Geological Field Trip 1 - Carbonate reservoir in the field

Description

This 4 days course in northwestern Sicily will provide the basics of carbonate reservoir characterization on the field, by means of spectacular exposures, visit to quarries, seismic scale outcrops. Main aims are to describe and illustrate the peculiar geological and petrophysical control factors occurring in carbonate reservoirs. The instructor will focus on the main sedimentological characteristics of different carbonate reservoir (pore diagenesis, facies, primary structures, paleontology, evolution and sequence stratigraphy) coupled with the role of fracturing (vertical and horizontal). Prediction criteria in fractures orientation will be explained, with limits and constrains. The course focuses on the seismic aspects of carbonate reservoir and the correlation with the outcrops. Role of permeability and anisotropy in fluids within the reservoir and relationship between boreholes and fractures will be cover using natural examples. A set of outcrops of shallow water carbonates affected by meso-and-macro volcano-dykes and atollo-type successions will show you some of the risks and critical factors occurring in reservoirs. At the end of this course you will able to describe carbonate reservoir at different scales, starting from the pore networks and rock textures, to the sedimentary bodies and stratigraphic-structural macro-architectures. A robust part on characterization of fractured reservoir with practical exercises is scheduled.

These outcrops provide therefore a natural laboratory to learn and experiment methods for characterizing and modelling properly carbonate reservoirs.

Dates: On Request/April-May or September-October

Meeting point:

Palermo international airport

Course Level: Intermediate / advanced

Duration: 4 days

Instructor: Prof. Pietro Di Stefano and PhD Gabriele Lena

Designed for:

This Course is suitable for geologists and geoscientist in general with some years of experience that want to broaden and deepen their knowledge on carbonate reservoir (properties and control factors on modeling). It assumes basic knowledge in geoscience. It’s designed for reservoir engineers and explorationists wishing to improve their geological knowledge.

How we build your confidence
Clear and impressive field stops allow a visualisation of the different facies typical of Carbonate reservoir.

Graphic material on site, correlation with seismic and well dataset will help you to understand the geological control factors typical of reservoir modeling.

Practical exercises on geometries, fractures and heterogeneities of the reservoir will be conducted in quarries where a multiple exposure and variable geometries of cliffs permit a 3D visualization of critical surfaces.

**The benefits from attending**

By the end of the course you will feel more confident in your understanding of geological key elements in characterization of carbonate reservoir. You will improve the capability to analyze and to assess properly the different control factors influencing a fractured reservoir, starting from petrophysical datasets and exporting to the large-scale reservoir.

**Topics**

**Day 1**
- Introduction on the Carbonate Reservoirs in Sicily
- Geological and petrophysical characteristics
- Karst, fractures, jointing and anisotropy
- Homogeneous vs heterogeneous deposits
- Correlation with well dataset

**Day 2**
- Peritidal cycles and reef complex, characteristics, facies and geometries
- From outcrop to macro architectures of carbonate reservoir
- Domino style faulted reservoir
- Unconformities and sealing
- Rudistic limestone reservoir, porosity and connectivity

**Day 3**
- Tidal flats, effect of matrix
- Sedimentary dikes, large faulting, ramp-bounded reservoir
- Stepped margin, channels, breccias and auto-brecciated reservoir
- Channels and other discontinuity
- Correlation with seismic

**Day 4**
- Large vertical barrier/discontinuity, volcanic dykes
- Mixed deposits, petrophysical parameter
- Slope carbonates and calcareous turbidites
- Prediction criteria, risk and case study
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Participants analyzing the peritidal cycles in San Vito Peninsula

The coral patch reef outcropping at Monte Sparagio

Stratigraphic logs and other practical activities will reinforce the field trip
Participants examining sedimentary dykes and fractures in Maranfusa quarry

The Jurassic hardground of Maranfusa quarry, a faulted shallow water carbonate overlies by deep water limestones.
View of the Jurassic-Cretaceous limestones of Monte Gallo
Geological Field Trip 2 - Structural Geology, stratigraphic architecture and trap styles of Sicily FTB

A Multidisciplinary approach on the field

Description

This 5 days field trip offers an intensive and robust multidisciplinary approach on techniques and analysis on the field (regional geology, geodynamics, structural geology, stratigraphy, facies analysis and petroleum geology). Set in the famous Sicily Island, one of the most interesting and complex fold & thrust belt worldwide, the course is designed to show to the participants typical geological control factors in different geodynamic and paleo environmental scenarios. The field trip is structured every day in the integrated analysis of stratigraphic and structural settings of one paleo domain, using existing dataset and comparing subsurface data and outcrops. 5 days for 5 different geological scenarios (carbonate platform, slope-to-basin, basin, terrigenous/evaporitic basin, foreland basin systems) in different tectonic stages (passive margin, failed rift, flexure, compression, thrust-top/satellite basin), every day the task is: to analyze the geosettings, to reconstruct the relationship and to predict the geometry of subsurface structures. Landscape and seismic-scale outcrops will help the participant in the correlation with tectonic model, geophysical data and analysis of structural styles. Once you arrived in Sicily, after a geology review and introduction on the regional settings, the field trip starts with the visit of various paleo domain, starting from the higher structural units towards the less deformed. Different pieces of information collected every day will allow you to put them together to draw a coherent geological picture, to produce a palinspastic restoration and to analyze the geodynamic scenario. We conclude with the prospect assessment and play analysis of some oilfields in Sicily, actually in production. Food, wine, monuments, impressive landscape and coastline of Sicily will accompany you along this trip.

Course Level: Intermediate to advanced

Dates: May or October

Meeting point:

Palermo International Airport

Duration: 5 days

Instructor: Gabriele Lena

Designed for you, if you are...

This Course is suitable for geologists, geophysicists, explorationists and geoscientists in general that want to broaden and deepen their knowledge on the field about the kinematic evolution of a FTB-foreland system, using a very multi-disciplinary approach. Continuous and well-exposed “seismic scale” outcrops will help you to understand the geometries of the geological bodies, using commercial and crustal seismic profiles, well and geophysical dataset.
How we build your confidence

New insights in recognition and prediction of geometry of shallow-seated and deep-seated structures, ramp dominated units vs thrust sheet dominated unit.

Facies analysis and correlation between different paleo environmental scenarios, from meso-scale to seismic scale units.

Cross-correlations between outcropping and buried structures, using seismic profile and well-data applied to very impressive landscape.

Explanation of new data deriving from commercial and crustal profile providing new insights and prediction criteria on the relationships between a) an imbricated carbonate thrust system of the Northern chain, b) the huge Caltanissetta terrigenous trough consisting of embricated thrusts system, and c) the flexure of the Iblean foreland crust below the FTB.

Different type of petroleum system and plays will be shown during this 5-days field trip

Exercises, line drawing, stratigraphic log, structural data plot and map and will be performed during the survey

The benefits from attending

By the end of the course you will feel more confident in your understanding of:

- The geological setting of the Sicilian-Maghreb FTB: the Mesozoic paleo domains of the ancient African continental margin (basins and carbonate platforms) and their structural evolution;
- The relation between shallow-seated and deep-seated deformations in the Tertiary evolution of the thrust belt; the effects of the late transpressional tectonics;
- Large-scale inverted and transpressional structures and their potential for petroleum exploration
- Synorogenic Tertiary deposits: sedimentology and facies associations;
- Lateral facies changes, architecture and structural control of the sin-compressional Miocene basins in Northern Sicily;
- The Messinian evaporitic deposits: lithostratigraphy, sedimentation vs tectonic process and new insights;
- The potential geo-resources of the Caltanissetta Basin (late Messinian): bituminous euxinic shale, salt dome and methane mud volcanoes;
- The Pliocene foreland basins of the Gela plain and the oilfields in subsurface;
- The present-day structural setting of the Sicilian foreland, seismic data from the Sicilian offshore
- Reliable note, draw, plot and map during a field survey, and the importance of field techniques and analysis to decrease uncertainties;
- Unique opportunity to approach to different geological scenario in a single field trip.
Topics

The course will cover the following areas of modern applications and perspectives of stratigraphy.

Day 1 - Introduction on the geological setting of the Sicily; the Mesozoic carbonate succession of the Panormide platform and facies relationships; interference between tectonic structures

Day 2 - Meso-Cenozoic slope-to-basin Imerese succession and its relationships with the overlaying Oligo-Miocene Numidian Flysch foredeep

Day 3 - Mesozoic extensional tectonics, volcanism and sedimentation at the Triassic Jurassic boundary the Sicanian deep-water domain; comparison of outcrop and seismic profile; Neogene imbricate thrust system deposits.

Day 4 - Georesources in the Messinian Evaporites; Miocene-Quaternary mixed ramp

Day 5 - The frontal part of the chain and the present foredeep: comparison with the subsurface setting will be imaged by seismic reflection profiles; the oil fields of Southern Sicily; the Iblean foreland and the forebulge with surface and sub-surface comparisons.

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<td><strong>Time</strong></td>
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<td><strong>Morning</strong></td>
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<td><strong>Lupo area:</strong> Mesozoic carbonate succession of the Panormide Carbonate platform: large and small scale stratigraphic analysis on reef complex. Prediction criteria using facies analysis on the field. Focus on the reef to back-reef lagoon facies relationships.</td>
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<td>- Scillato: the internal deformation of the Imerese succession and panoramic overview of the Scillato wedge-top basin.</td>
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<td>- Settefarine: tectonic setting of the high angle Settefarine thrust.</td>
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<td>- Gela Oilfields: history, type of traps and style, play analysis and geological parameter affecting the origin of the play. Risks and prediction.</td>
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<td>Structural assemblage in carbonatic units.</td>
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<td>Dinner and overnight in Palermo</td>
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Participants examining a section of Numidian Flysch
Impressive Neptunian dykes, synsedimentary faults and Hardground in ammonitic limestones

Panoramic view of the E-W trending flower structure of Kumeta anticline
Asymmetric folds in Messinian Gypsum

Horse-jack and derrick of Gela oilfields
Horse-jack in the Ragusa oilfield

Shallow-water carbonates resedimented in channel in the Sicanian Basin succession
Seismic-scale landscape showing the shallow seated deformation of Tertiary lithosomes

Sandstones organized in clinoforms, deposited in a quaternary mixed ramp environment