Microbial Prospection for Oil and Gas (MPOG®)

Potential Applications in Greek Exploration

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CONTENTS

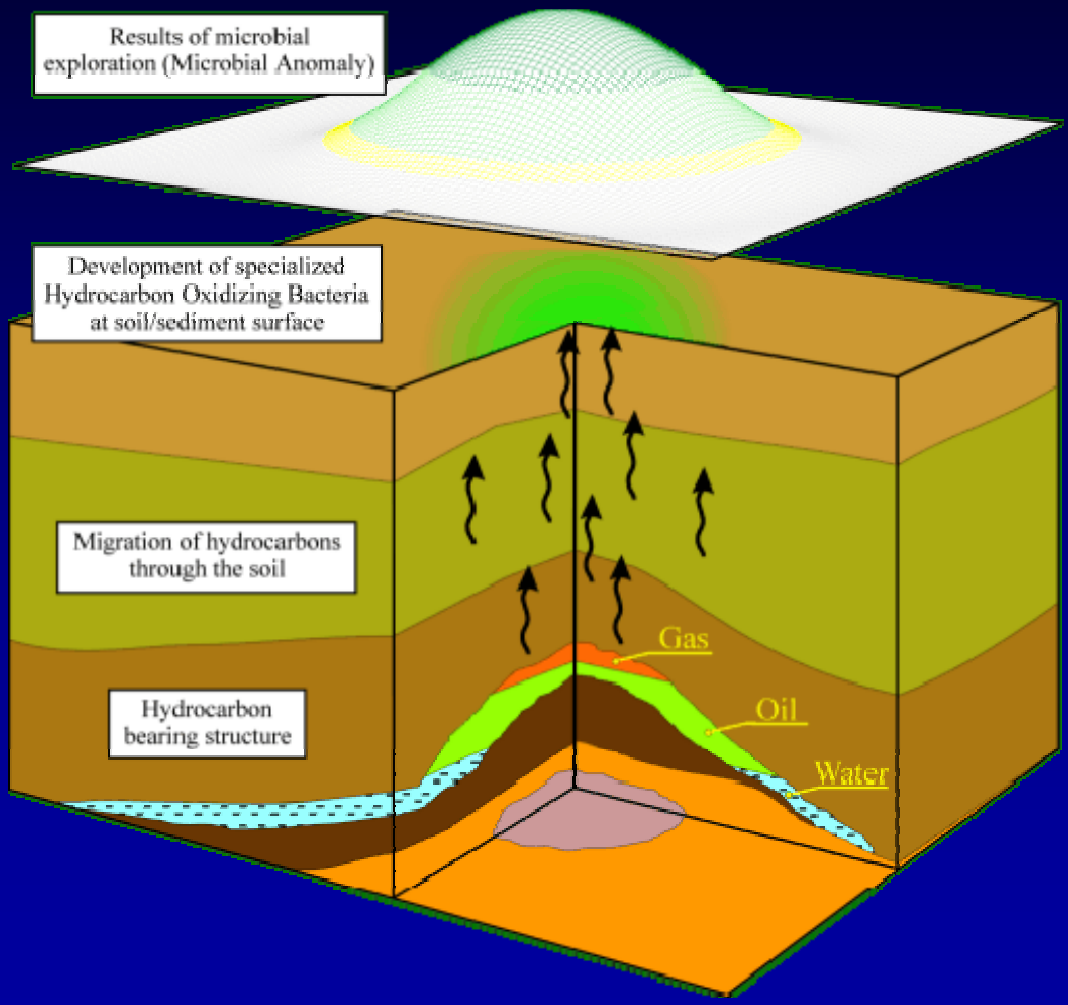
INTRODUCTION

- Microbial Prospection for Oil and Gas (MPOG ®) is a surface exploration technology based on detection of anomalies in microbial distribution and biochemical activity in soil samples.
- Microbial Prospection is a unique, stand-alone and inexpensive method which has proved itself effective even in complex geological settings.
- The use of specialised microbiological techniques to detect the presence of various groups of methane-, propane- and butane-oxidising micro organisms can reliably differentiate between prospective and non-prospective areas, as well as between oil and gas reservoirs!
- In a 6,000 km² block, 17 onshore and offshore microbial anomalies were identified , which subsequently were confirmed by drilling!

THE BASIS OF MPOG®

- The basis of MPOG® is that oil and gas fields emit a continuous stream of light hydrocarbon gases to the earth's surface.
- Specialized micro organisms, the Hydrocarbon Oxidizing Bacteria, use light hydrocarbon gases as their only energy source.
- Such micro organisms are able to utilize extremely low concentrations of hydrocarbons wherever there is a continuous gas flow, and are only found enriched under the surface above hydrocarbon bearing structures.
- The exceptionally high adaptability of bacteria to grow on most different nutrient sources and its ubiquitous distribution form the basis of MPOG® microbial prospecting method.

THE MPOG® PRINCIPLE



THE MPOG® METHODOLOGY

- No geological or seismic data are required to carry out MPOG ® microbial prospecting.
- In green-field areas, the MPOG ® sampling interval ranges from 500 m to a maximum of 1,000 m, depending on the expected reservoir size.
- The MPOG ® method can give principal evidence on the occurrence of hydrocarbon anomalies in very large exploration areas!
- The subsequent seismic and geological investigations could thus be concentrated on the most favourable areas.
- In regions where structural data of the sub-surface already exist, the MPOG ® sampling interval can be reduced to 250-500m, in order to create a more detailed picture of the hydrocarbon anomalies.

THE MPOG® METHODOLOGY (cont.)

- As a result, the seismic structure maps and MPOG ® microbial anomalies maps, which have been drawn up independently from one another, can be compared and contrasted.
- The MPOG ® method is particularly suitable for the evaluation of the aerial extend of the field.
- The higher the calculated measured units (cell numbers and activity) , the more intense is the hydrocarbon supply to the bacteria in the area under investigation, and therefore the greater the probability of finding large hydrocarbon accumulations!

MPOG® ADVANTAGES

- MPOG ® is applicable in both onshore and offshore areas.
- Sampling is simple, cost effective and environmentally friendly.
- The technique is unaffected by external disturbance factors.
- Reliable results are obtained even in geologically complex settings.
- The technique is not influenced by fractures, overlying salt or other geological features.
- Can establishing a clear distinction between oil reservoirs, gas reservoirs and oil bearing structures with a gas cap.
- Wherever microbial evidence establishes the presence of hydrocarbon anomalies, a high yield well production rate is achieved (sweet spots).

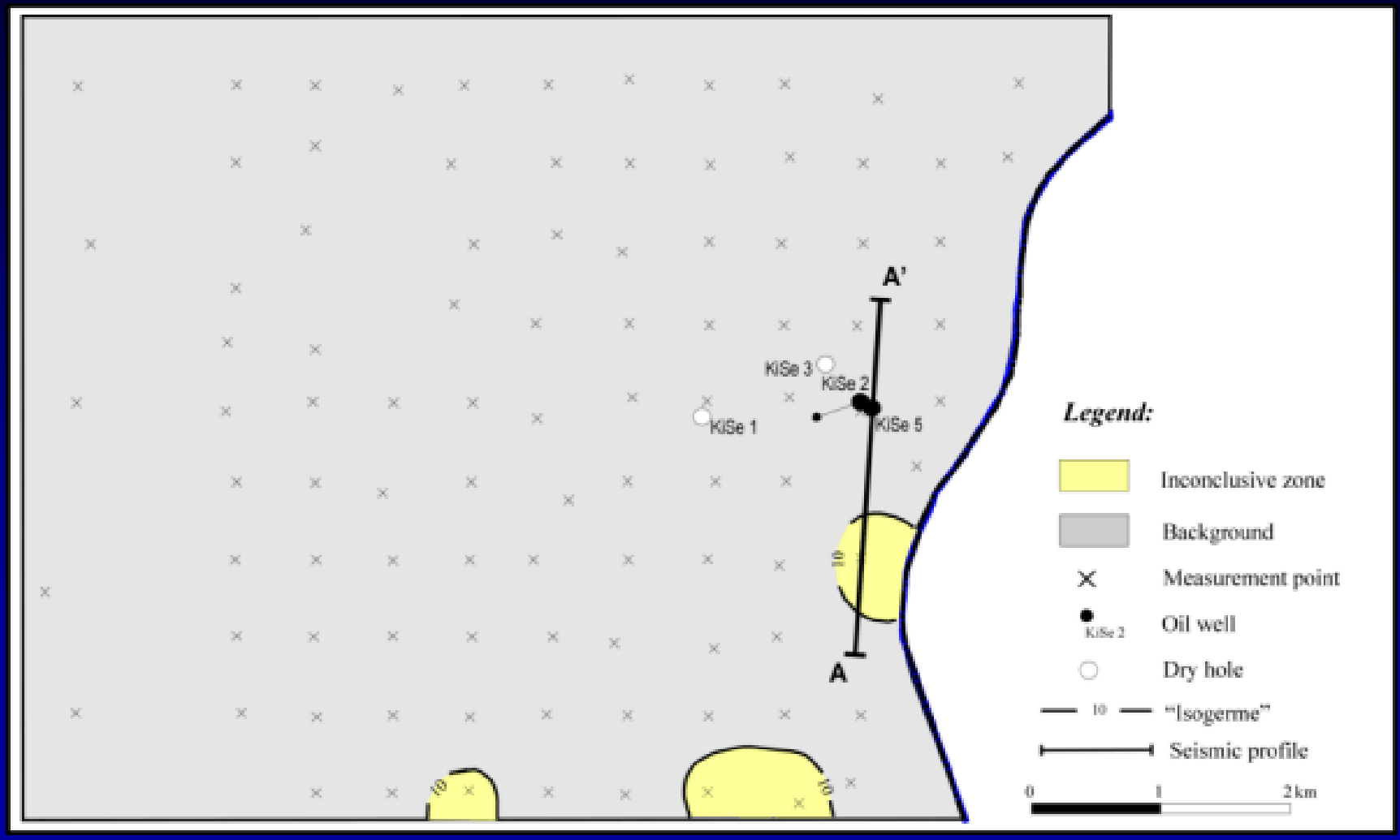
MPOG® CASE STUDIES

- The available case studies compare and contrast the results of the MPOG® microbial prospecting with seismic and geological data.
- The MPOG® case studies to be presented were selected based on their different geological settings and ALL were “blind tests”.
- By separately identifying methane- and hydrocarbon-oxidizing bacteria, it is possible to differentiate between oil and gas reservoirs, and oil reservoirs with a gas cap!
- Oil fields without a free gas cap have either no or small methane indications, but do have significant oil indications!
- Oil fields with a free gas cap create measurable methane anomalies and increased oil indications!

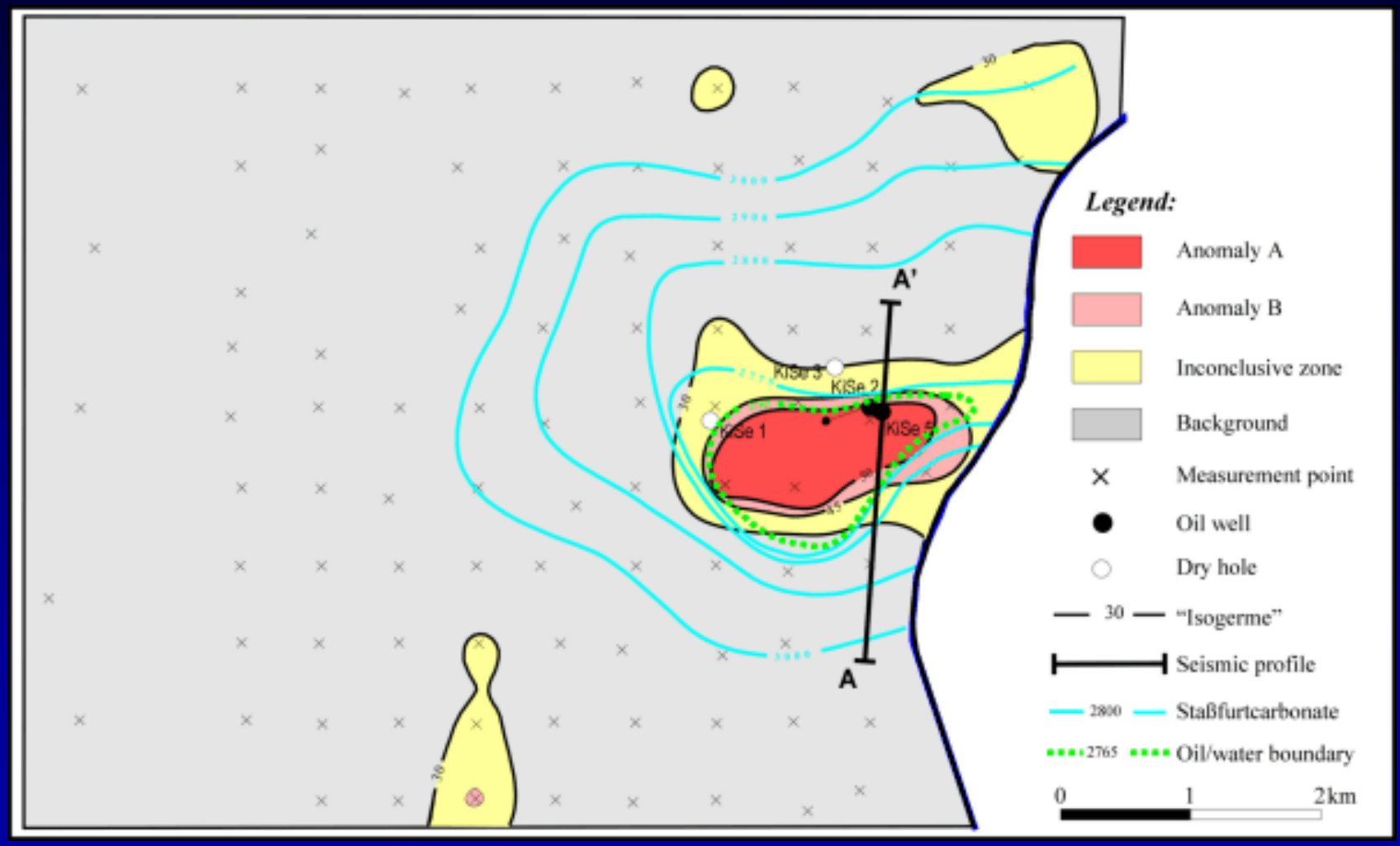
MPOG® Case Studies

Onshore

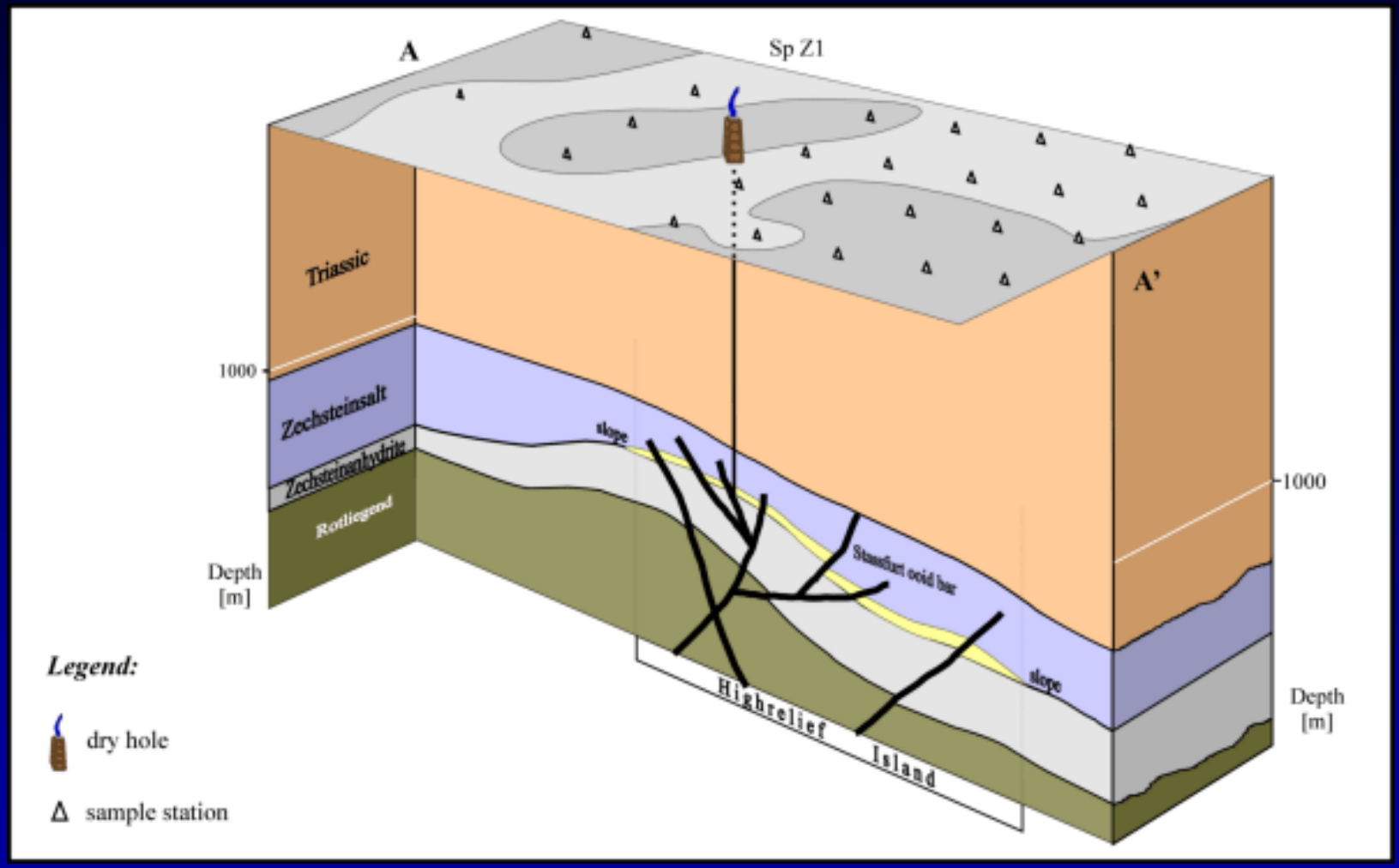
KIETZ METHANE-OXIDIZING BACTERIA RESULTS



KIETZ HYDROCARBON-OXIDIZING BACTERIA RESULTS



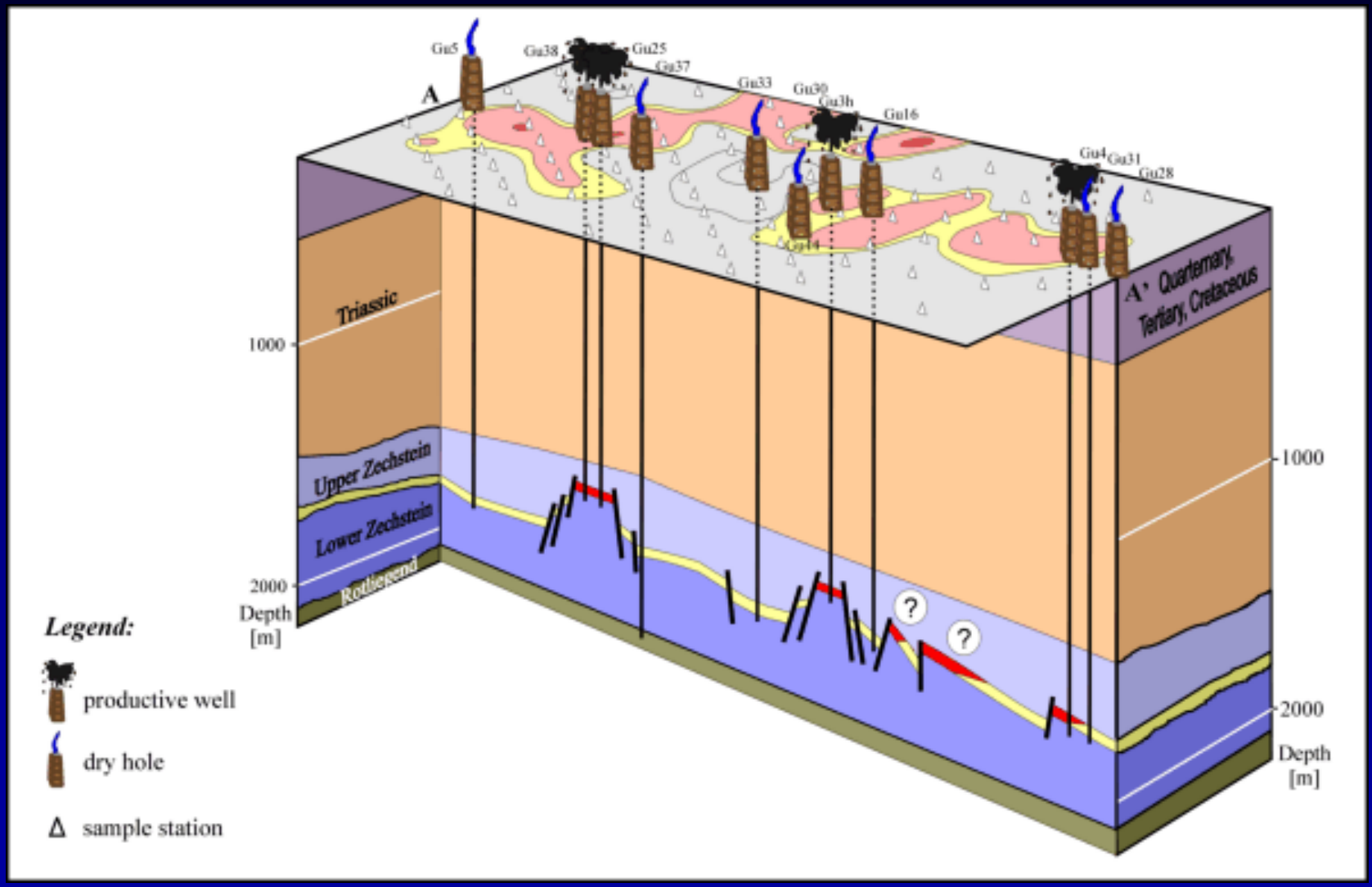
SPROETAU 3D GEOSEISMIC CROSS-SECTION



GUBEN (ONSHORE)

- In spite of densely located 2D seismic profiles, the exploration of the small structure traps was very complicated, reflected in the large number of dry wells!
- A total of 35 dry wells were drilled on detected geological traps, which are mainly located in areas without hydrocarbon indications according to the MPOG ® process!
- The statistical evaluation showed 8.3% oil indications and 7.2% gas indications from a total of 278 investigated measuring points!

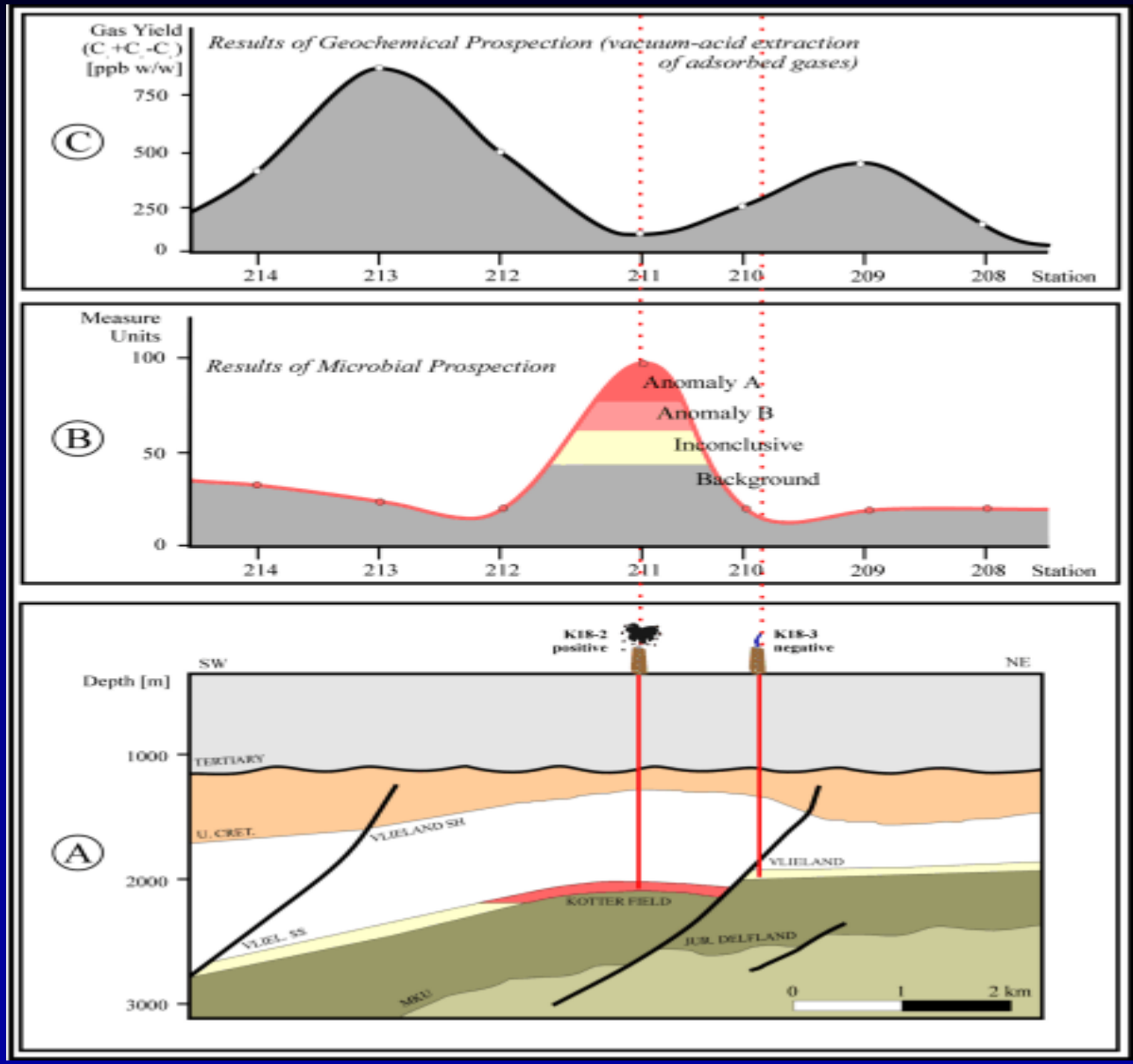
GUBEN 3D GEOSEISMIC CROSS-SECTION



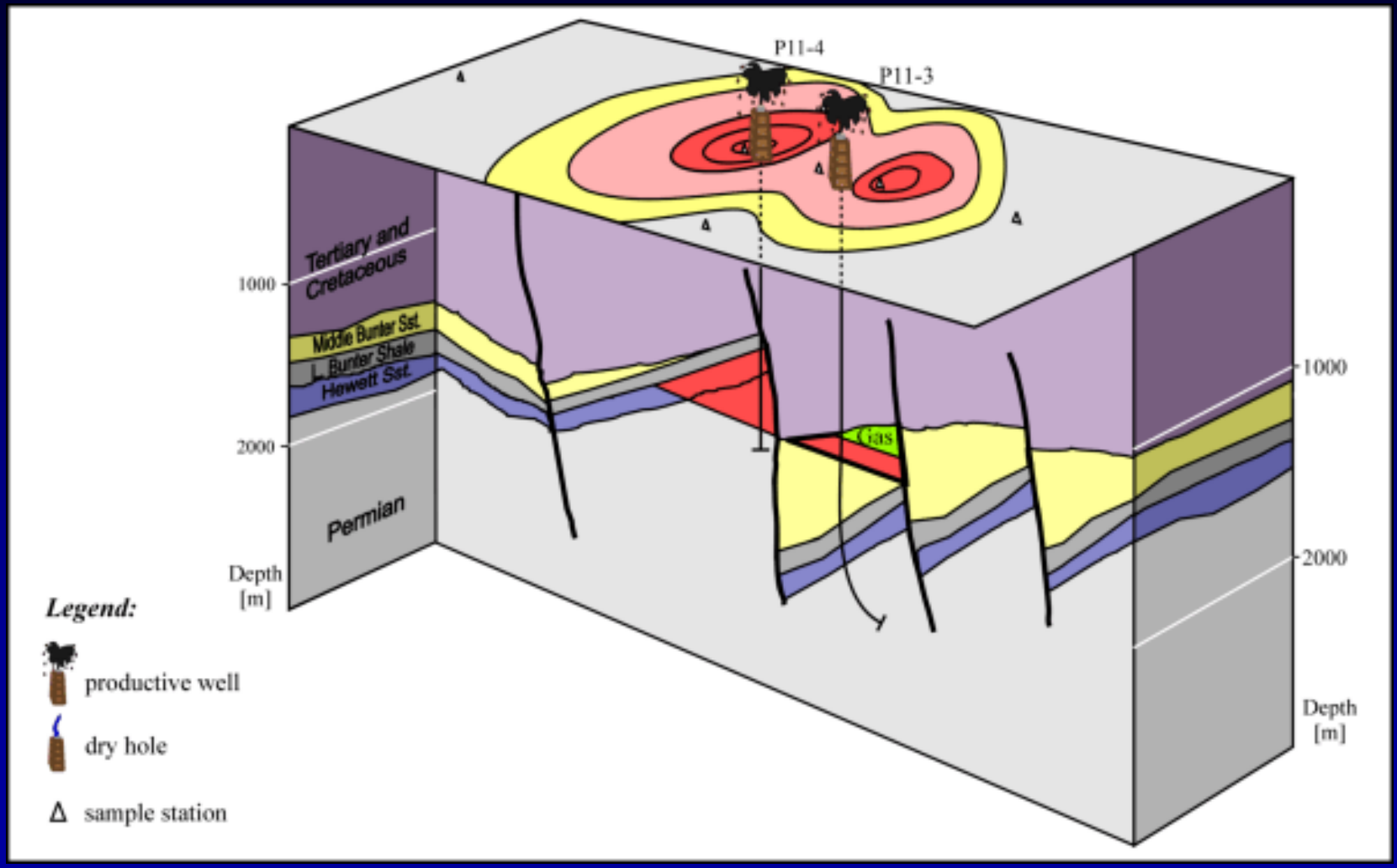
MPOG® Case Studies

Offshore

CROSS-SECTIONS OVER THE KOTTER FIELD



P 11 3D GEOSEISMIC CROSS-SECTION

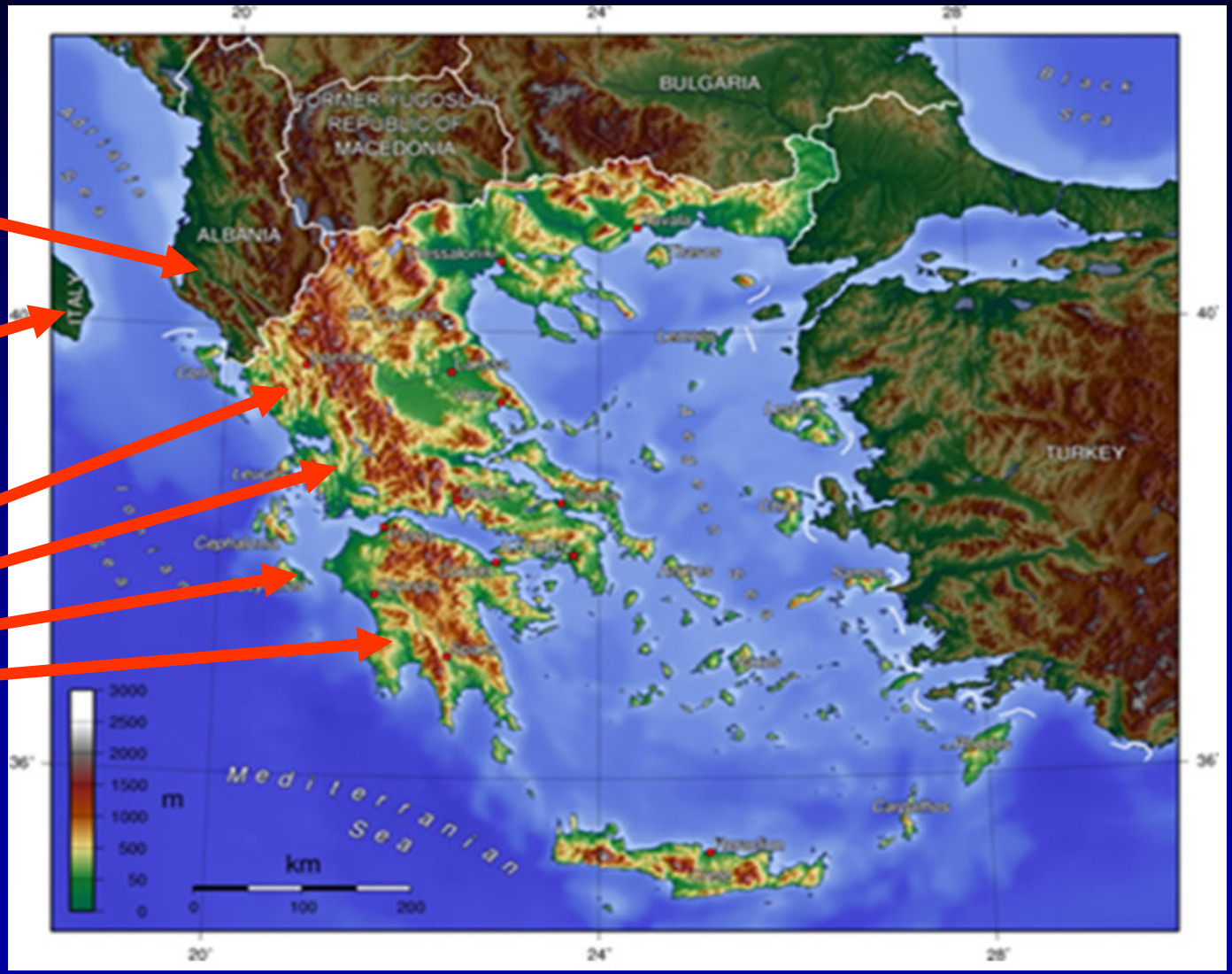


OIL & GAS POTENTIAL OF WESTERN GREECE & MPOG®

Albanian Fields
> 1.0 BBO

Italian Fields
> 2.0 BBO

Greek
Surface
Seeps



Let MPOG® find the OIL and GAS!!!

Thank you for your attention!!!

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