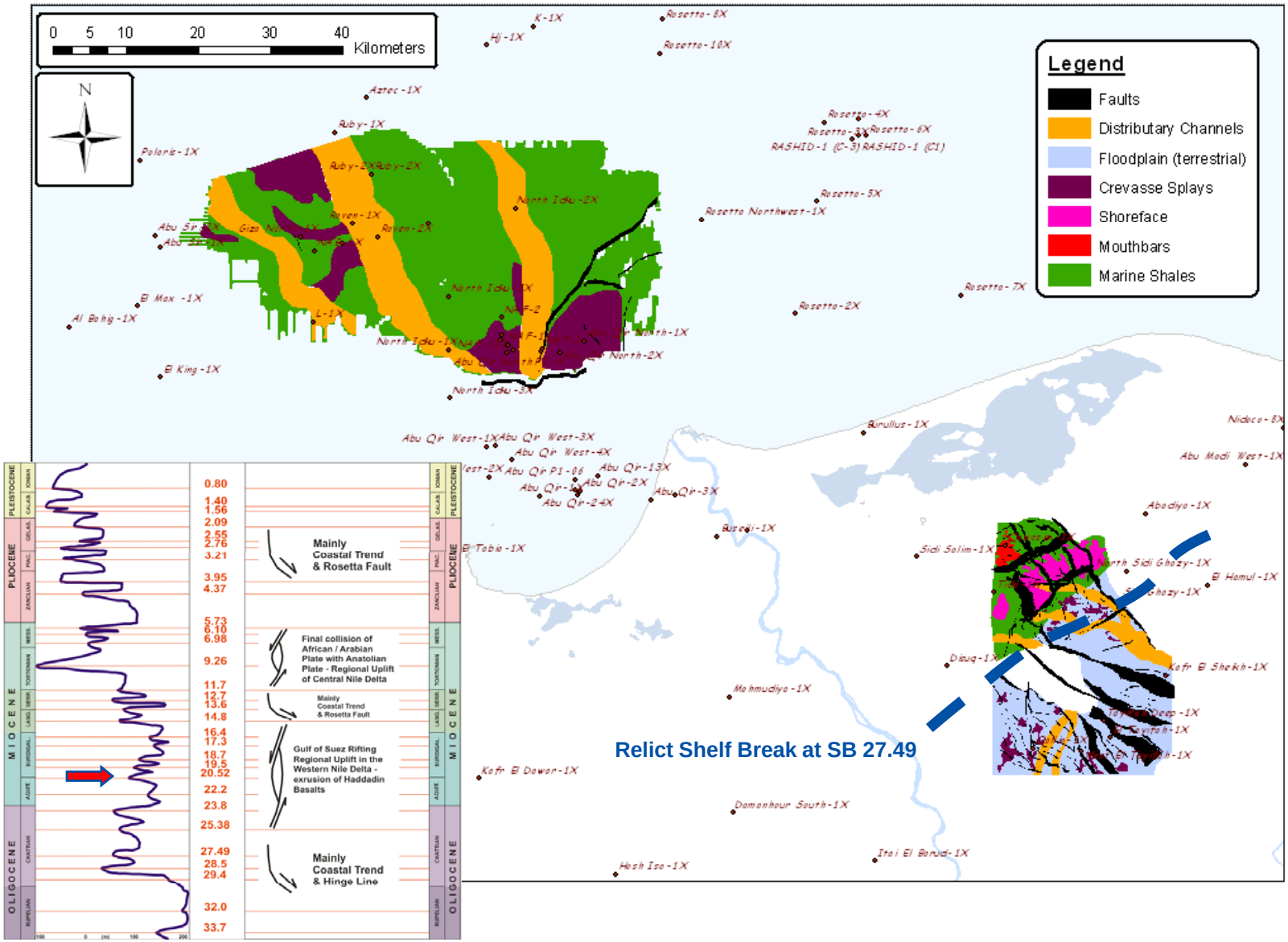
Gross Depositional Environment Map for SB 20.52



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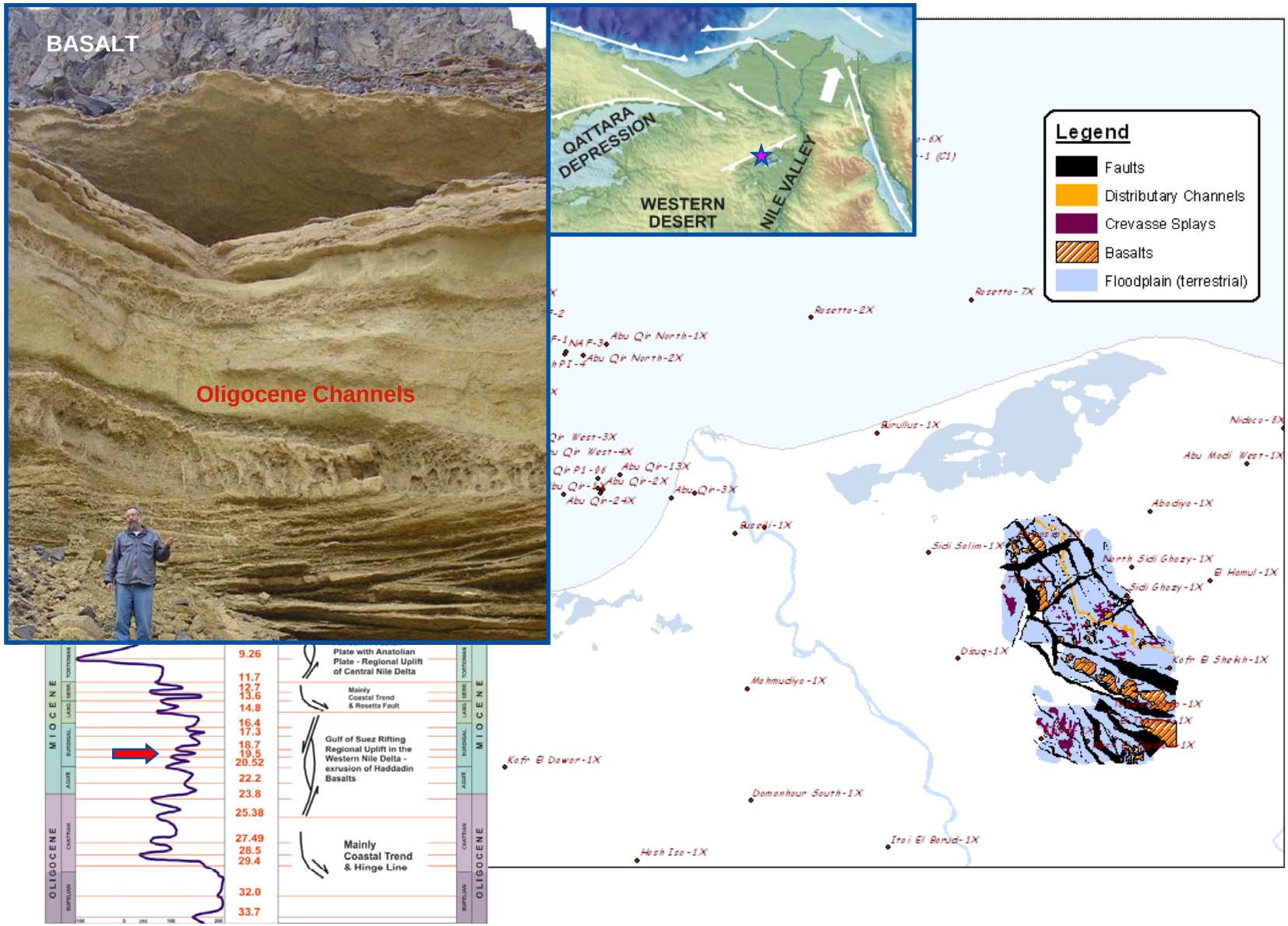
Gross Depositional Environment Map for SB 19.5



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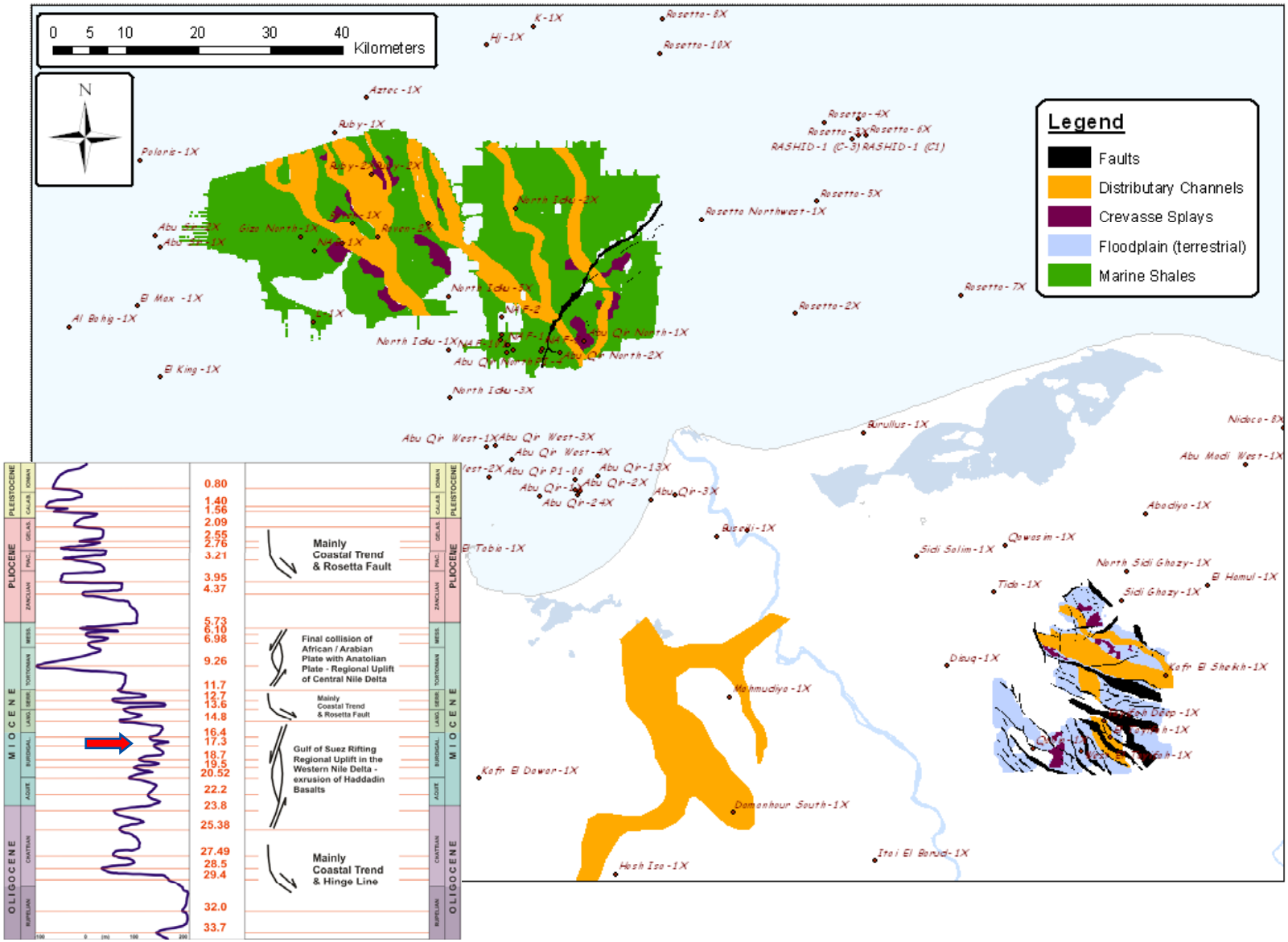
Gross Depositional Environment Map for SB 17.3



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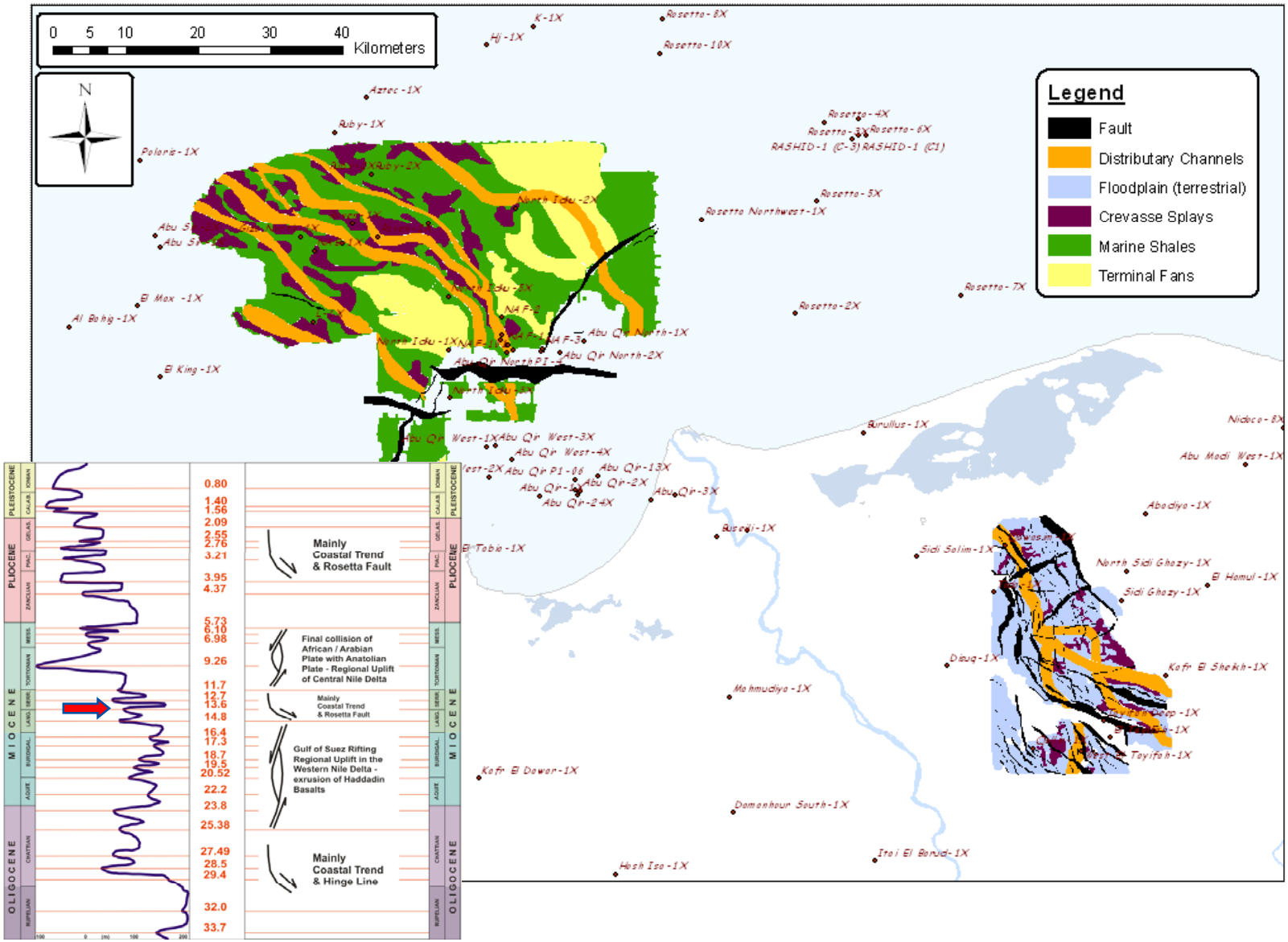
Gross Depositional Environment Map for SB 13.6



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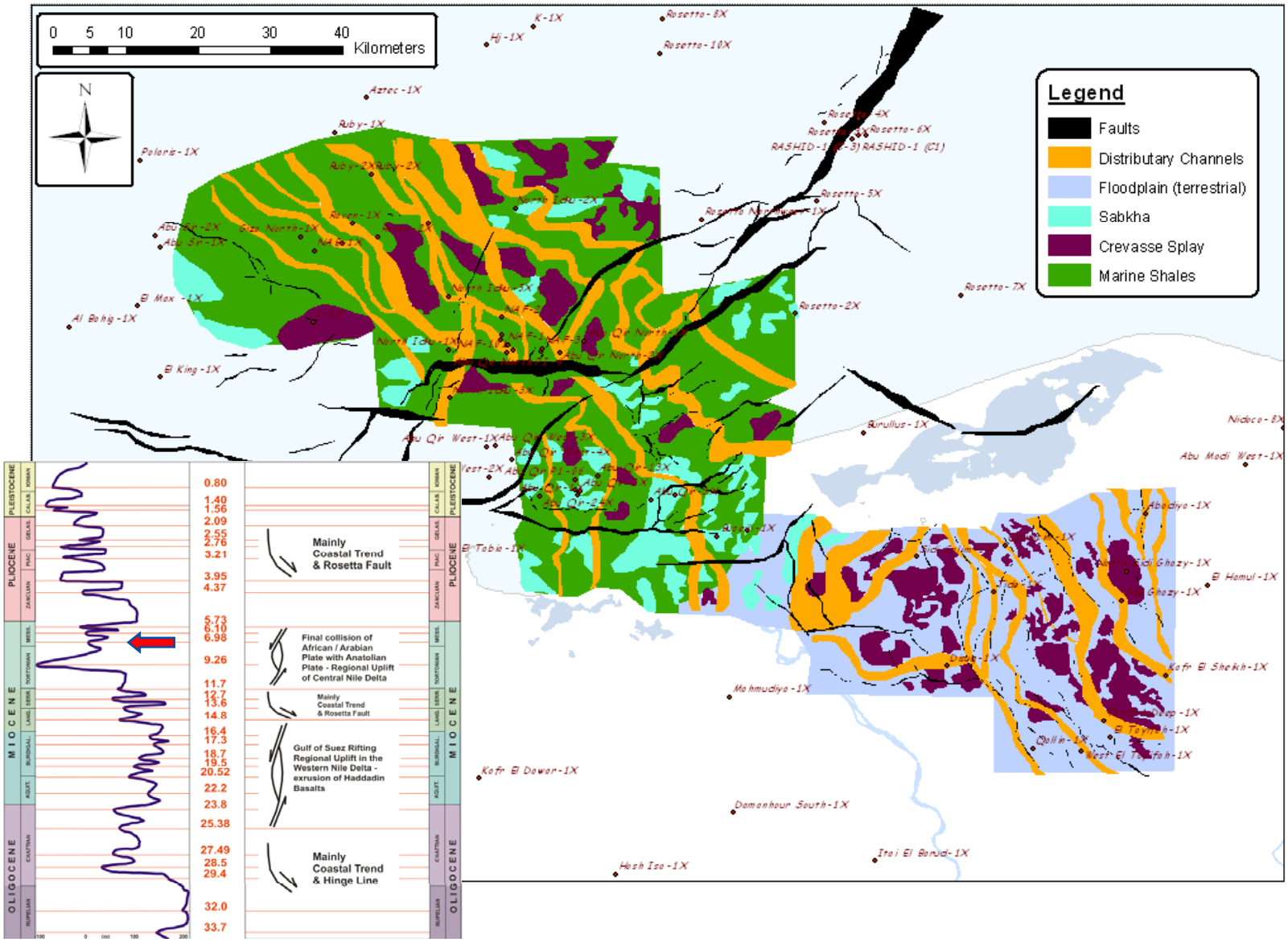
Gross Depositional Environment Map for SB 6.98



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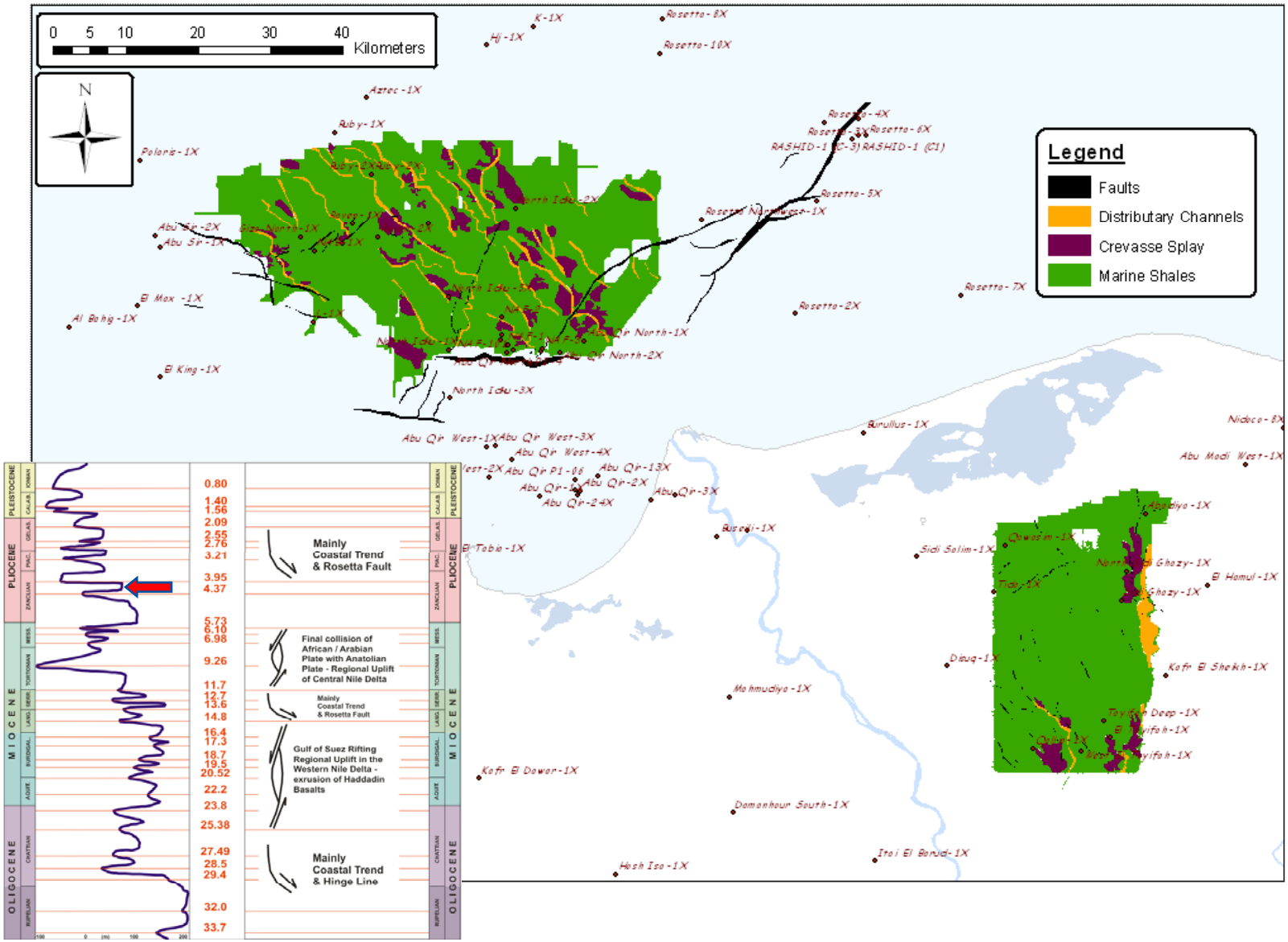
Gross Depositional Environment Map for MFS 4.0



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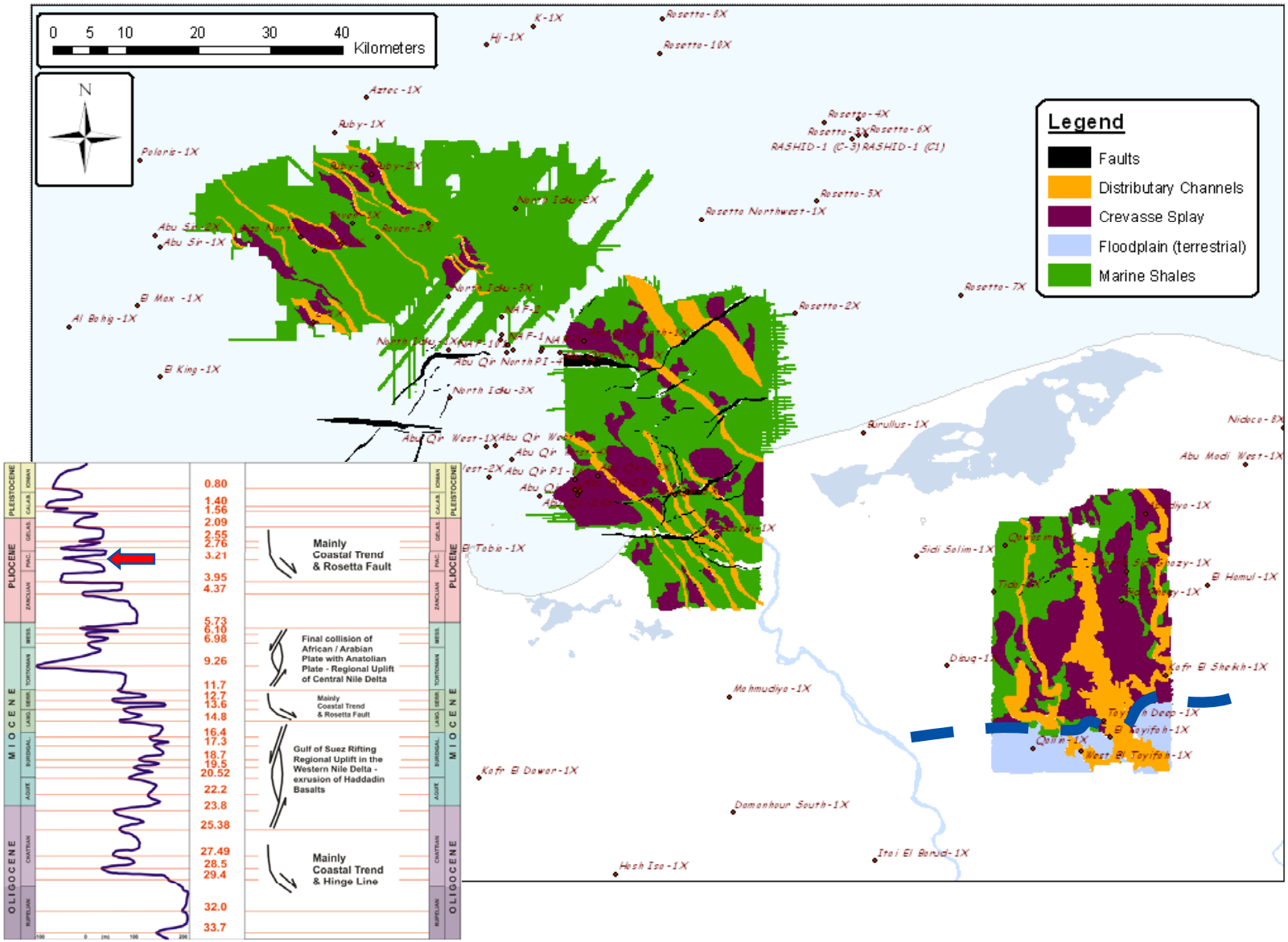
Gross Depositional Environment Map for SB 3.21



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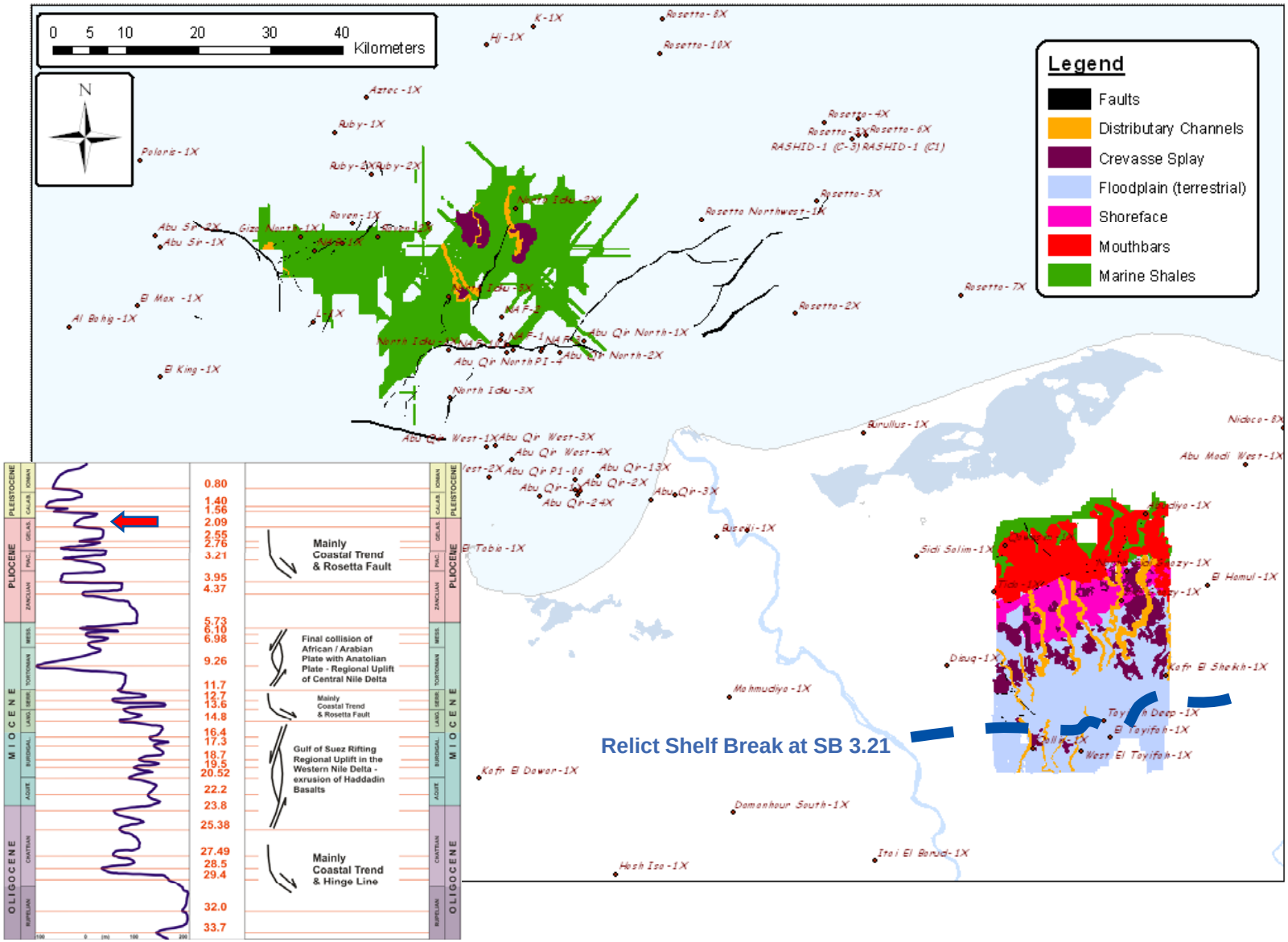
Gross Depositional Environment Map for SB 2.09



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Conclusion & Lookout

- Major tectonic events influence depositional patterns at a higher order scale.
- Miocene deltaic deposition was interrupted by late Tortonian and Messinian hinterland erosion and deposition.
- Pliocene deltaic deposition commences subsequent to major transgression at base Pliocene.
- Proven “genetic” methodology approach enables reservoir / seal and migration prediction for successful gas exploration.
- Results will be complemented by ongoing investigation of infill areas.

Selected References

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