IN DEVELOPMENT

Eastern Mediterranean Basin Synthesis (EMBS)

Tectonostratigraphic Controls and Geochemical Indicators

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Investment per Sponsor
$68K (USD)

Duration
12 months

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Figure 1. Plate tectonic setting of the Eastern Mediterranean Sea

VALUE

- Better understanding of the geodynamic tectono-sedimentary evolution of the Eastern Mediterranean basins for oil and gas exploration with a focus on how tectonic and stratigraphic forces have controlled the key petroleum system elements from source rocks to traps.
- An ArcGIS assessment and easy-to-use tool for analysis of the regional geology and petroleum plays in the region based on an integrative database that can be augmented with internal databases of the sponsoring companies.

Key Deliverables

1. An integrative digital database for the Eastern Mediterranean distilling a huge amount of information and publications that are currently scattered. The database would also evaluate and standardize the information on the region borderded by eight different countries in the region, from Egypt and Lebanon to Cyprus and Turkey.
2. An easy-to-use geologic knowledge-base with a focus on basin evolution, structural framework, paleofacies distribution, geochemical evaluation, and origin of oil and gas accumulations.
3. Play fairway mapping of hydrocarbon prospectivity in selected key areas based on regional synthesis of information from wells, seismic, biostratigraphic, and geochemical data.

Regional Framework and Study Rationale

Situated at the intersections of Africa, Asia, and Europe, the Mediterranean Sea with a surface area of 2.5 million sq. km includes 12 local seas and gulfs as well as over 3300 islands. The Mediterranean is also connected through narrow straits to the Atlantic on the west, the Black Sea to the north, and the Red Sea to the south. Moreover, 22 countries in Europe, North Africa, and West Asia face the Mediterranean. This geographic setting has given the Mediterranean a geostrategic position in the world both politically and economically. Indeed, the very term "Mediterranean" (Latin, "interior of Earth's landscape") signifies its key position historically.

In the past two decades, the Eastern Mediterranean has witnessed the discovery of several major gas fields such as Aphrodite, Leviathan, Tenin, Tamar, Karish, Dalit, and Zohr in the Levant Basin. These, in addition to the classic oil and gas fields of the Nile Delta and Western Desert basins in Egypt, indicate the existence of a prolific petroleum province for exploration with proximity to major markets in Europe. Nevertheless, many aspects of the petroleum systems in the Eastern Mediterranean are little known, such as the distribution of source rocks and reservoir in space and time, the causes of microbial (biogenic) vs. thermogenic gas fields, the impact of the Messenian Salt Giants on petroleum systems, and the nature of deep plays. Some of these problems can be investigated through integration of geologic, geophysical, and geochemical data from both onshore and offshore areas. In this way, petroleum systems can be viewed against the background of tectono-sedimentary evolution of the Eastern Mediterranean basins.

While the Nile Delta fields are located at relatively shallow water depths, the recent discoveries in the East have extended this petroleum province to water depths of 1000-3000 m. Moreover, the Eastern Mediterranean as a remnant of the western Tethys ocean hosts the oldest oceanic crust (Triassic-Jurassic) still subducting beneath Eurasia. This oceanic crust is contrasted with transitional-continental crust to the south and east, underlying a sedimentary package of 2-4 km thick.

The main aim of this study is to synthesize the current geo-knowledge of the Eastern Mediterranean basins and basement toward answering key questions relevant for petroleum exploration.

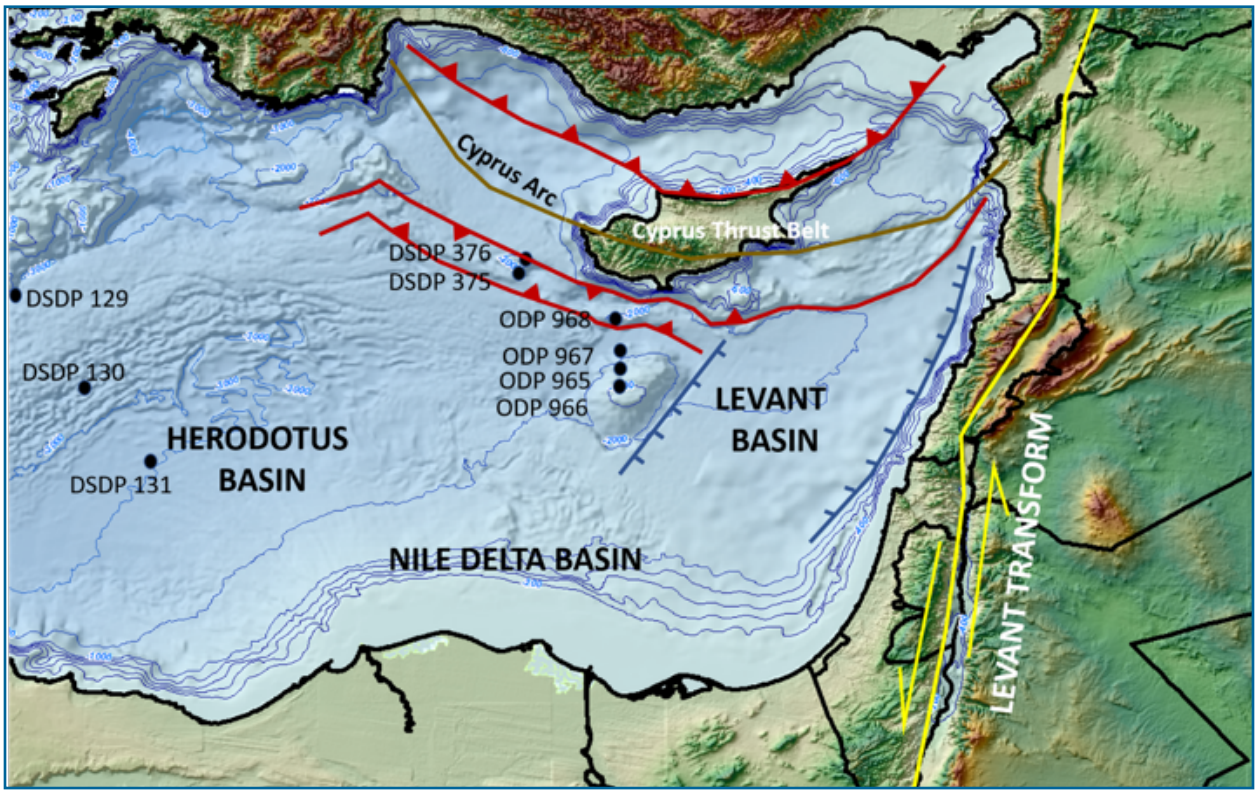

Figure 2. Bathymetry and major structures in the Eastern Mediterranean

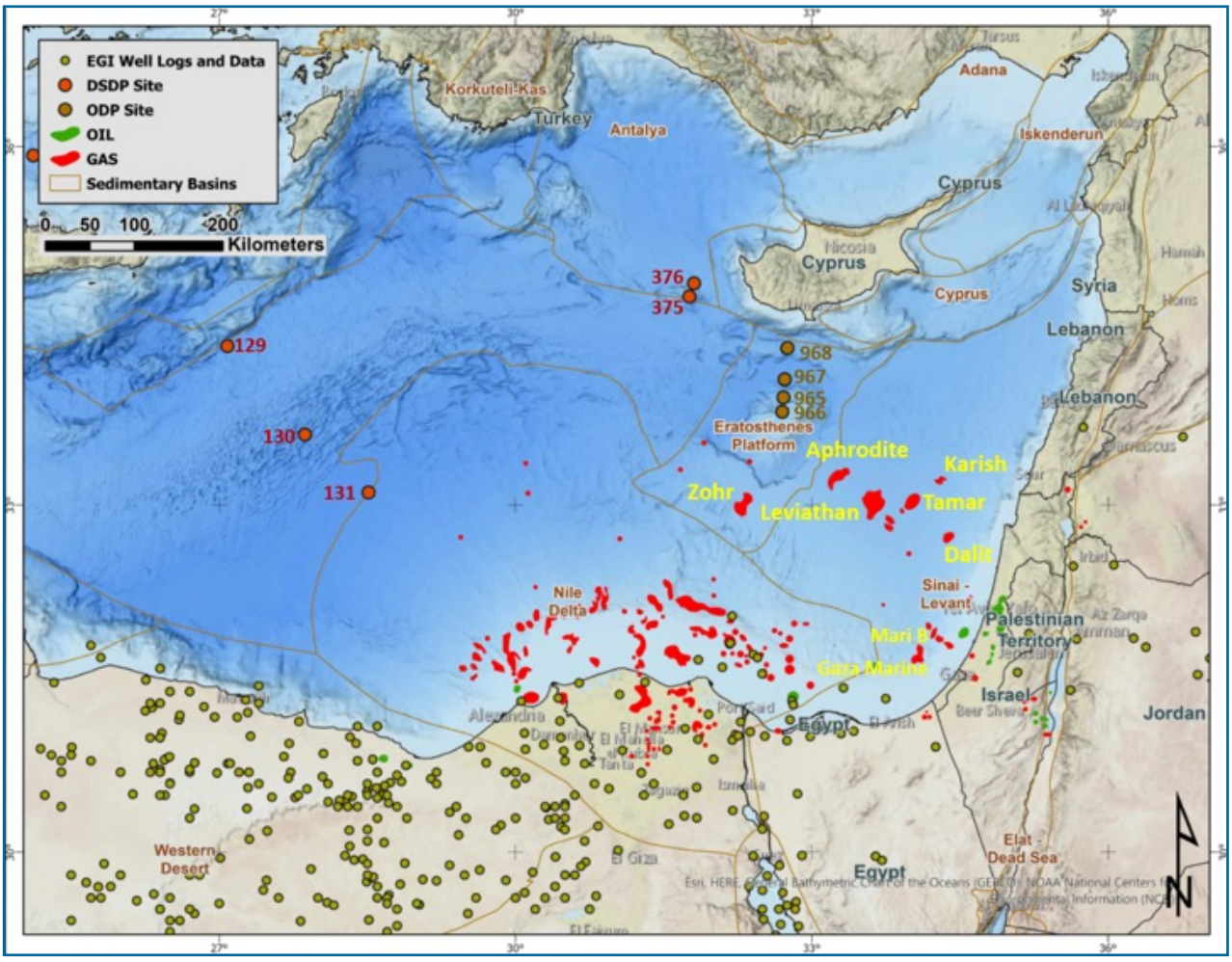

Figure 3. Basins, oil and gas fields, and EGI wells for this study.

Research Tasks and Project Deliverables

- Geodynamic evolution of the region: Opening, development and deformation of the Eastern Mediterranean basins
- Geophysical characteristics of the basement
- Paleofacies maps for source-rock and reservoir rock time horizons
- The role of faults as barriers (seals) or conduits to hydrocarbon migration (oil, gas or mixed systems)
- Geologic constraints on biogenic (microbial) vs. thermogenic gas accumulations
- Integrated stratigraphic charts based on integration and evaluation of well data, and biostratigraphy studies
- Cross-sectional fence diagrams for facies distribution and analysis of petroleum source, reservoir, and cap rocks
- The effect of "Messinian salinity crisis" (giant salt deposition) and "Zanekan flooding" on basin modeling

- Updated stratigraphy and regional correlation from wells and outcrops (onshore to offshore, parallel and across the Eastern Mediterranean)
- Interpretation or re-interpretation of available seismic lines and relating the seismic images to significant strato-facies horizons.
- Characterizing Pre-Miocene stratigraphy and petroleum plays
- Source rock evaluation with respect to paleofacies, upwelling, and thermal history
- Modeling subsurface pressure regimes (in terms of hydrostatic, hydrocarbon generation, sediment burial rates, and Messinian salt capping)
- Selected basin modeling and play fairway mapping for ranking and risk analysis
- Oil and gas accumulations: controls on trap types and sizes

Data Sources and Methods

The study will utilize data from well reports, logs, seismic sections, and geochemical and stratigraphic data from institutions in the region as well as over 4,000 publications. We will employ various techniques including well log analysis, seismic and structural interpretations, biostratigraphy and facies mapping, basin modeling, fault seal analysis, geochemical analysis, and GIS mapping to answer the scientific questions specified in the project and to synthesize data as an easy-to-use regional geology screening.

EGI Research Team

Dr. Rasoul Sorkhabi	EGI Research Professor	Principal Investigator, Structural/ Seismic Interpretation, Paleofacies Mapping,Basin Modeling
Dr. Sudeep Kanungo	EGI Research Associate & Adjunct Associate Professor	Principal Investigator, Bio-Chronostratigraphy
Dr. Eiichi Setoyama	EGI Research Scientist	Principal Investigator, Paleoenvironment, Bio-Chronostratigraphy
Dr. Bryony Richards	Senior Petrologist	Petrography and Mineralogy
Dr. Dhrupad Beti	Post-Doctoral Research Fellow	Petroleum Geochemistry, Pyrolysis
Christopher Kesler	GIS Manager	GIS Analysis and Data Mapping

EGI Affiliate Scientists and Collaborators

Dr. Tony Doré	Global Chief Scientist Senior Advisor to the Director	Project Advisor
Dr. Fadi Nader	Collaborating Scientist	Eastern Mediterranean Regional Geology
Dr. Sylvain Garel	EGI Affiliate Scientist	Organic Geochemistry, Palynofacies
Tom O'Connor	EGI Affiliate Scientist	Geology, Egypt and Sudan
Dr. Henry Halpern	EGI Affiliate Scientist	Petroleum Geochemistry, Saudi Arabia and Egypt

Project Timeline, Investment & Report

The project will be conducted over the course of 12 months; start date is Q3 2022.

The investment for this project is $68,000 (USD) per sponsor for the entire project.

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