2010' Update for Exploration of ELEONORA and IGIA Concessions

Onshore Sardinia (Italy)

Final Report
Contract: 2101070

ESTRATTO DALLA RELAZIONE ORIGINALE
Allegato alla Relazione Geologica

Prepared for :

Saras SpA

May 2011

BeicipFranlab

232, av. Napoléon Bonaparte – BP 213
92502 Rueil-Malmaison Cedex – France
Tel: +33 1 47 08 80 00 - Fax: +33 1 47 08 41 85
e-mail:info@beicip.com – www.beicip.com

Disclaimer

This document was prepared by Beicip-Franlab for the sole use of its customer under a specific contract and is submitted on the basis of the confidentiality clause under such contract. Any information given to Beicip-Franlab by its customer was used for performance of this work, only.

Beicip-Franlab has made its best efforts in preparing this document according to industrial practices into force. All the results are based on the information provided by the customer and known at the time when work was carried out.

Beicip-Franlab Project Number	2101070
Client Contract Number	
Date	2011
Revision	May 2011

Prepared by:		
Name	Position	Signature
T. Chrest	Project Manager	
D. Guirauden	Senior Economist	
G. Roy	Economist	

Checked by:		
Name	Position	Signature
Y. Coury	Director of Operations	Y Coury

Approved by:		
Name	Position	Signature
Y. Coury	Director of Operations	Y Coury

Beicip-Franlab
232 Av. Napoléon Bonaparte
92500 Rueil Malmaison
France
Phone: 33 1 47 08 81 01
Fax : 33 1 47 08 81 08
Email: info@@beicip.com

1 INTRODUCTION

1.1 Study Objectives

In the 2007' Campidano Basin Exploration study by Beicipfranlab for Saras SpA (Saras), Sardinia, Italy, several attractive leads were defined *…(Igia: omissis)….* It was concluded that new seismic data should be acquired *…(Igia: omissis)…*

In 2010, Saras carried out a seismic campaign (…) acquiring a total of 11 new 2D lines.
These lines shed a new light on the sedimentary infilling of the Sardinia Graben system showing that several kilometres of sediments were present below the last horizon imaged in 2007..
Saras requested Beicip-Franlab to update the seismic interpretation *…(Igia: omissis)…*

The objective of the study described hereafter is to:

- To interpret the 170 newly acquired line km, processed in 2010 *…(Igia: omissis)…*, and their integration in the 2007' interpretation;

- update the previous results of the 2007' Beicip-Franlab Report (leads definition, volumetrics, economics);

- define possible drilling sites with emphasis on the Eleonora concession.

The study combines 2007' results, new seismic data, new chrono-stratigraphic attributions and a review of the two wells.

1.2 General Approach

To achieve the objectives, Beicip-Franlab divided the study in two parts;

- Eleonora concession study.
- *(…)*

It was composed of two phases:

- Phase 1: review of existing data, QC([1]), database generation/recovery
- Phase 2: is divided into three to five main tasks:
    - Seismic interpretation study, integration with 2007' results
    - Seismic characterization analysis, integration with 2007' results
    - Hydrocarbon potential analysis (prospects with their uncertainties)
    - Well proposals (in Eleonora)
    - Economic risk analysis (in Eleonora)

The study was led in close and permanent interaction between Beicip-Franlab and Saras.

([1])*QC = Quality Control (ndr)*

2 GEOLOGIC BACKGROUND

This topic already addressed in the 2007' report has been updated to take in account the results of the new seismic data which changed considerably our vision of the Sardinian Graben System with consequences in the Exploration of the Saras concessions.

2.1 Geological history

The formation of the Sardinian Graben System (Casula et al,2001 The Cenozoic Graben System of Sardinia (Italy): Geodynamic evolution from new seismic and field data) is related to the geodynamic evolution of Europe and the Western Mediterranean during the Cenozoic. It is linked to the "Apeninnic" subduction of a Neo-Tethys oceanic crust westward below the Iberia-SW Europe continental crust, since the Late Eocene-Early Oligocene. The main geological events were:

- A regional extension broadly NW-SE oriented which affected SW Europe including Iberia with the still attached Corsica-Sardinia Block. It created a series of horsts and graben like in SW France, in the Gulf of Lion, in the Gulf of Valencia, in the Provençal-Balearic area and in the whole area comprising Corsica-Sardinia. To illustrate the similarity with South West of France, a structural section in the Oligocene Manosque-Fourcalquier Basin in displayed in Figure 2.1. The onshore Sardinian Graben System (with offshore continuation in the Gulf of Cagliari and the Gulf of Asinara) is one of these extensional features and this period corresponds to the 2 main rifting phases of its geological evolution from the Late Eocene to the Lower Burdigalian with important normal faulting controlling the sedimentation. The new seismic profiles calibrated by a revised stratigraphy at OR-1 shed a new light on the Sardinian Graben System, confirming the Gravity data interpretation (see the 2007' report), showing a maximum total thickness of 6000 to 8000 m of sediments, 2/3 being syn-rift sediments.
  Two phases of rifting appear now clearly, separated by an unconformity called top SynRift 0 to avoid confusion with the 2007' report labelling of horizons. This unconformity is supposed to be near Top Oligocene (Chattian) and corresponds to the marine invasion of the Graben System.
  The second phase of rifting extended from the Chattian to the Lower Burdigalian and includes the SR 1 and SR 2 levels defined in 2007. During this second phase, a deepening of the basin due to normal faulting is demonstrated by the geometry and the nature of the deposits (thick deltaic fans along the edges of the troughs and turbidites in the axis).
  The nature of the SynRift 0 Formation thought to be essentially continental, is not firmly established. It could partly correspond to Ussana Fm type of sediments but also may be to sediments similar to those encountered in the Oligocene Graben of SE France as discussed in the following Stratigraphy section.

- An anticlockwise rotation of about 40° of the Corsica-Sardinia Block due to the formation of a small back-arc oceanic basin, the Provençal-Balearic Basin which detached the Corsica-Sardinia Block from Iberia-SW Europe. This rotation occurred from the Upper Burdigalian to the Langhian. It stopped probably due the collision of the Sardinia-Corsica Block with the Adria Plate to the East and the North Africa Margin to the SW. In Sardinia this period corresponded to the post-rift phase with no more normal faulting activity. During this period, some tectonic deformations occurred with an Apeninnic NE-SW direction of compression (observed by microtectonics in different parts of Sardinia – J. Letouzey et al, 1982; A. Cherchi and P. Tremoliéres, 1984), but without important visible consequences in the deep Sardinian Graben Syste

- Since the Late Miocene and until the present, the regional tectonic stress orientation has changed in southern Europe and in Corsica-Sardinia with a NE-SW to N-S direction in the Late Miocene to a N-S direction since the Pliocene. In Sardinia, the Late Miocene shortening direction, oriented 140° to 160° has been well documented by micro-tectonics measurements on the outcrops. It has structural consequences, important for Exploration, which are well displayed on the seismic profiles. Controlled by the previous syn-rift fault pattern, it generated various trans-tensional faulting and deformations as elongated N-S inversion anticlines along strike-slip faults (flower structures), large inversion (around 1000 m) of the basin infilling like along the eastern flank of the Campidano Graben in the area of Cagliari …(Igia: omissis)… In the Eleonora concession in particular, this Late Miocene to present faulting concerned mainly the section above SR 0, few of these faults affect SR 0. It shows that the Lower Miocene Ales Marls are a level of decollement.A most important feature is the trans-tensional Campidano s.s. Graben system formed since the Middle Pliocene, superimposed on the Oligo-Miocene Graben System and infilled by the Samassi continental formation and more recent Quaternary deposits with a total maximum thickness as high as 1000-1200 m. It must be emphasized that these deformations are still occurring at the present time, as clearly shown by the seismic profiles with faults which can be followed to the surface in Eleonora (…) with bending and faulting of the Samassi Fm and Late Pliocene basalts in Eleonora.

To summarise, three major rift segments can be distinguished in the central-southern part of the Sardinian Graben System. The gravity data had shown however that it is a single trough with a thick sedimentary section below the Miocene:

- The northern Oristano Segment with the Eleonora Concession: a west dipping half-graben bounded to the West by the Capo Frasca-Sinis Master fault. To the North it is limited by the Nuoro Fault zone, a prominent regional NE-SW striking tectonic lineament. It corresponds to a late Hercynian shear zone reactivated during the different Tertiary phases of compression and extension of variable orientation.
- A complex transfer zone, corresponding to a twist zone.
- A southern Campidano Segment (…): an East dipping half-graben bounded to the East by the Monastir Master Fault.

2.2 Stratigraphy

Stratigraphy in a rifting context is complex because sediments deposition and environment (thicknesses and facies) are strongly influenced by syn-sedimentary faulting, sea level variations, distance to land and changes in basin water depths. It created a large variability of facies from continental to marginal-transitional, then to shallow and deep water environments.
This complex relationship has been clarified in Sardinia by studies on outcrops and on Ori-1 and Camp-1 wells (Casula et al, 2001) with, in 2008, a revision by A.Cherchi *et al.* in "*The stratigraphic response to the Oligo-Miocene extension in the western Mediterranean from observations on the Sardinia Graben System (Italy)*" (Figure 2.2).
The new seismic profiles showing a thick syn-rift section called SynRift 0 (3 to 4 km thick) below what was interpreted as top Pre-rift, a reinterpretation of the bio-stratigraphy of the wells (…) and of the correlations between wells obliged to change considerably the stratigraphy of the

sediments infilling the Graben System of Sardinia and therefore the interpretation in the Eleonora (…) concession.

The main results are the following:

- The thick section below what was considered in 2007 as top Pre-rift is now interpreted as syn-rift Oligocene (Rupelian and Chattian) and may be Late Eocene if one includes the Cixerri Fm whose deposition is controlled by normal faulting. The Oligocene could comprise the continental Ussana facies but probably other lithologies if one accepts the analogy with the Oligocene Graben of Southern France (…). One could expect alluvial deposits with sand and shales with lignite lenses, lacustrine deposits with organic rich muds and limestones and even evaporites if some marine connections existed from time to time with the Ligurian oceanic Basin
- The top of these series, now labelled Syn-Rift 0, corresponds to the first important marine transgression which is dated late Chattian on outcrops in Sardinia, in Southern France and in the northern margin of the Provençal-Balearic Basin.
- Above, the syn-rift marine Ales Marls of Aquitanian age contain source rocks and excellent sand reservoirs (the Gesturi sands) as observed on outcrops. They can be tidal deposits on the edges of the Graben but more gravity deposits in the central deeper parts of the basin. The high amplitude reflectors above SynRift 0 could correspond to such sands. A sand reservoir has also been found near the top of the Ales marls at the bottom of OR-1. The seismic profiles show that these sands could be deep water deposits connected to the deltaic fan well displayed on profiles south of the Eleonora concession. …(omissis)….
- Above, the syn-rift Marmilla Formation of Lower Burdigalian age is characterized by marls with an important component of volcanic material (tuffites). Some thin streaks of porous sands exist in OR-1 but without reservoir potential. The top of the Formation is considered as top syn-rift – base post-rift.
- The post-rift Miocene from the upper Burdigalian to the Messinian comprise basinal marls with typical signatures of turbidites on logs. It shallows upwards in the Serravallian and Tortonian with possible sand reservoirs. In particular in Eleonora a 23-m massive sand has been encountered in Ori-1 in the Tortonian.
- The Messinian salinity crisis, characterized by a large sea level drop in the Mediterranean area with erosion on the margins and adjacent lands and deposition of thick evaporites in the deep basins, affected also Sardinia.
  In Eleonora, the Messinian erosionnal surface is generally well displayed on the seismic profiles with an incised deep channel (a paleo-Tirso) eroding a part of the Miocene sequence. In ORi-1 some marine marls of Messinian age exist below the erosional surface. Above, in a 40-m interval, 7 conglomeratic and sandy layers have been found with a cumulative 23-m reservoir thickness. In the middle of this interval, marine marls have been dated Lower Pliocene. These sands can therefore be partly related to the Lower Pliocene transgression reworking Messinian clastic deposits.
  ….(omissis)…
- Above, until 1000 to 1200 m of continental Samassi Fm of Pliocene age with in the Upper part in Eleonora, an intercalated layer of basaltic flows.
- Above are Quaternary alluvial and deltaic deposits with some marine influences.
- A special mention must be done of the volcanics in the Campidano area. It has been addressed in the 2007 Report. There are mainly a calco-alcaline episode linked to the Apeninnic subduction during the Oligocene and the Lower-Middle Miocene and a basaltic flows episode during the Pliocene-Quaternary. The 1st episode concerns mainly the northern part of Eleonora as shown by the OR-2 well and the magnetic data

…(omissis)…. The volcanic material existing in the Marmilla Fm is linked to this episode. The 2d episode did not affect the concessions. Only some basaltic flows are intercalated in the Upper Pliocene of Eleonora.

–

….(omissis)…

2.3 Nature of the Pre-rift in Saras concessions

The nature of the pre-rift formations below Eleonora …(omissis)… was considered of prime importance in the 2007' report because on the seismic lines the penetration was limited practically at the level which was considered at that time as base syn-rift – top pre-rift. Now it appears that this horizon, which is labelled Syn-Rift 0, corresponds in fact to the top syn-rift Oligocene. Therefore the true pre-rift formations are much deeper (several km) than previously expected and they probably can not be considered as targets in the present stage of exploration.
In Eleonora, the nature of the pre-rift is speculative. It could be Mesozoic formations like in the Nurra. The age is uncertain because erosion could have been important before the Oligocene deposition.

….(omissis)…

2.4 Exploration history

The onshore exploration history can be divided into four main periods:

- The first exploration period was carried out by Wintershall during the early 1960's. The 2D seismic acquisition and processing of 593km-lines (lines 1 to 32) resulted by drilling (wells Oristano-1 in 1961, Oristano-2 in 1963 and Campidano-1 in 1964).
- The second exploration activity during the early 1990's was carried out by AGIP. A 2D seismic survey was acquired corresponding to 285 km-line (lines OR…92V and CA…92V).
  - The third exploration period was realized by Saras in 2006. 40 2D seismic profiles enabled to carry out a completely new assessment of the hydrocarbon prospectivity …(omissis)….
- An infilling campaign (11 lines) and complementary reprocessing of 2006 lines were carried out in 2010 to ensure the different potential closures (…omissis…) and update the previous Interpretation Report by BeicipFranlab

3 AVAILABLE DATA

(…)

A large part of the data has been recovered from the 2007' study (*NB*: seismic processed in 2006, study realized in 2007). The new seismic files (post-stack, pre-stack and velocities SEG-Y files) have been sent by Saras according to CGGV output (over August until December 2010).

3.1 Data review

2007' data
Most of paper reports and digital data from 2007 have been re-used in the study. Nevertheless, a new focus has been undertaken on a particular point, which drastically changed the over-all calibration of the Eleonora survey: time-depth table from Agip for Oristano-1 (three check-shot points depth/twt). …(omissis)…

The geological regional map (Figure 3.1), have been imported into a geo-referenced database in order to properly set the regional surface faults which are out of the seismic survey: it helped the interpretation (…).

Concerning Oristano-1 well, A.Cherchi revised its bio-stratigraphy (Figure 3.3).
The microlog-resistivity logs for Orsitano-1 have been digitized in order to get them into a numerical database. A new review of these logs helped to characterize a deeper main sandy reservoir at the very end of Oristano-1 (Aquitanian sandstones, …). The complete logs column is displayed with markers revision in Figure 3.4.

….(omissis)…

2010' data - Eleonora
Six new lines have been acquired and processed in 2010 (Figure 3.6). They were chosen to infill the central part of the survey (22 to 25), but also to get a second N-S line (19xn) along Oristano bay to join the northern part (22):
- 10-19xn (extension of 06-19)
- 10-22
- 10-25
- 10-26
- 10-27
- 10-28

Consequently to the seismic data improvement (above all in the deep part of the sections, either pre-stack for AVO or post-stack for interpretation), a set of 2006' lines have been reprocessed following the same process. These lines are:
- 06-04
- 06-05
- 06-06
- 06-07
- 06-08
- 06-09
- 06-15
- 06-16

….(omissis)…

3.2 Database

Landmark project used in 2007 was back-uped. The new lines were loaded and old interpretations re-used and completed to create the new maps. The following modules were used in Landmark:

- SeisWorks 2D for interpretation
- ZMap for mapping (time and depth)

Well analysis was run under BeicipFranlab's EasyTrace sofware.
AVO analysis was run under Hampson-Russell software.
Inversion was run under BeicipFranlab's InterWell software.
Seismic facies analysis was run under SAS and/or Matlab sofware.

A problem of geodesy existed in 2007 between seismic and other UTM referenced data. This is not the case anymore with the new seismic data. We recall here the projection parameters:

Projection Type:	Universal Transverse Mercator
Zone:	32 N
Datum:	Monte Mario 1940

ELEONORA - 2D SEISMIC INTERPRETATION

The objective of the study in this concession was to confirm the leads viewed in 2007 with the new infilling lines, then to propose the best well location and evaluate the associated risks.

The seismic structural interpretation is based on the extension/correction of the six main horizons already interpreted in 2007.
The first attempts to join the 2010' infilling lines with the 2006' survey revealed that a major problem of interpretation on line 15 existed (N-S key-line in the western part of the survey). For all horizons below the Messinian unconformity, a simple extension of 2007 was impossible. A total re-interpretation of these 4 deep horizons was undertaken, starting with the seismic strong events now much closer to Orsitano-1 well path, whose calibration was, once again, a big issue.

3.3 Seismic to well calibration

In 2007, it was already clear that was (…) generated in 1992 a dubious sonic log from resistivity log with a neural network analysis calibration on a 2D line crossing the well. Nevertheless, as a check-shot time-to-depth law was available, the well calibration was set with this law, then statically shifted at the synthetic calibration step in order to match one of the two closest lines (projections ~ 1 km) within the best correlation.
After a first quick-look, it was proved that such calibration was incorrect: an incised valley (Messinian erosion) is precisely located in the neighbourhood of the well. The projection of the well in two (…) lines falls into this erosive valley. To fit at least the most recognizable seismic marker (Messinian unconformity) in the closest lines, a strong static shift downwards would have been necessary, but involving a total mismatch for the rest of the markers.
Consequently, in 2007 the well calibration was finalized leaving the check-shot drives the time-to-depth law (Messinian unconformity set at 700 ms …).

In 2010, a new 2D line, running 120 m off the well, is available to check the seismic calibration (…). Using the pseudo-sonic and the check-shot available, a synthetic calibration was carried out (…according to which polarity and which analysis window chosen).

….(omissis)…

But this time, from all these considerations, the solution used to calibrate the geology to the seismic lines with Oristano-1 was to use at first approximation the seismic velocities, and then match both by distorting this law and fit the two most certain seismic reflectors – basalt and Messinian – with their geological interpretation at well (…).

Thus, this (rough) calibration is sufficient to fit the main geological events. Nevertheless, as no phase analysis was possible (no real sonic nor density log), the polarity remains unknown. It may be normal, inverse, or even non-zero phase.

….(omissis)...

3.4 Time interpretation

3.4.1 Horizons

Six main horizons were re-interpreted. An upper horizon (basalt) was completed in the line (without any map gridding). A new local horizon was also added for the central part (Aquitanian sands). Here are the seismic names used for the interpreted horizons (see Figures 4.4 and 4.5):

Top basalt
Named "top Samassi" in 2007, this horizon was extended in some of the 6 new lines without changes, in order to get its depth in every well proposal. It is often a very strong reflector. The bottom of the strong phases was interpreted. The geological "top Samassi" is now interpreted higher (100 m above basalt).

Near base Samassi
This reflector created in an old well calibration in 2007 was extended in the new lines without changes. The geological "base Samassi" is 60 m below it, where marine Pliocene reflectors begin.

Messinian unconformity
This very clear seismic horizon was naturally extended in the new lines.

Top Tortonian
The new N-S line (…) enabled to give a new point of view to understand the extension of the central part towards the North. Indeed, in 2007, large assumptions of fault presence were made in a line northwards, line whose quality is very bad below Messinian. Moreover the incised valley in the central part prevented reliable continuity for sub-Messinian markers. …(omissis)…
The new line was clear enough to pick the top of continuous and strong reflectors following a weak energy layer (…). In 2007, this reflection was set as "top Langhian". After Oristano-1 calibration, this strong reflector was identified as the thick Tortonian sand layer characterized in the well, 7 meters below the geological top Tortonian. *From now, the geological "top Tortonian sands" will be simply named as "top Tortonian"*.

Top Langhian
Previously named as "Syn-Rift II" in 2007, it is now defined as a strong reflector (…) (Figure 4.5). In the well, it is very close to the geological top Langhian.

Top Marmilla
Previously named as "Syn-Rift I" in 2007, it is now defined as a strong reflector (…) (Figure 4.5). Extending to the well, it turns out that it represents exactly the geological top Marmilla and the base of the post-rift section.

Top Aquitanian sandstones
Due to the evidence of a new reservoir layer 20 m thick at the very end of the well, a local central interpretation was added from the well calibration at its end. Surprisingly, it does not correspond to any reflection (at Oristano-1). The reason may be an impedance that is very close to the background one. Its interpretation tried to follow at best the general shape of reflectors in its vicinity. Outside the well, it can be linked to some reflections (Figure 4.5).

Top Syn-Rift 0
Previously named "top Pre-Rift" in 2007, it is the last reflector (unconformity in fact) that was picked. It is defined as the base of the strong and low frequency reflectors that are present in the whole northern/central part.

….(omissis)…

3.5 Structural results in the Eleonora Concession

The update of 2007' study confirmed the high level of faulting in this concession and the structural style as described above.

Concerning plays and leads, the Eleonora structural pattern (at least above Ales marls) illustrates the main challenges for HC trapping:

- *all* faults are striking more or less along a North-South azimuth. It means that no transversal fault could close any structural trap in this direction. We must find anticlines closing Northward and Southward.
- the anticlines are not well developed. The main area is around Oristano-1. There is no single and major high, but a high zone dissected by faults, segmenting it into several local highs
- the very tops of these highs are *always* situated against faults (exception for some small anticlines in top Aquitanian sands and top Marmilla). It means that a possible leakage path might always exist if faults are not perfectly sealing.

Below the Aquitanian shales (the Ales Marls), the near Syn-Rift 0 complex (strong reflectors) is rather structurally disconnected from above and less faulty. Some highs exist, but they do not superimpose with the Messinian/Tortonian leads. It is therefore necessary to find stratigraphic traps at those levels.

3.6 Conventional Seismic facies interpretation

An update of conventional and qualitative seismic facies interpretation has been done and is presented hereafter.

3.6.1 Volcanism

The new lines confirmed the upper Pliocene basaltic sills found in 2007. A new possible origin was spotted close to Capo Frasca-Sinis fault.(…)

3.6.2 Stratigraphic characteristics

Rift deposition
In 2007 a seismic section involving what was called "syn-rift I" mega-sequence was interpreted (…). The updated analysis is commented on the reprocessed version (…). From base to top:

- Over top Syn-Rift 0 (unconformity with top-laps underneath, see Figure 4.4) lie the high amplitude reflectors called "near SR0 anomalies". They onlap eastwards against the unconformity. In 2007 they were suggested as "*initial rift deposits with conglomerates and volcano-clastics*"; They are now interpreted also as possible Gesturi sands;

- Above these series lies a transparent facies, identified as the Ales marls. At their base appears a kind of sedimentary mound (interpreted in 2007 as a low-stand basinal feature). Now it is likely to be a deformation of the Ales marls, formed close the anchor point of an upper fault.
- It is followed by a facies with high frequency, medium amplitude, low continuous, sub-parallel reflections. They correspond to lower Burdigalian's volcano-clastics: Marmilla formation. It is clearly syn-rift, numerous onlaps can be spotted.
- At the end, strong reflectors onlap on the underlying facies. Their thickness increase eastwards. Top Marmilla is interpreted as the top of them. They could represent the last stage of the volcano-clastics deposit.

Delta-fan feature

No new analysis of the southern delta fan was realized, as this play was not kept for the petroleum lead analysis (too risky).

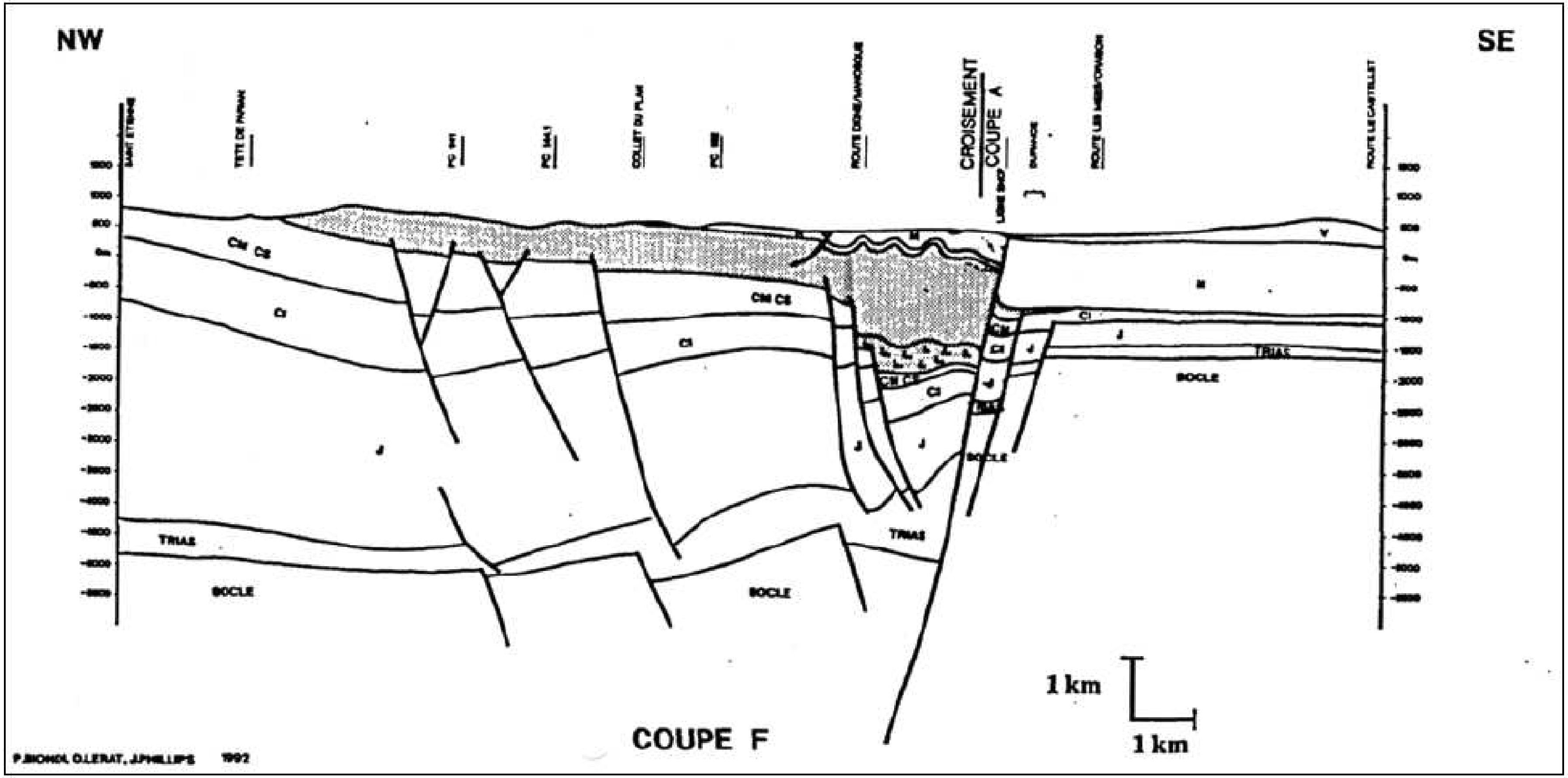


Fig. 2.1

Structural section of the Oligocene Manosque-Fourcalquier Basin (SE France)

Main chrono-biostratigraphic data from Sardinia

(A. Cherchi, N. Mancin, L. Montadert, M. Murru, M.T. Putzu, F. Schiavinotto, V. Verrubbi, in press 2007)

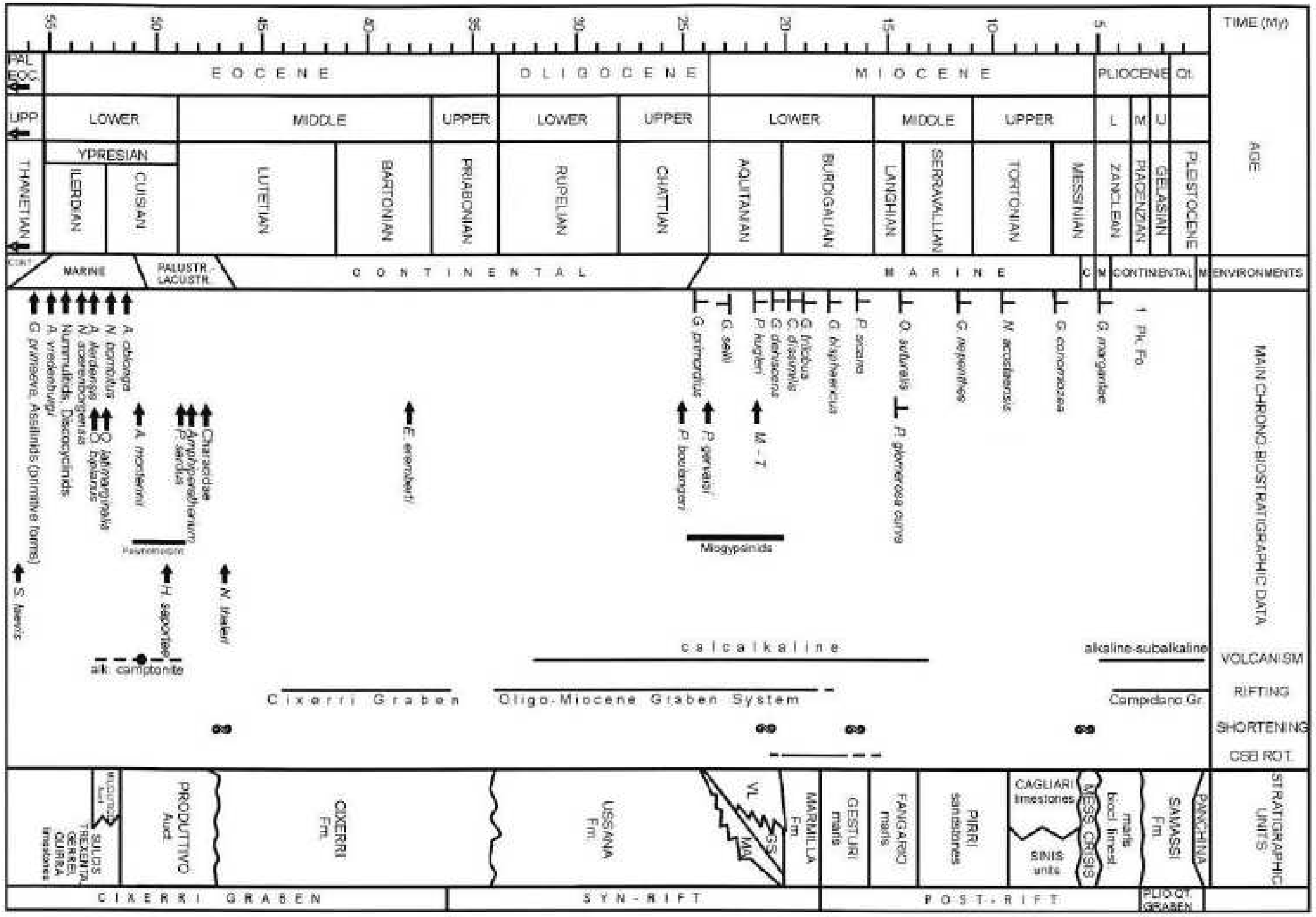


Fig. 2.2

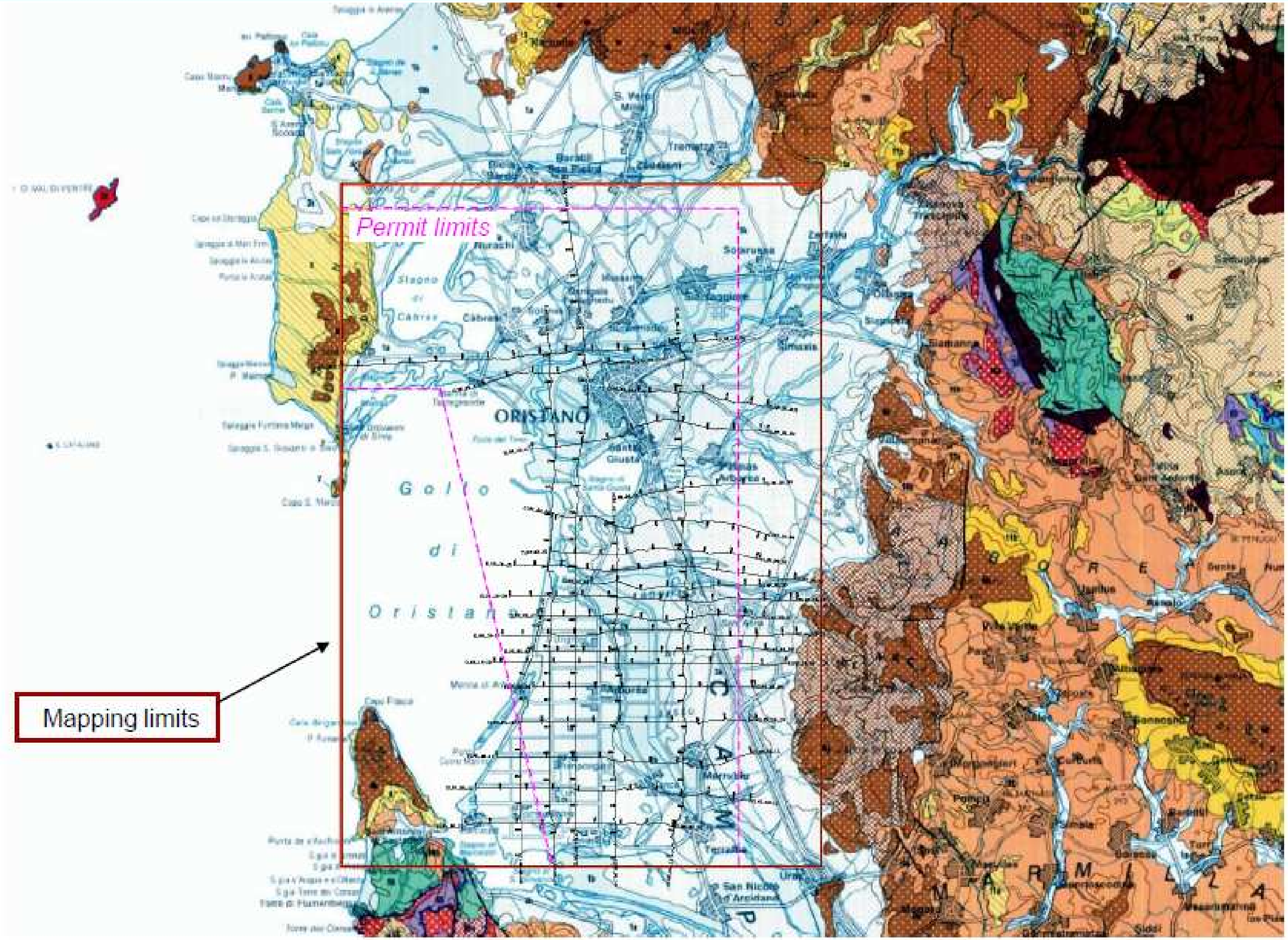
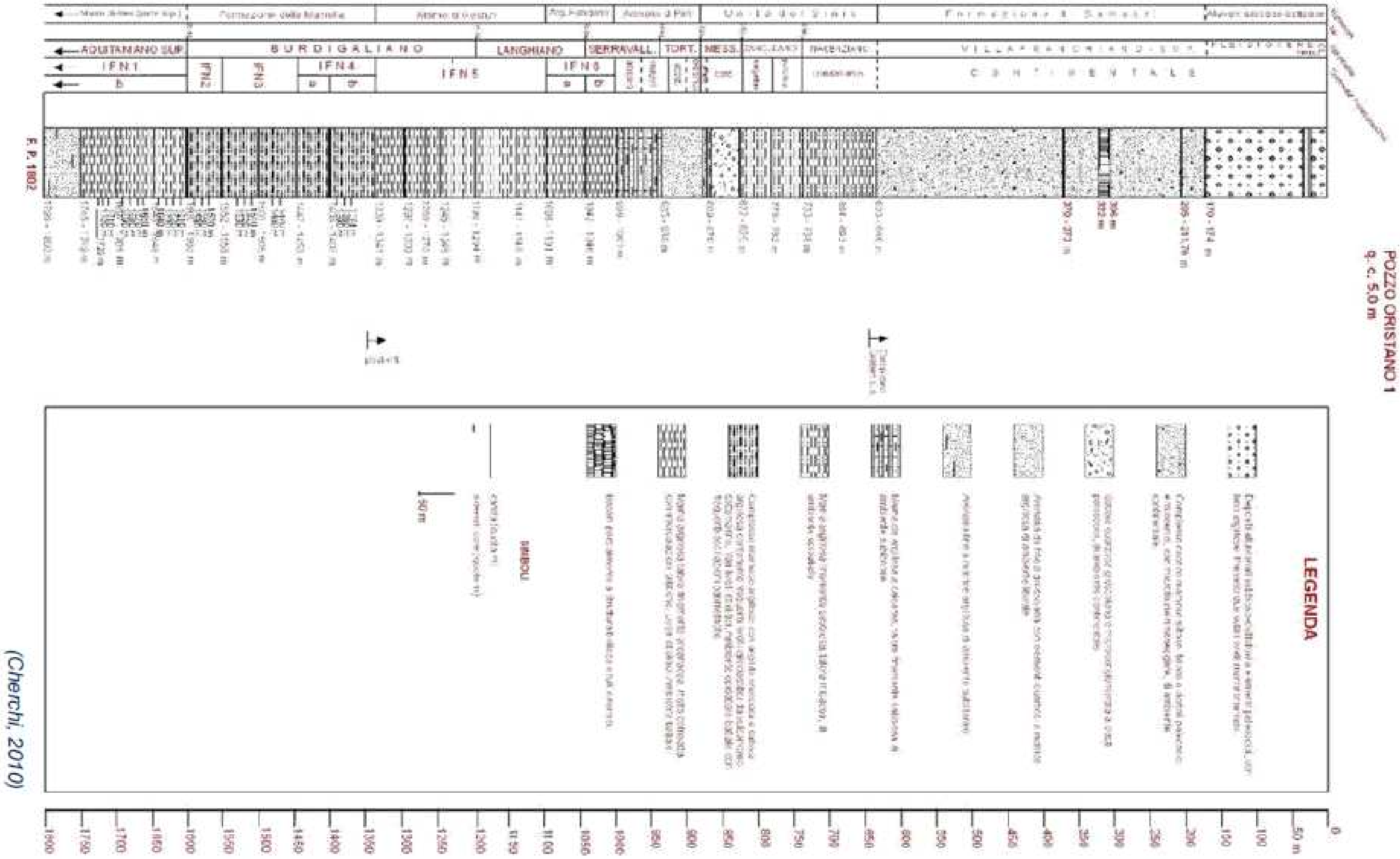


Fig. 3.1

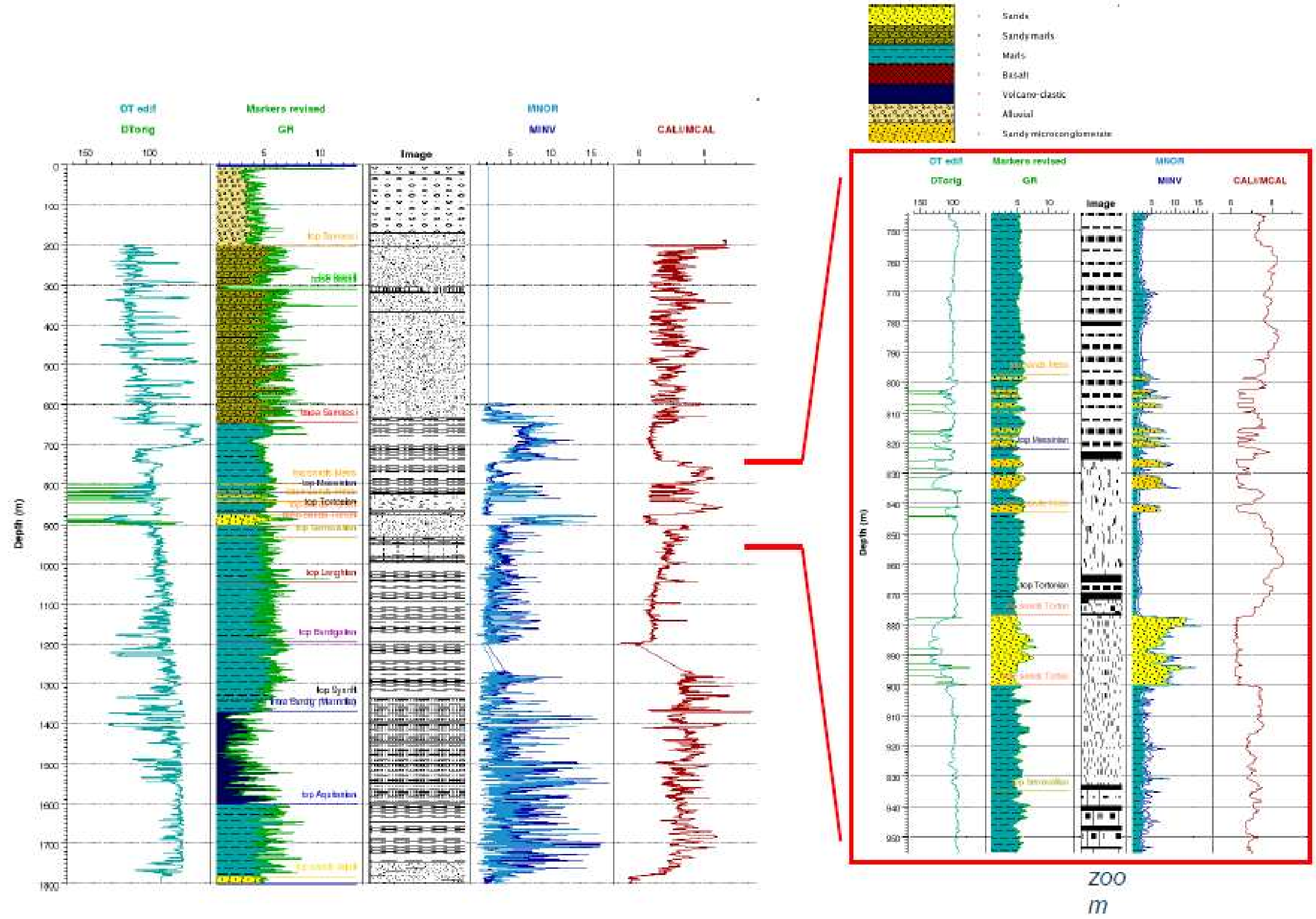
Geological map – Eleonora



(Cherchi, 2010)

Fig. 3.3

2010' revised biostratigraphic in Oristano-1



Oristano-1

Fig. 3.4

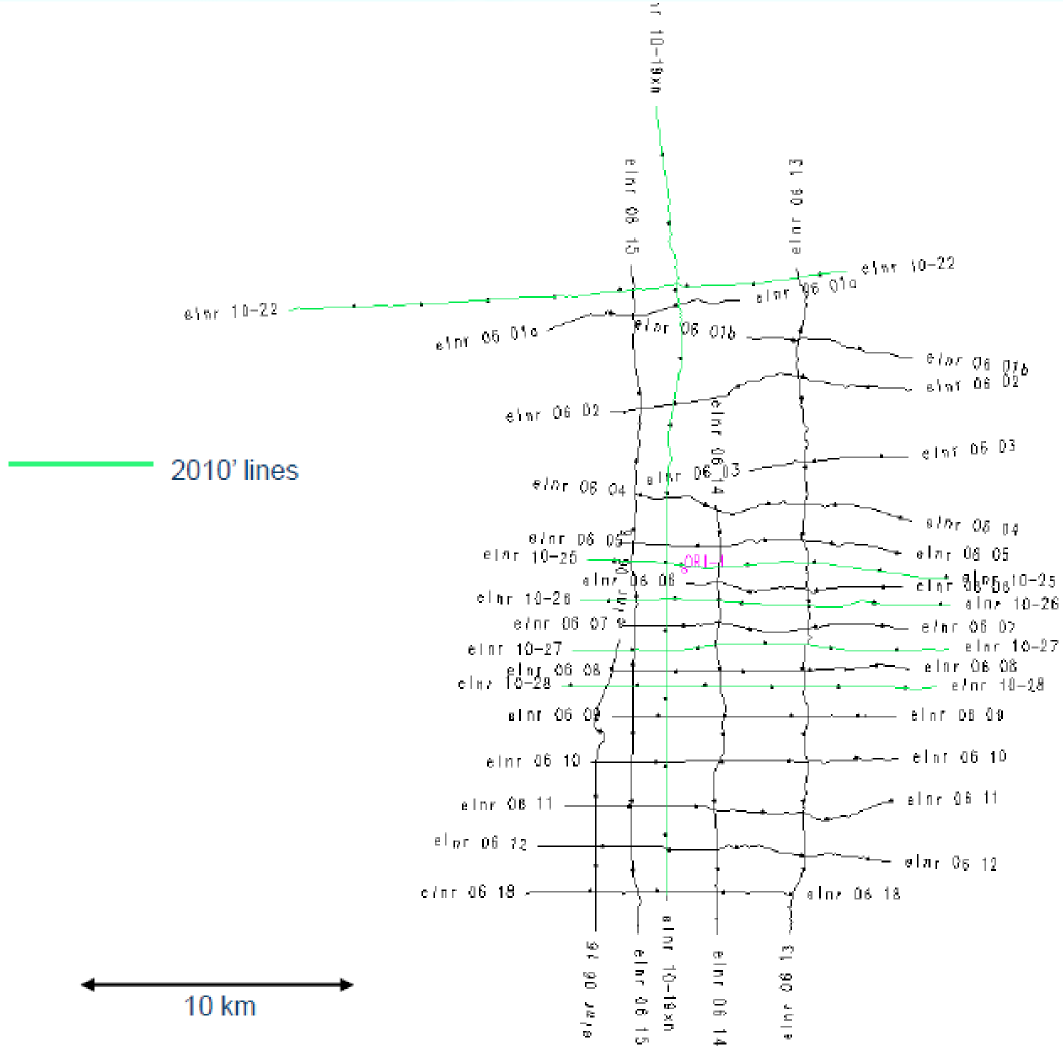


Fig. 3.6

ELNR basemap

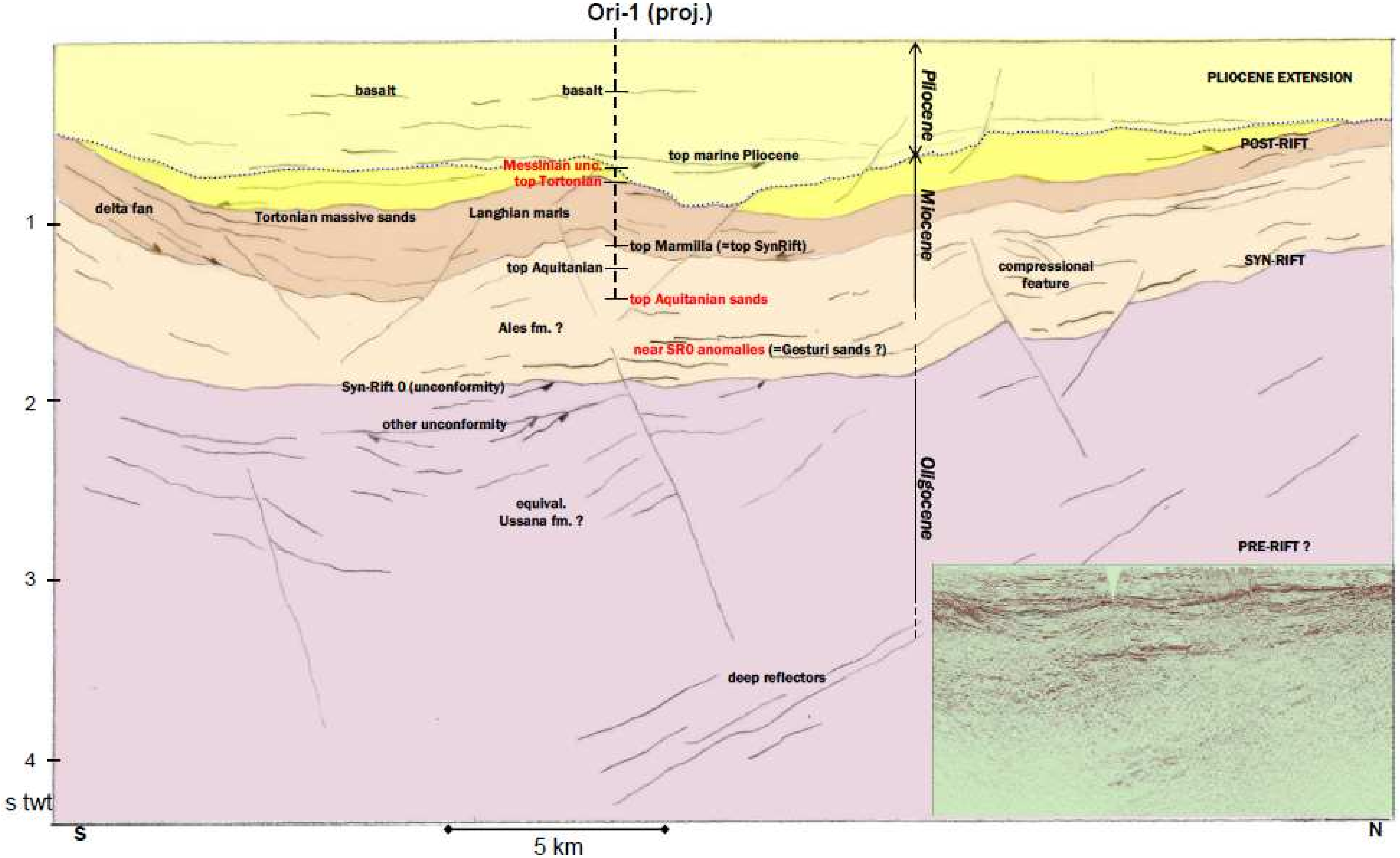
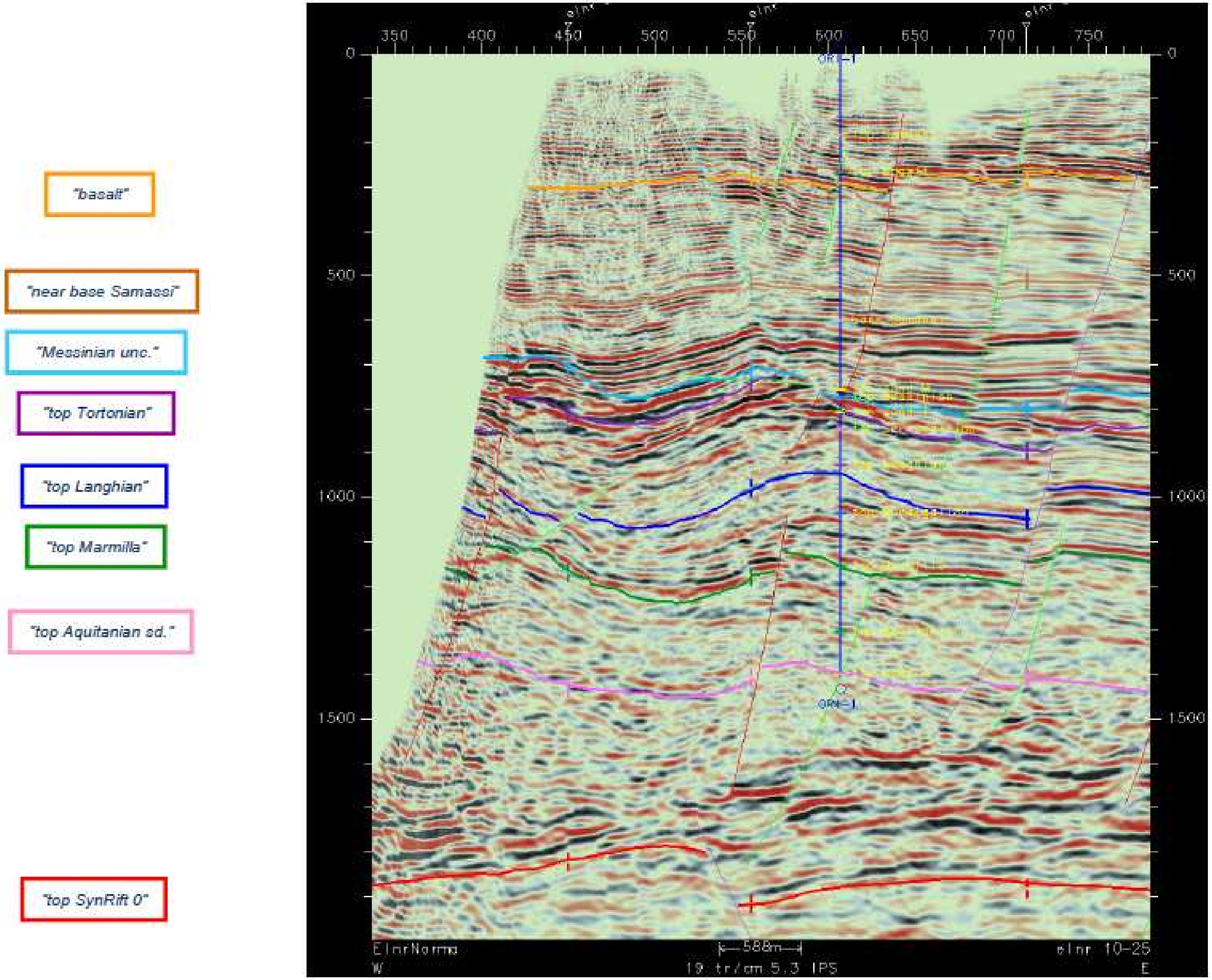


Fig. 4.4

Geoseismic cross-section: ELNR-10-19xn



Horizons interpreted and well calibration

Fig. 4.5

NOTA ESPLICATIVA ALLEGATA AL DOCUMENTO

Il presente documento è costituito da un estratto del Report Finale (Maggio 2011) *"2010' Update for Exploration of ELEONORA and IGIA Concessions"*, prodotto da Beicip Franlab per Saras, allegato alla Relazione Geologica su richiesta del Servizio SAVI..

Si specifica che il documento di pari titolo datato Gennaio 2011 e citato nella Bibliografia della Relazione Geologica costituisce una versione *draft* del documento redatto nel Maggio 2011 (che invece, come già detto, costituisce la versione finale).

Sono indicati con *"…(omissis)…"* tutti i passaggi che sono stati omessi ogni qualvolta si è verificato uno dei due casi seguenti:

1) dati del Progetto Igia, non di pertinenza del procedimento autorizzativo in oggetto (Progetto Eleonora, realizzazione di una perforazione esplorativa nel territorio comunale di Arborea);

2) dati di interesse industriale, di proprietà della Saras, non pertinenti agli aspetti geologici.

Si indicano semplicemente con (…) i riferimenti superflui (figure-elaborati non allegati, richiami ad altri capitoli).