



Progetto GeoMol - il modello 3D dell'area pilota italiana

C. D'Ambrogi*, F.E. Maesano*, F.C. Molinari°



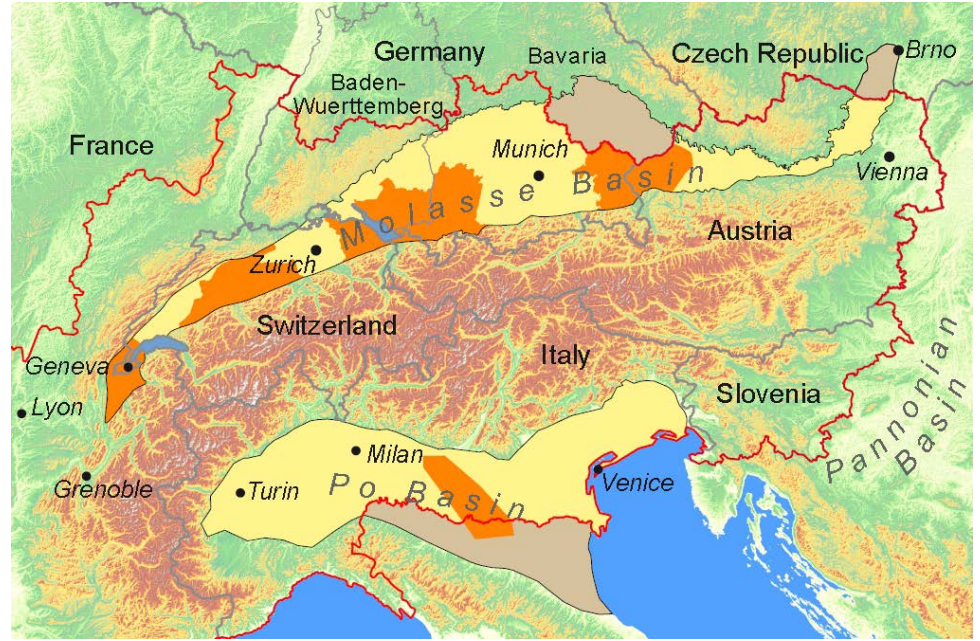
** ISPRA – Servizio Geologico d'Italia, ° Regione Emilia Romagna – Servizio Geologico, Sismico e dei Suoli*

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



GeoMol Project – Assessing subsurface potentials of the Alpine Foreland Basins for sustainable planning and use of natural resources

Inizio 01/09/2012
Fine 30/06/2015



**Bayerisches
Landesamt
für Umwelt**

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Federal Office of Topography swisstopo

Geologische Bundesanstalt



Sciences pour une Terre durable
brgm

ISPRA
Istituto Superiore per la Protezione
e la Ricerca Ambientale



**Regionalverband
Bodensee-Oberschwaben**



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Federal Office of Energy SFOE



**REPUBLIQUE
ET CANTON
DE GENEVE**
HOFF THOMAS LUN

**Regione
Lombardia**

Regione Emilia-Romagna

**LAND
OBERÖSTERREICH**

GeoMol
Assessing subsurface potentials of the Alpine Foreland Basins
for sustainable planning and use of natural resources

**Alpine
SPACE**
EUROPEAN REGIONAL DEVELOPMENT FUND
Investing in your future

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



GeoMol Project – Assessing subsurface potentials of the Alpine Foreland Basins for sustainable planning and use of natural resources

Inizio 01/09/2012

Fine 30/06/2015

WP5 DATA PREPARATION

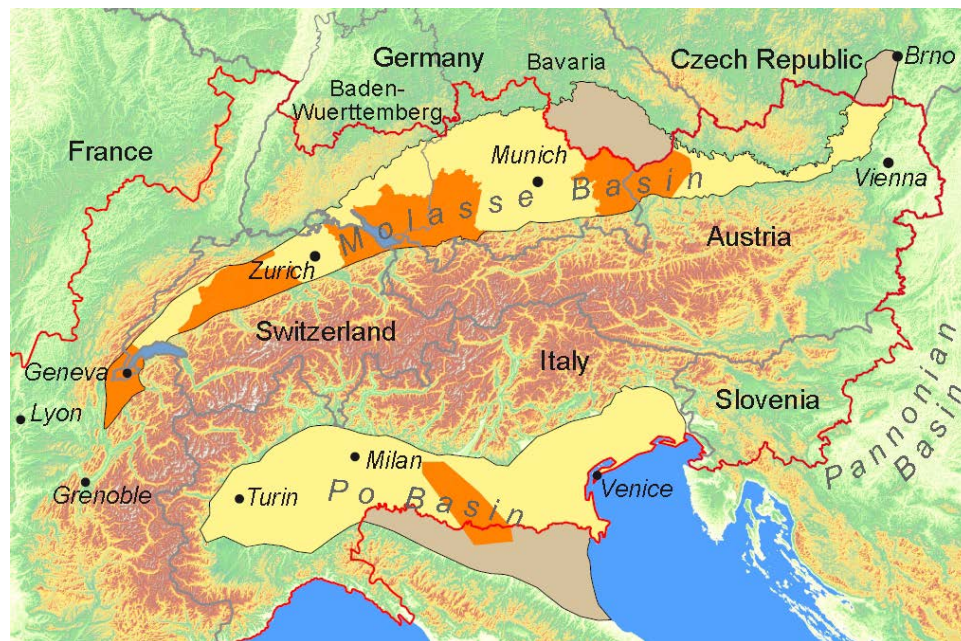
...harmonised data and consistent methodologies for the unbiased transnational synthesis and evaluation

WP6 3D GEOLOGY & GEOPOTENTIALS

... elaborating common methods and workflows for subsurface potential assessment incl. characterization of seismogenic sources

WP8 TEST AND PILOT ACTIVITIES

... implements the results of WP5 and WP6 in selected pilot areas with different focus on subsurface potentials



Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

I partner italiani del Progetto GeoMol



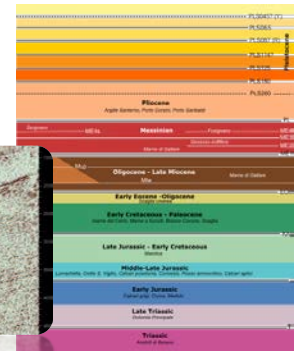
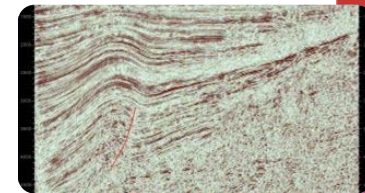
contributors



Attività

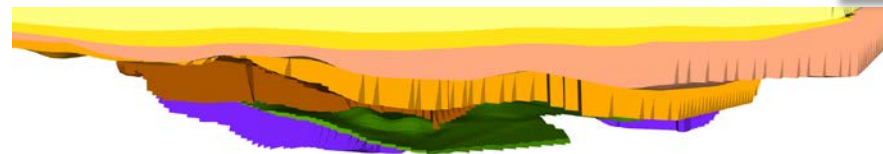
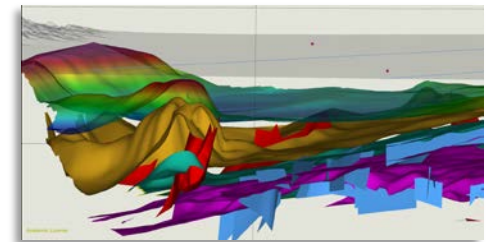
WP5

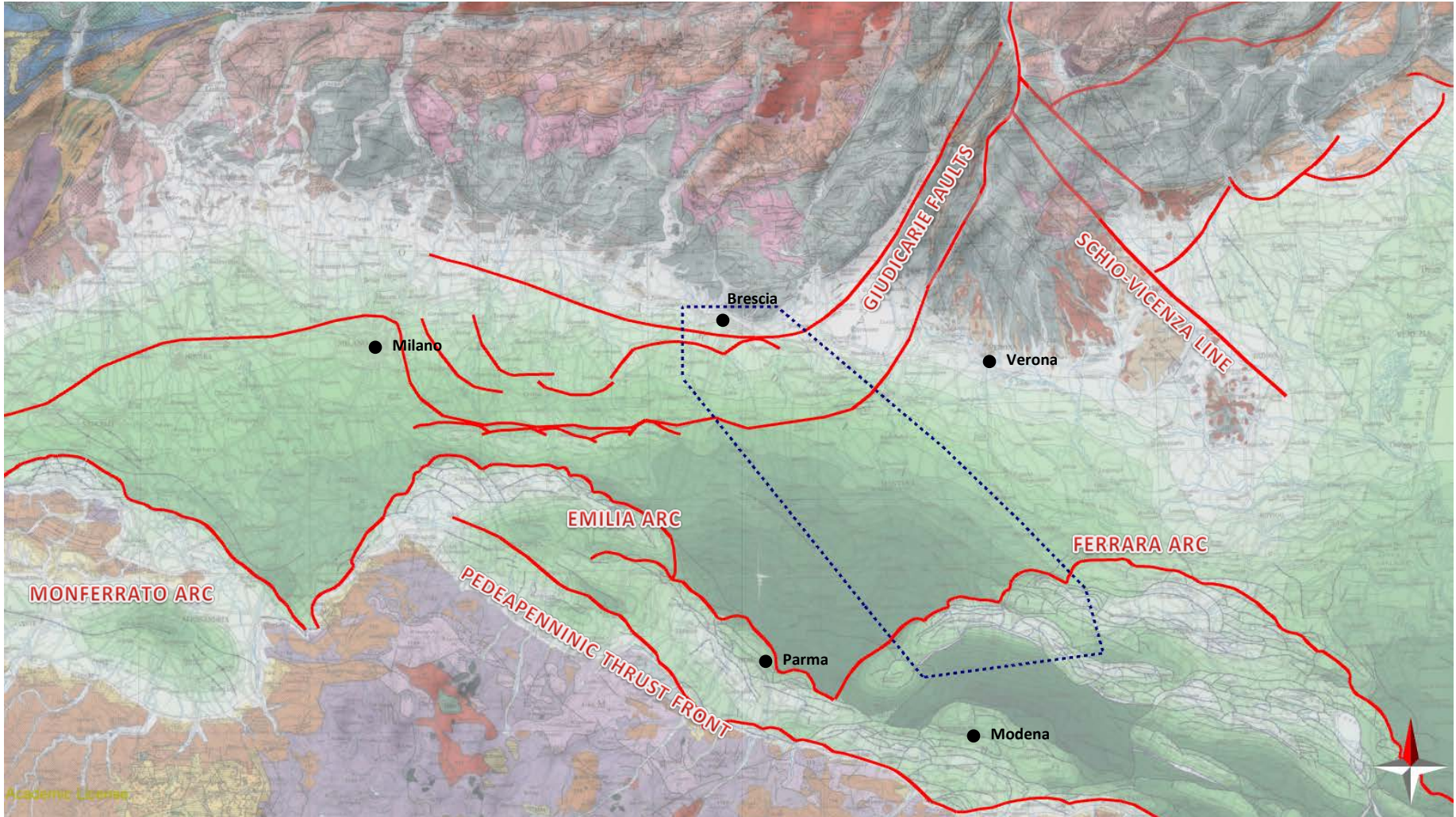
- Acquisizione dei dati e & armonizzazione (linee sismiche e pozzi)
Sintesi stratigrafica e database
RER-SGSS, Reg. Lombardia + IGAG, ISPRA



WP6
WP8

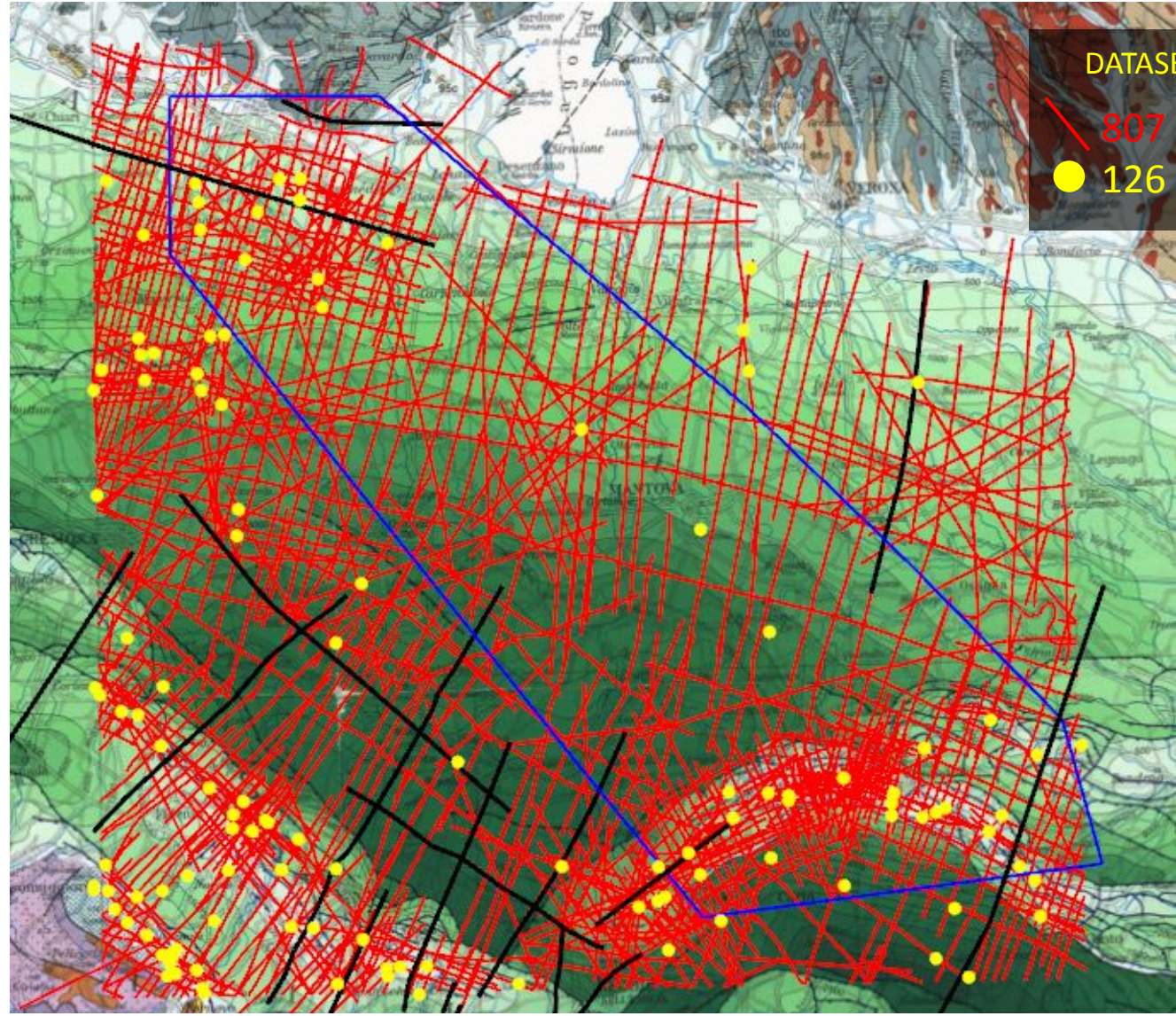
- Modellazione 3D di orizzonti e faglie (in tempi e profondità) **ISPRA**
- Parametrizzazione per la valutazione di geopotenziali
Potenziale geotermico **RER-SGSS**
Caratterizzazione faglie attive **ISPRA** con il contributo di **INGV**
Bedrock sismico **Reg. Lombardia** con il contributo di **CNR - IGAG**





Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



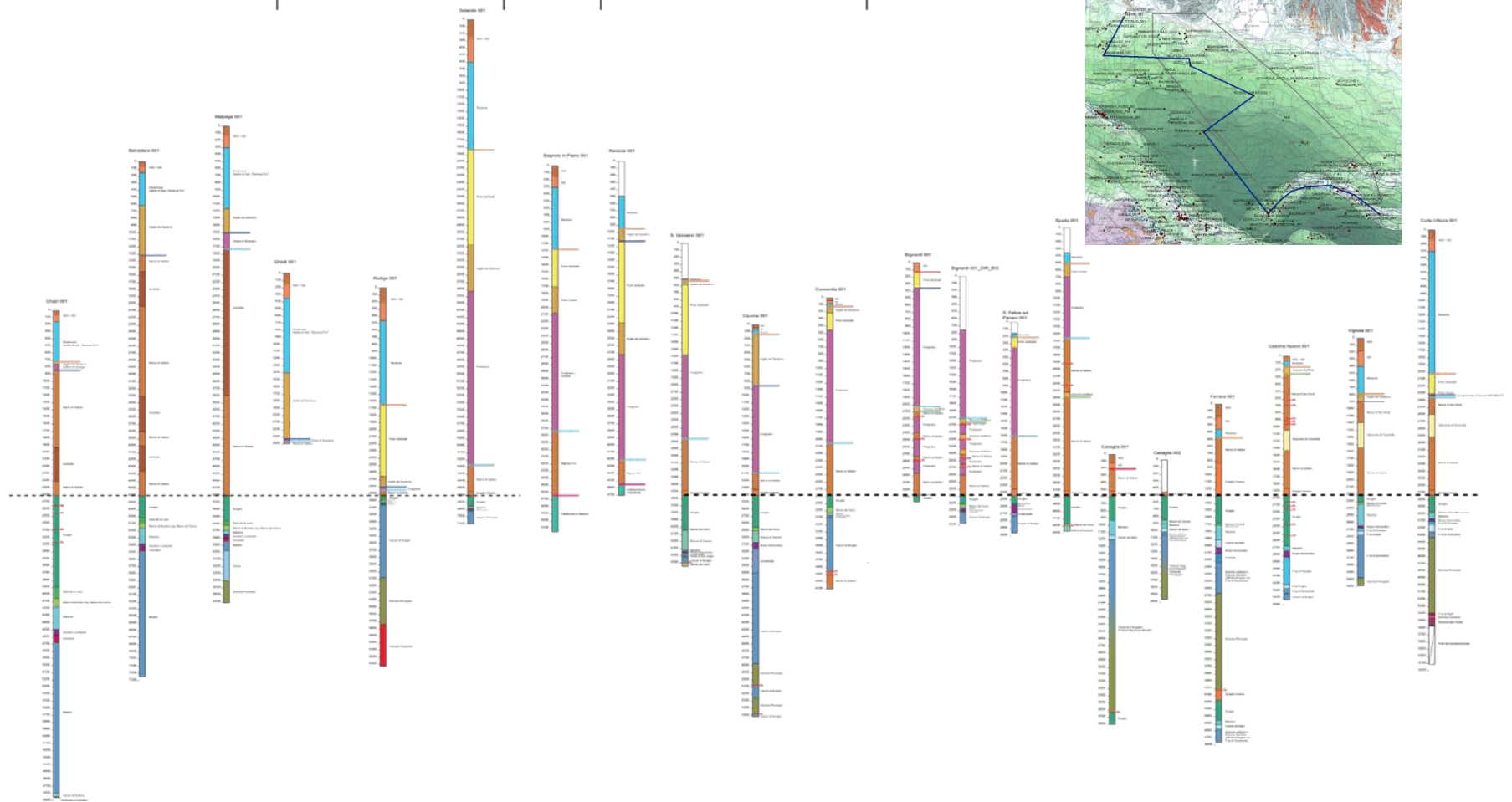


DATASET (ENI courtesy)
 807 linee: 12.200 km
 126 sondaggi

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

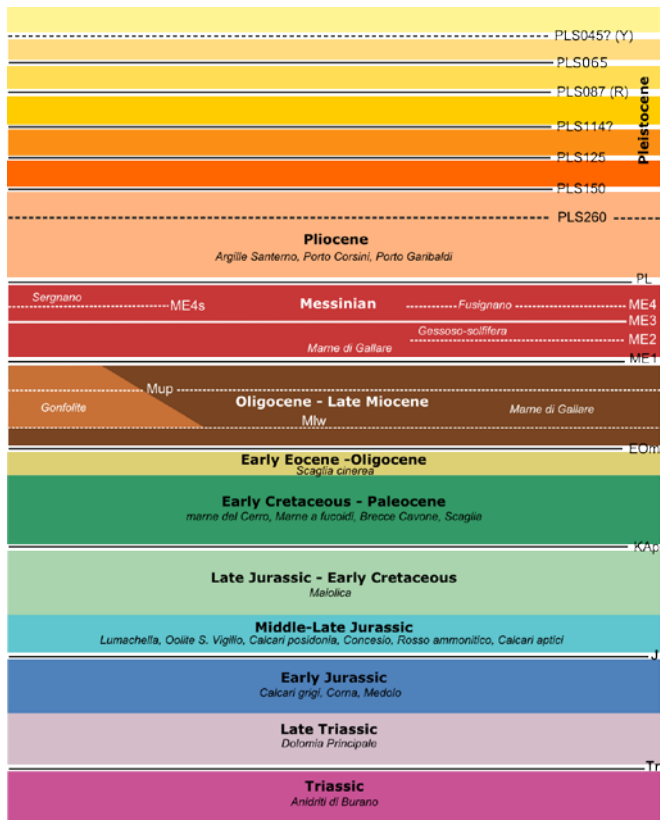
Stratigrafia – Transetto stratigrafico pozzi

Sudalpino | **Monoclinale Mantovana** | **Alto di Bagnolo** | **Alto di Cavone** | **Alto di S.Felice** | **Pieghe Ferraresi Esterne**



Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

Schema stratigrafico armonizzato



Code	Type	Base/Top	Age (Myr)		Horizon
<i>PLS065</i>	unconf	base	Middle Pleistocene	0.65	MIS16
<i>PLS087</i>	unconf	base		0.87	AEI – R surface
<i>PLS114</i>	unconf	base	Calabrian	1.14	"near base Jaramillo" reflector
<i>PLS125</i>	unconf	base		1.25	Base QM2
<i>PLS150</i>	unconf	base		1.5	Base QM1
<i>PI</i>	unconf	base	Lower Pliocene	5.3	base Pliocene
<i>ME4s</i>	unconf	base	Messinian		base Sergnano
<i>ME4</i>	unconf	base			base ME4
<i>ME3</i>	unconf	base			base ME3
<i>ME2</i>	unconf	base			base ME2
<i>ME1</i>	unconf	base		7.3	base ME1
<i>Mup</i>	unconf	base		upper Miocene	
<i>Miw</i>	unconf	base	Lower Miocene		lower Miocene unconformity.
<i>Eom</i>	strat	top	Middle Eocene		top Scaglia
<i>KAp</i>	strat	top	Lower Cretaceous		top Maiolica
<i>J</i>	strat	top	Lower Jurassic		top Noriglio
<i>Tr</i>	strat	top	Upper Triassic		top Evaporiti trias



Database dei pozzi (solo per uso interno al Progetto)

GeoMol
Assessing subsurface potentials of the Alpine Foreland Basins
for sustainable planning and use of natural resources

Alpine SPACE
EUROPEAN COOPERATION
THIS PROJECT IS FUNDING BY THE
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

GeoMol Italian Pilot Area

Well log database

Tables

- [General](#)
- [Stratigraphy](#)
- [Age](#)
- [Litology](#)
- [Enviroment](#)
- [Biozones](#)
- [Dip/Azimuth](#)
- [Unconformities](#)
- [Velocity](#)
- [Mineralizations](#)
- [Temperatures](#)
- [Porosity](#)
- [Permeability](#)
- [Salinity](#)
- [Fluids](#)
- [Groundwater](#)

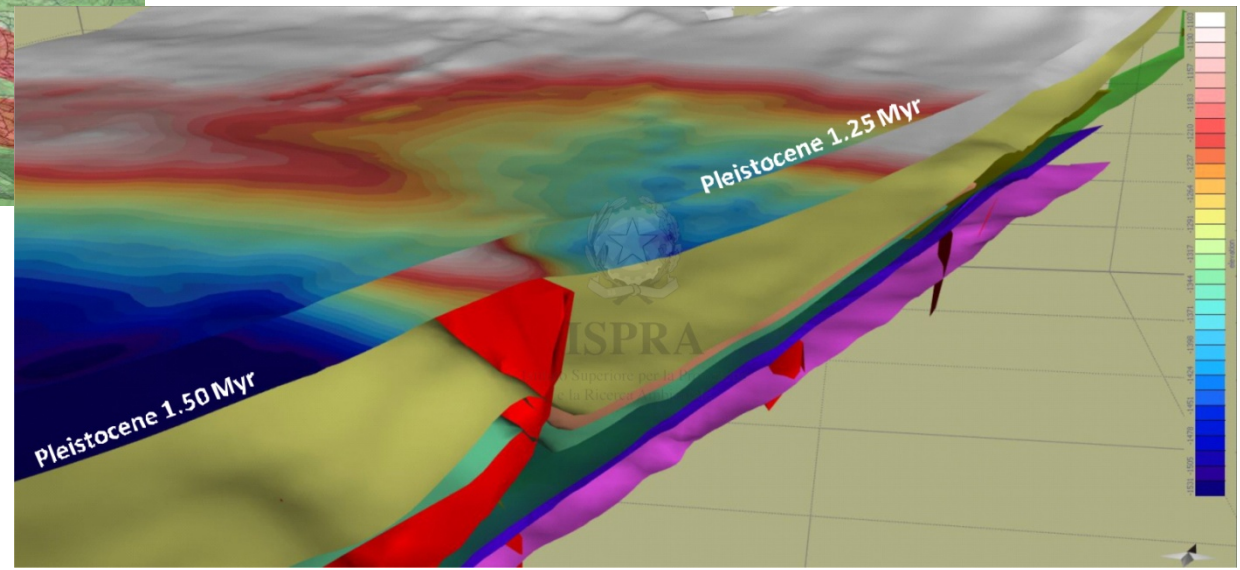
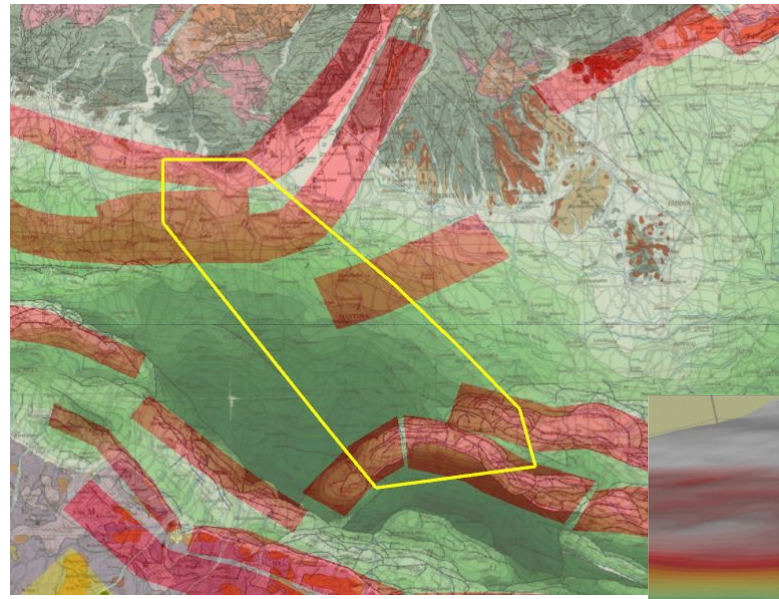
[Primary keys](#)

Query

- [Interroga codice formazione](#)
- [Interroga stratigrafia sondaggio](#)

Type	N. records
Stratigraphic	559
Age	661
Unconformity and faults	89
Dip and azimuth	614
Biostratigraphic	419
Fluids density	707
Mineralization	2910
Permeability	7
Porosity	18
Salinity	15
Temperature	57
Velocity	1926

Sorgenti sismogenetiche DISS-INGV



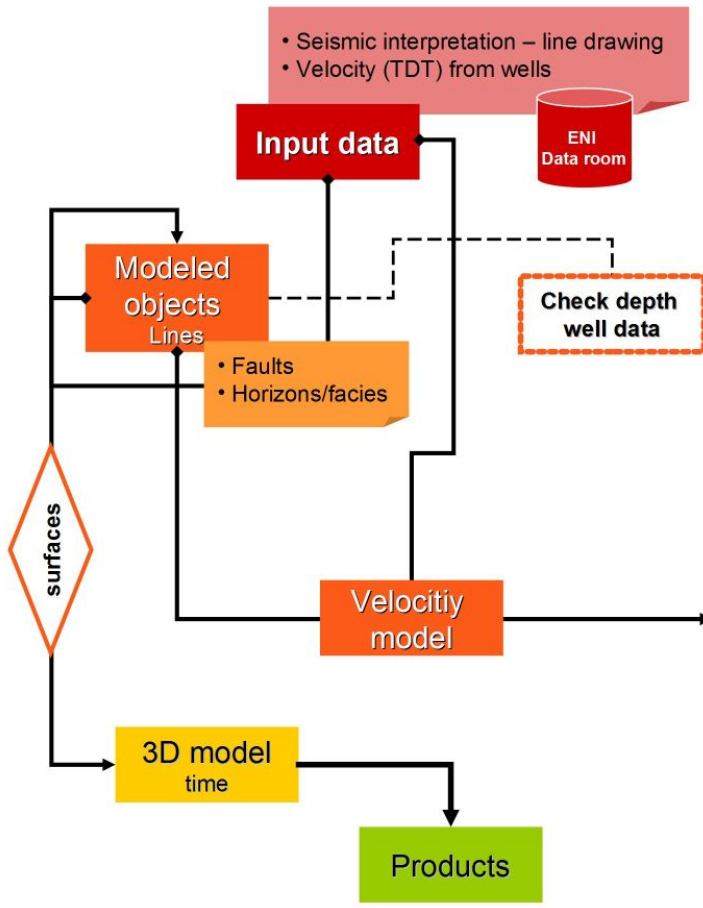
Modellazione 3D in aree sismicamente attive = analizzare strutture e quantificare slip rate

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

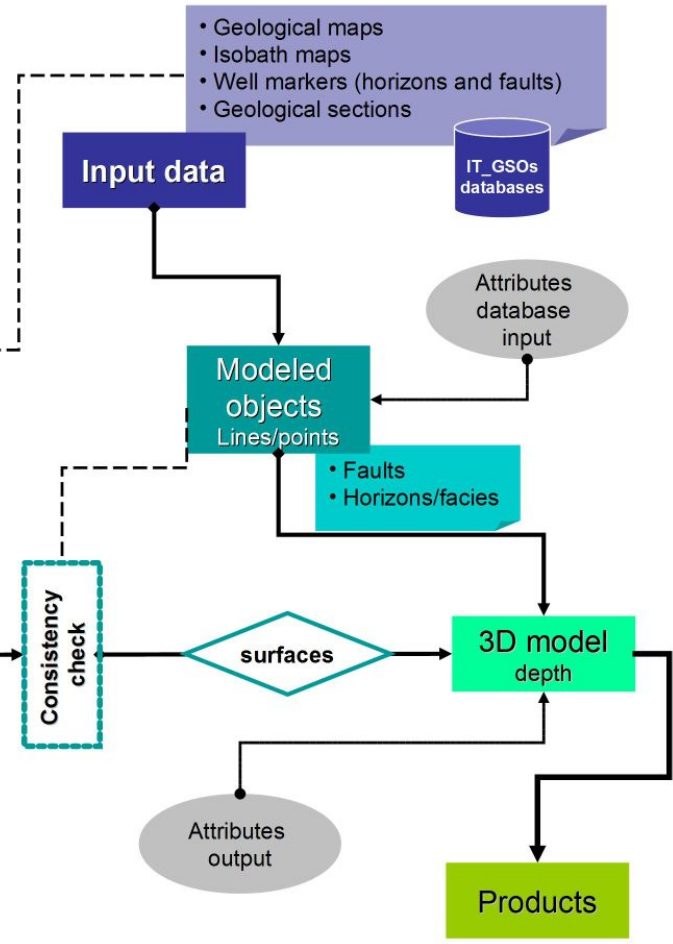


Workflow modellazione 3D

3D Time domain



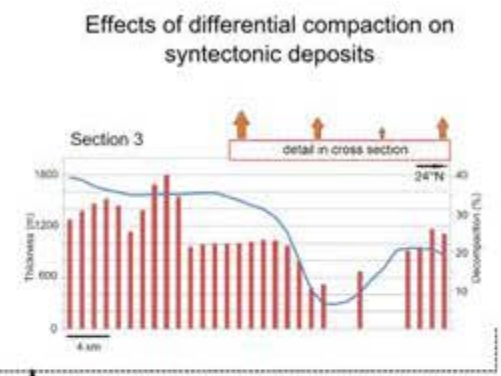
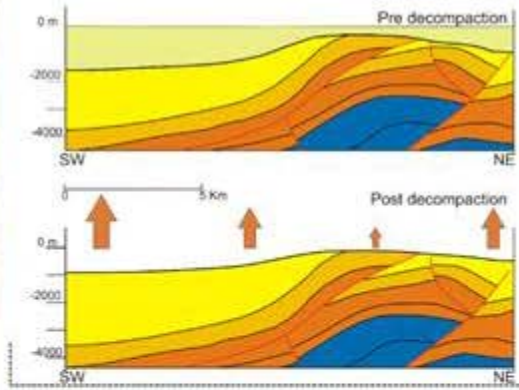
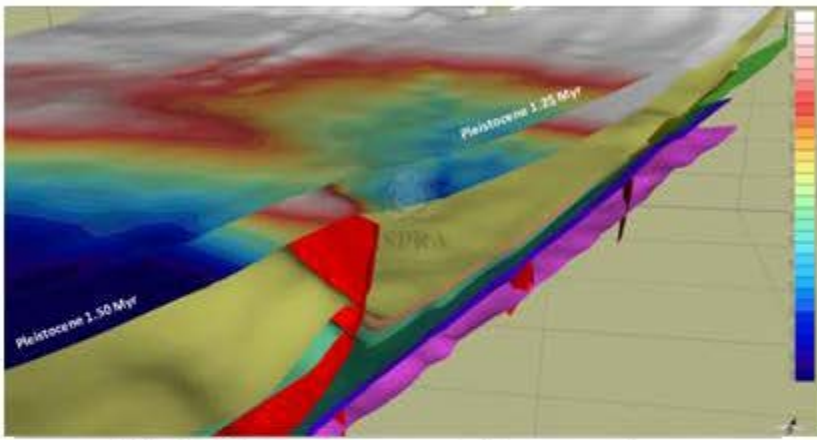
3D Depth domain



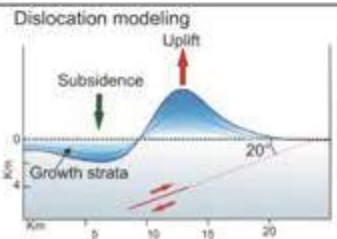
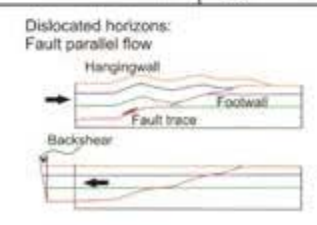
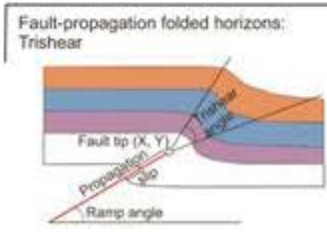
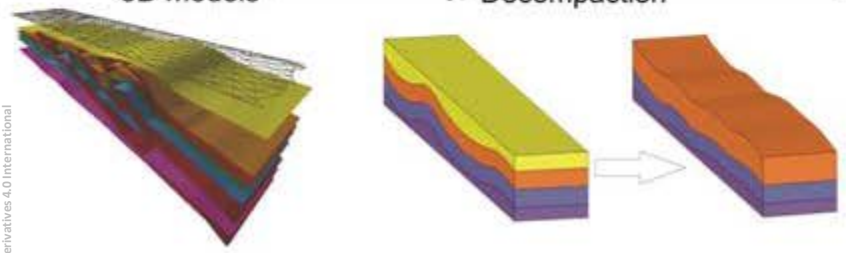
Maesano et al., Rend. Online SGI 2014

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

Workflow di retrodeformazione e calcolo degli slip rate



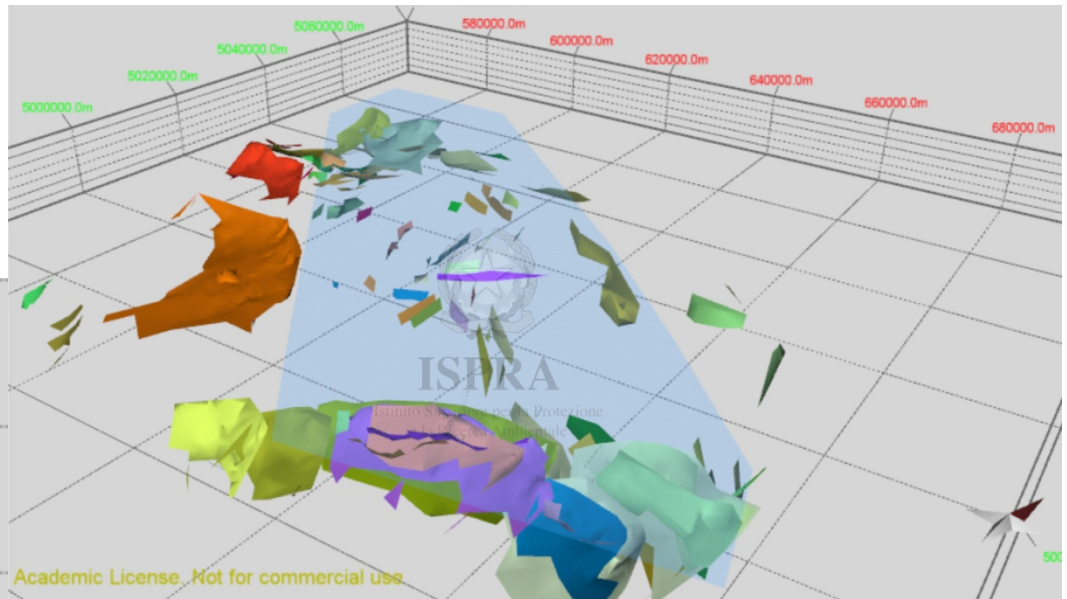
3D models → Decompaction → Restoration algorithms



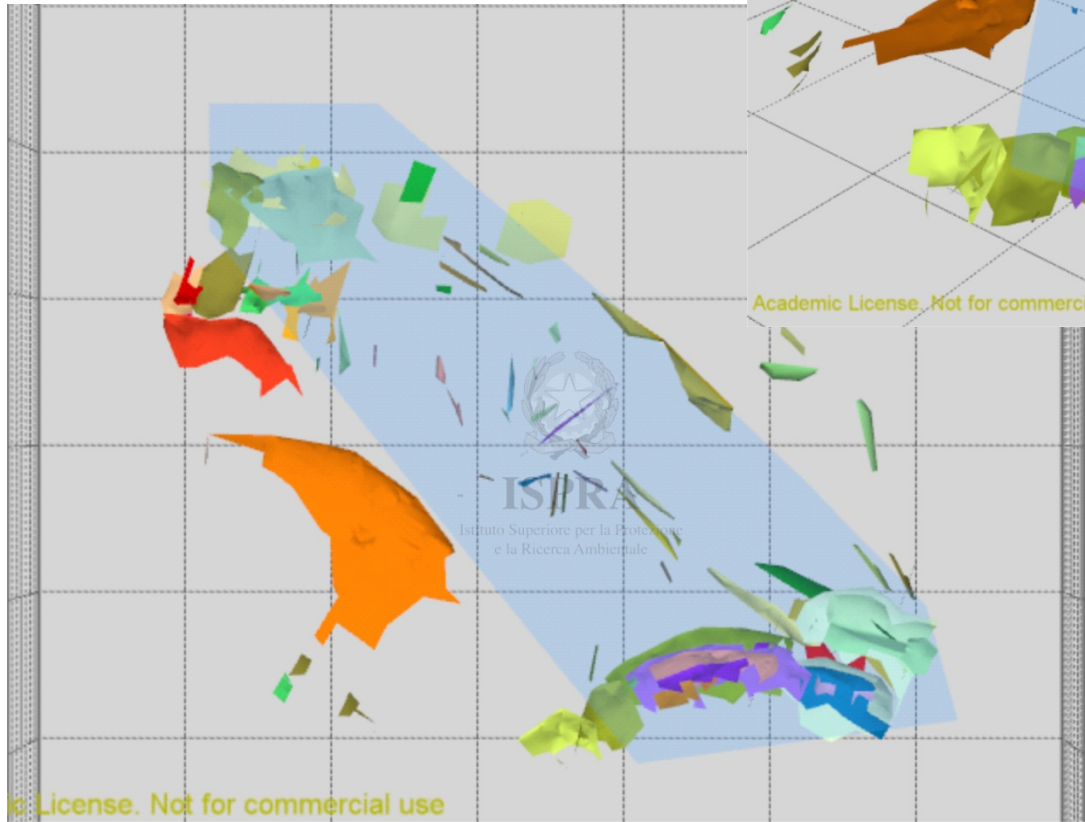
modified from Maesano et al., JMPG (2013)

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

Principali elementi strutturali

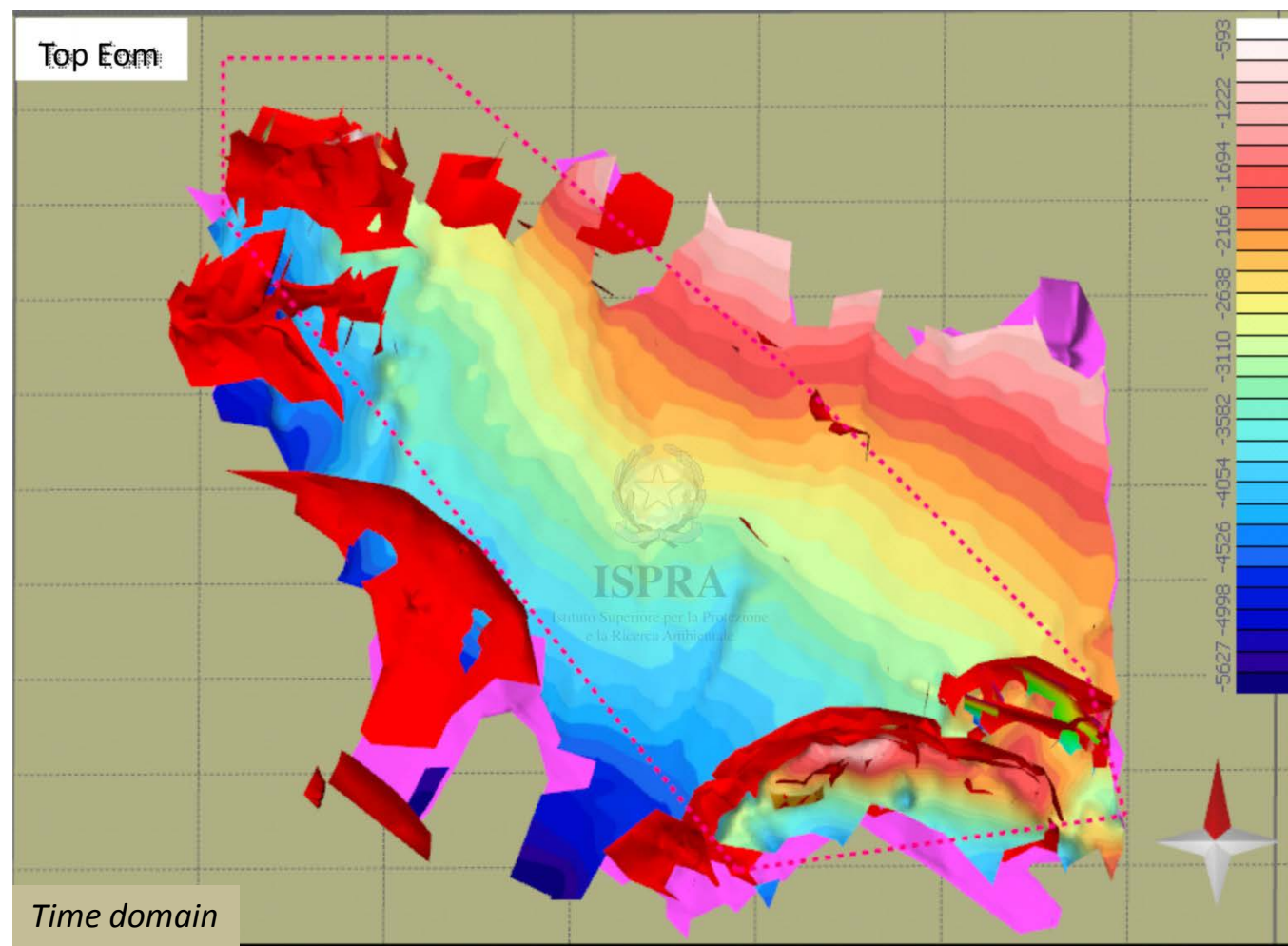


Academic License. Not for commercial use



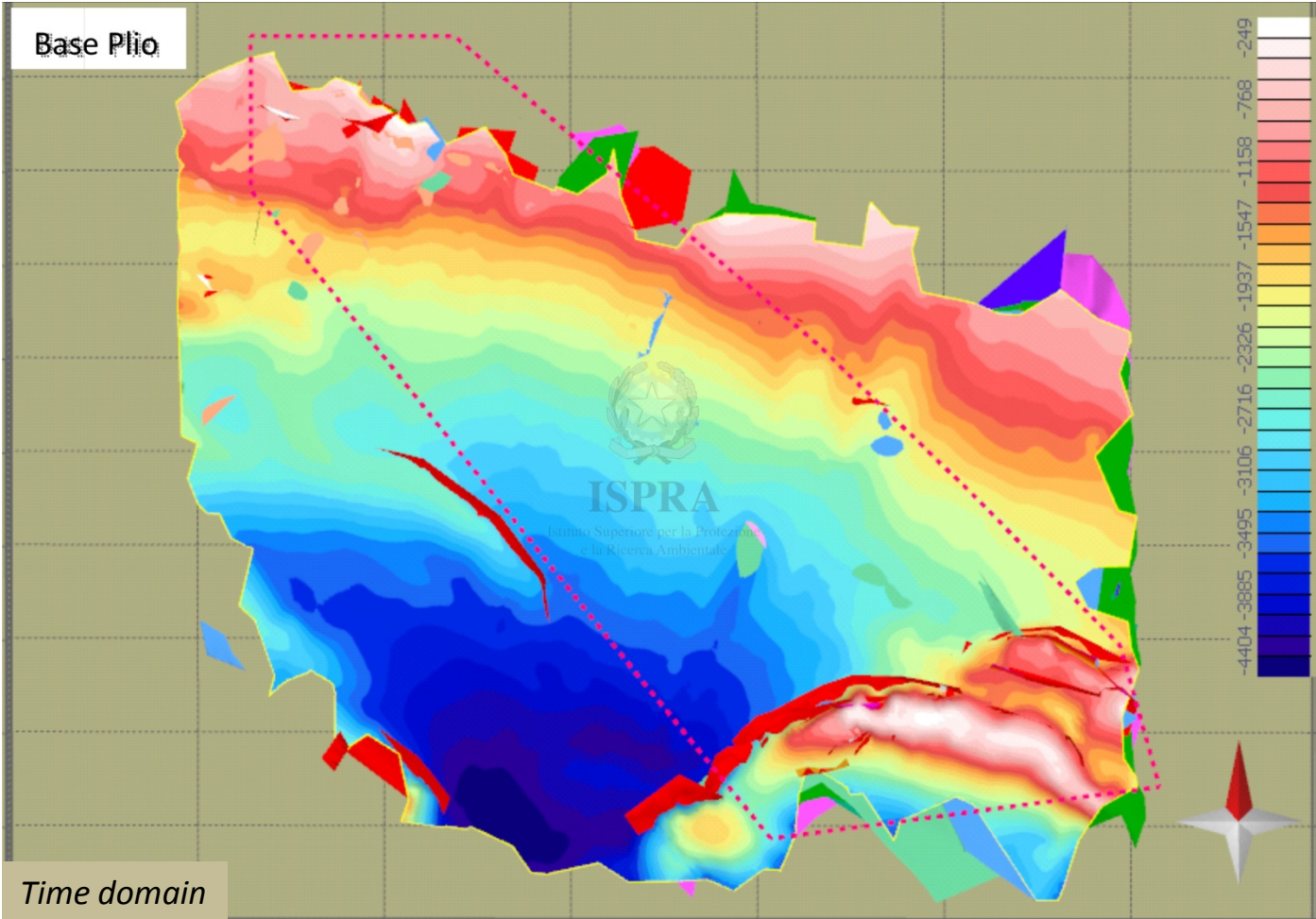
Academic License. Not for commercial use

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

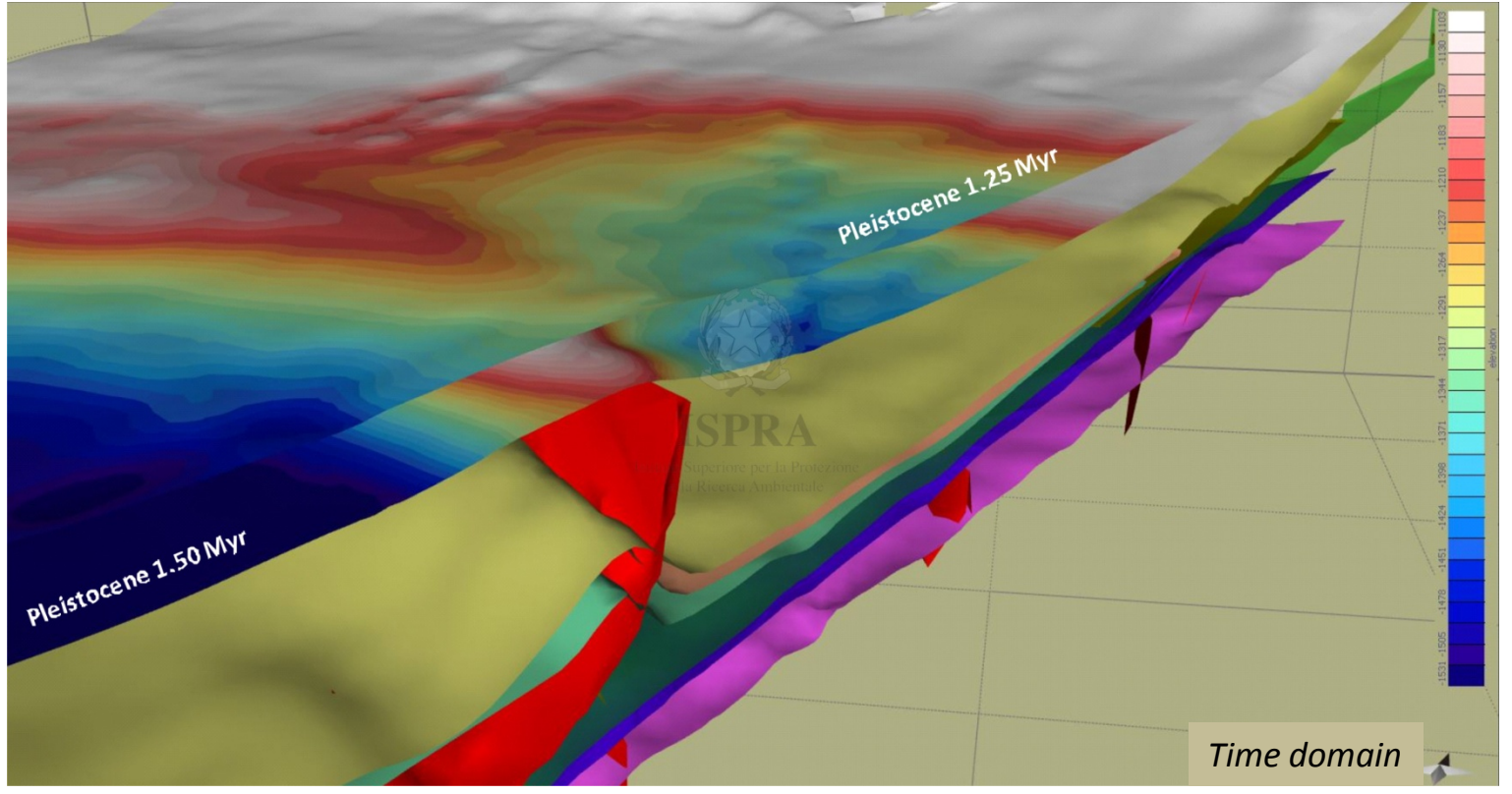


Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



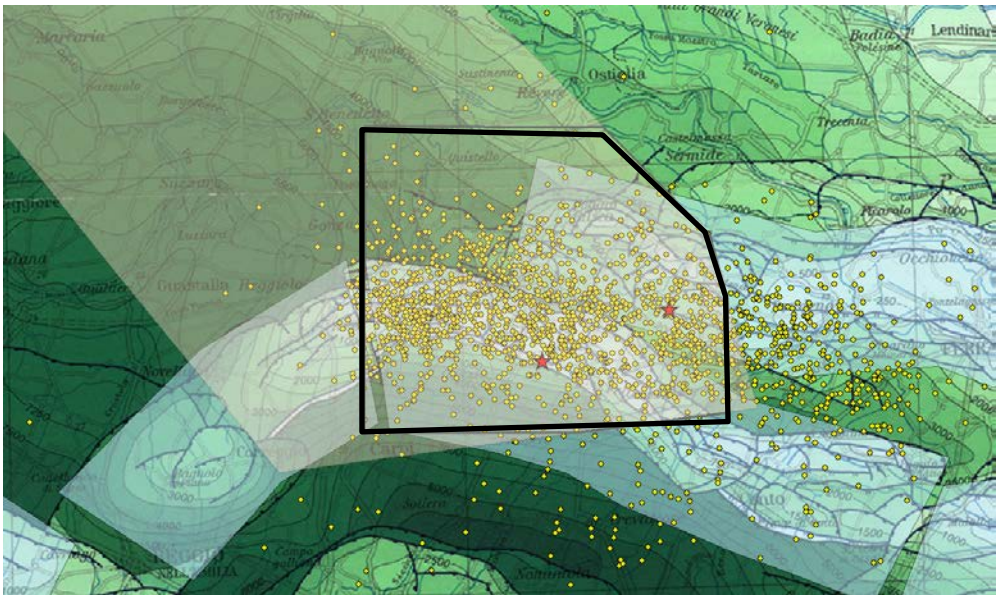
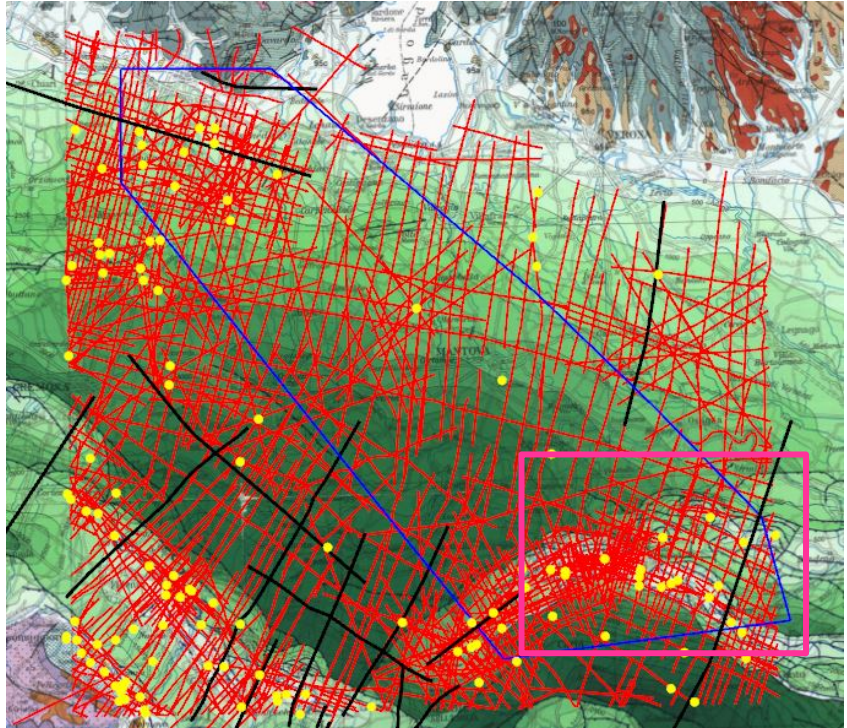


Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

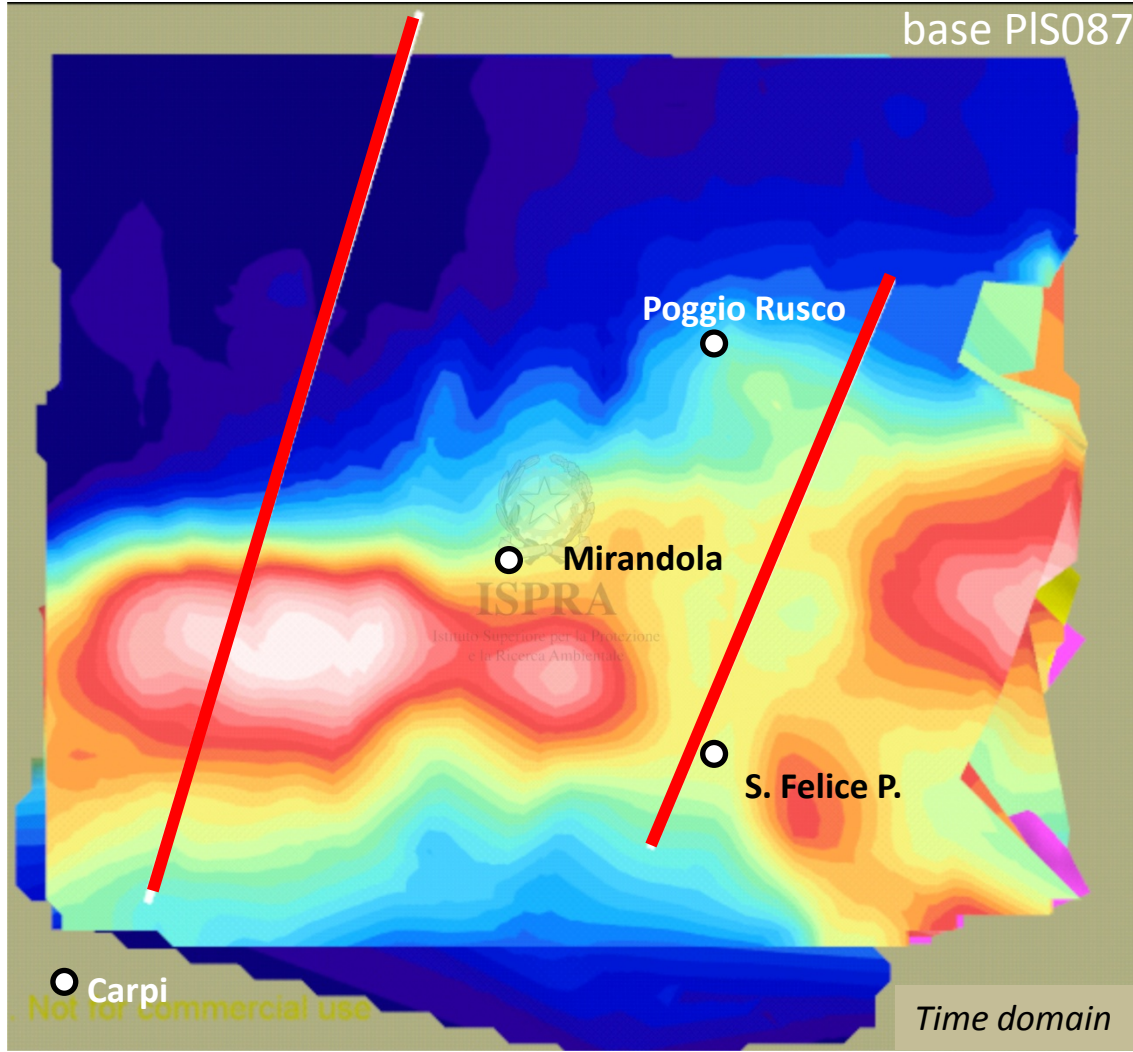


Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

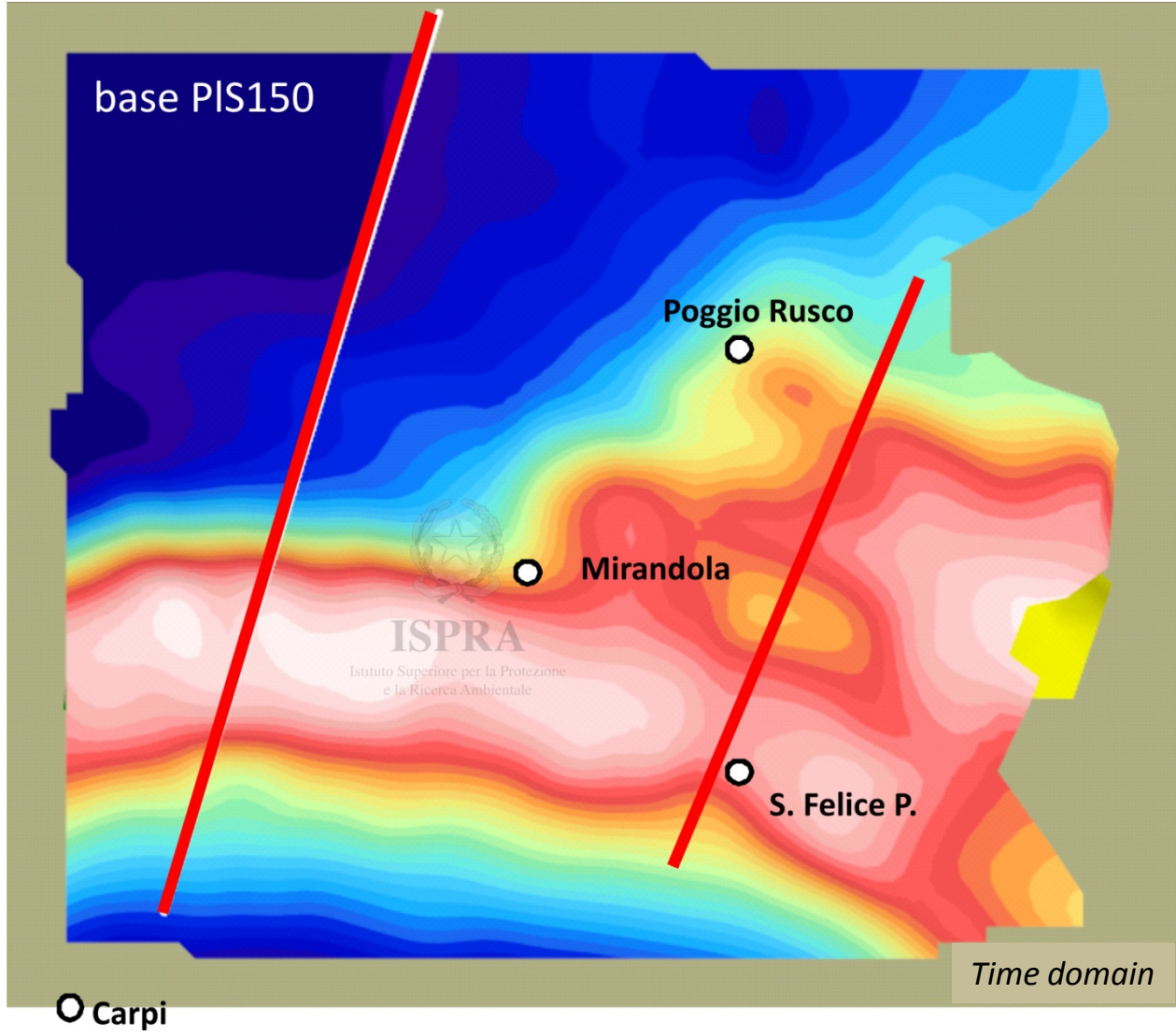
Dataset del Progetto GeoMol



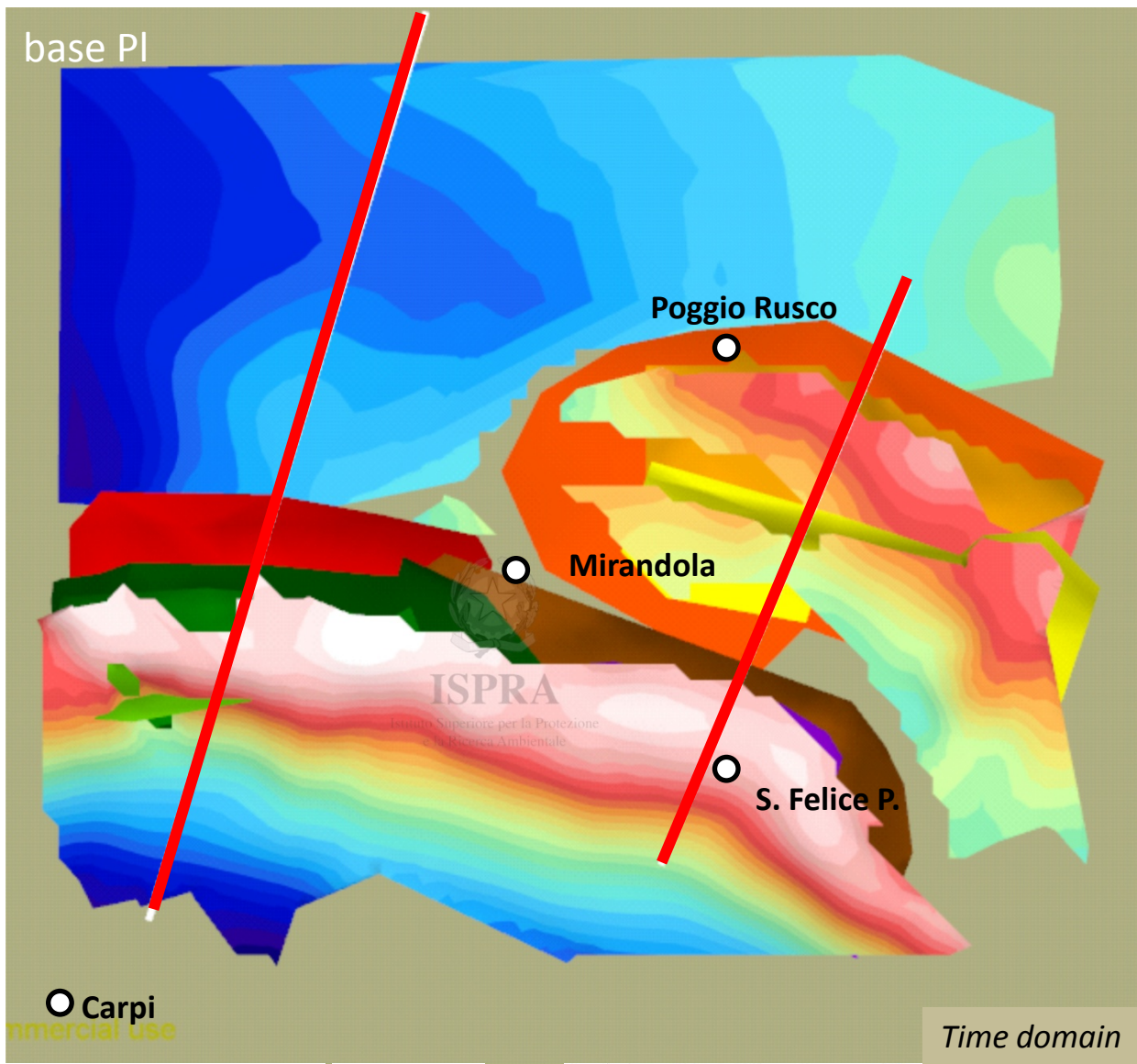
Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



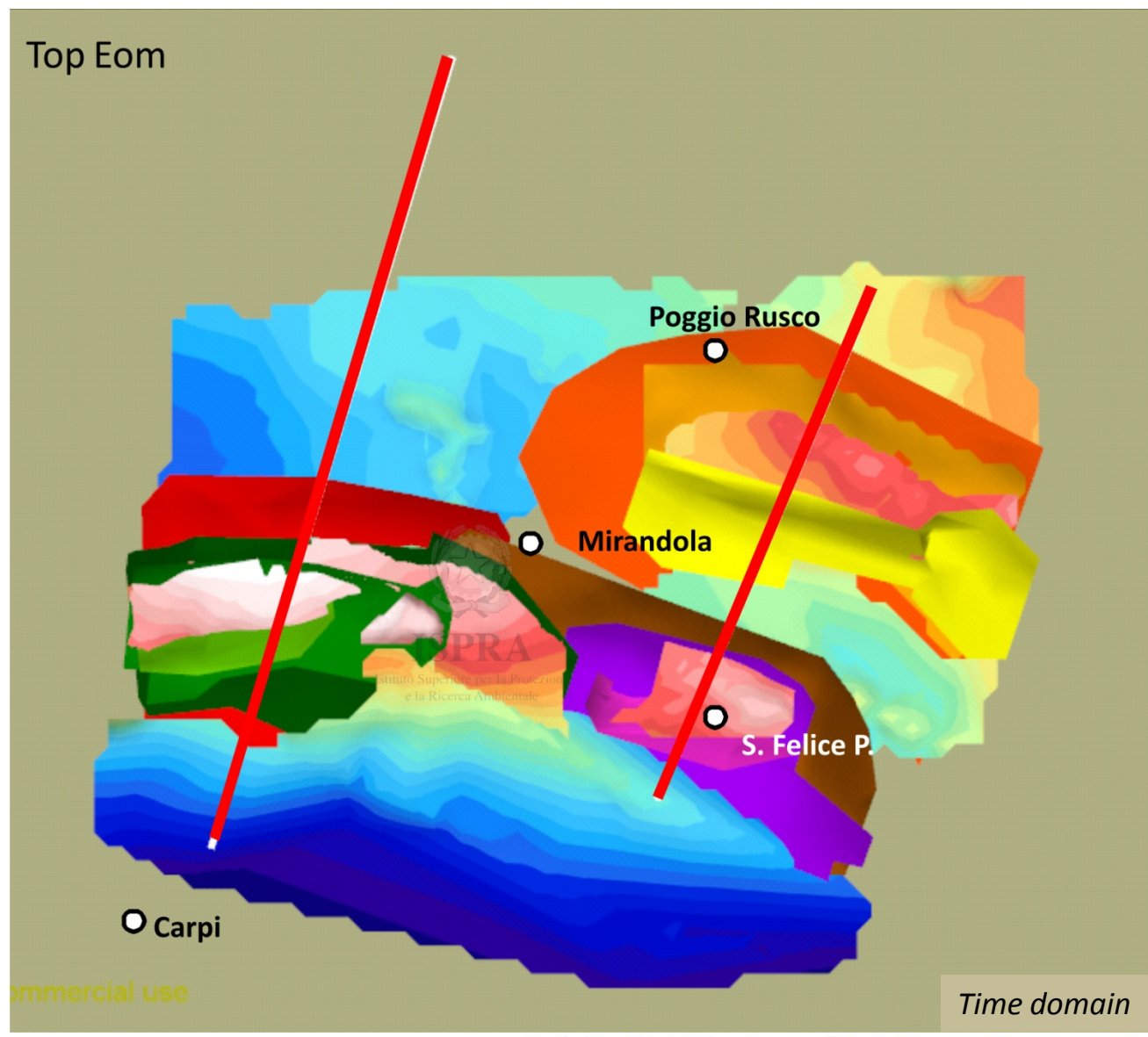
Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



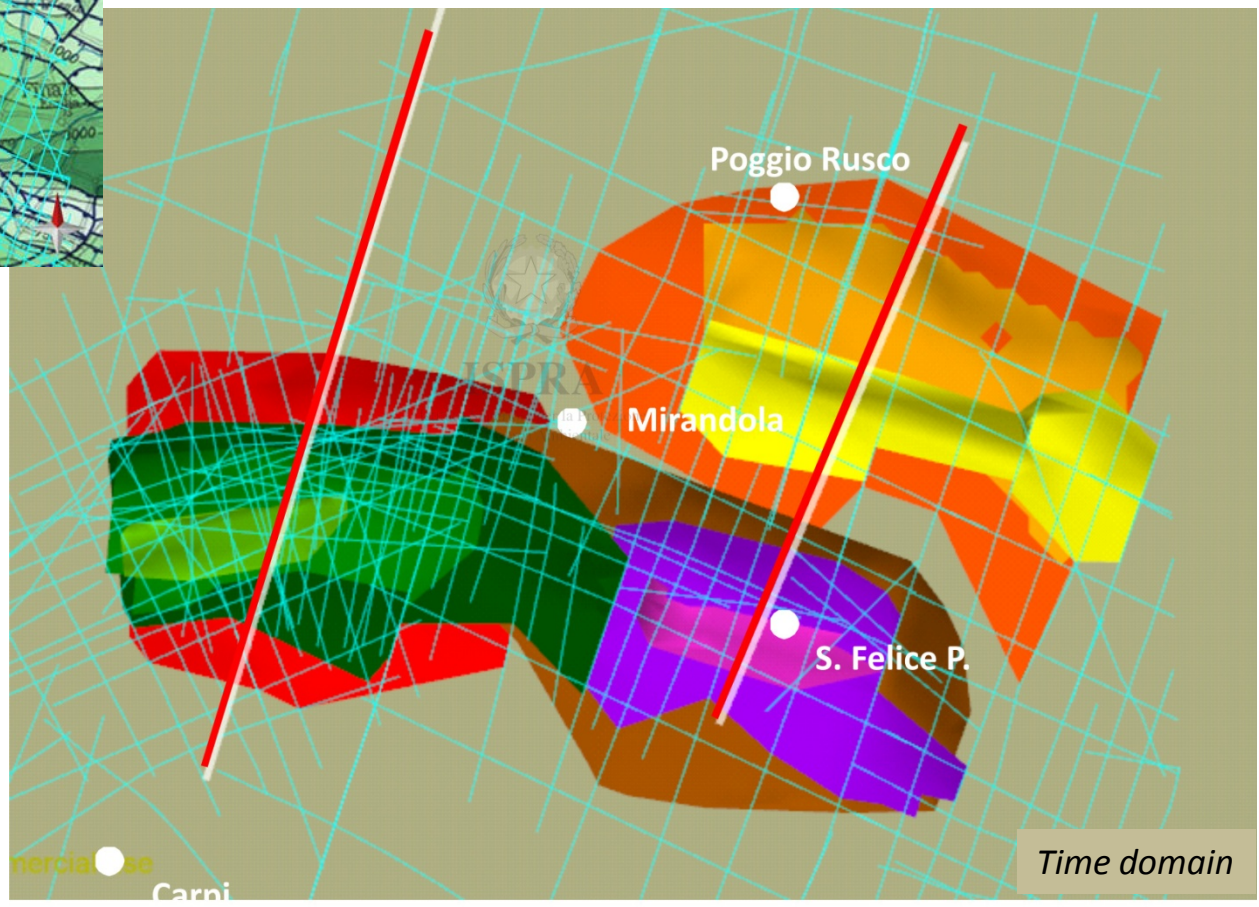
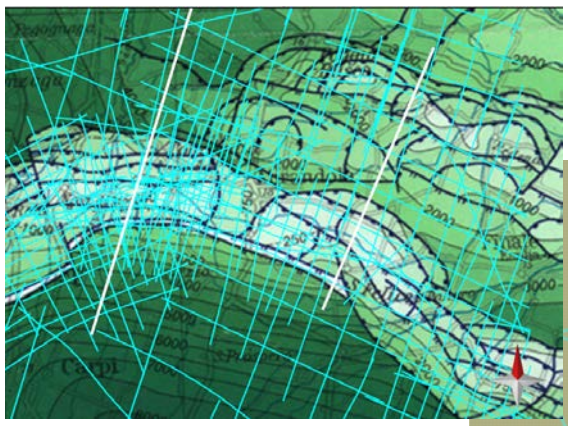
Time domain

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

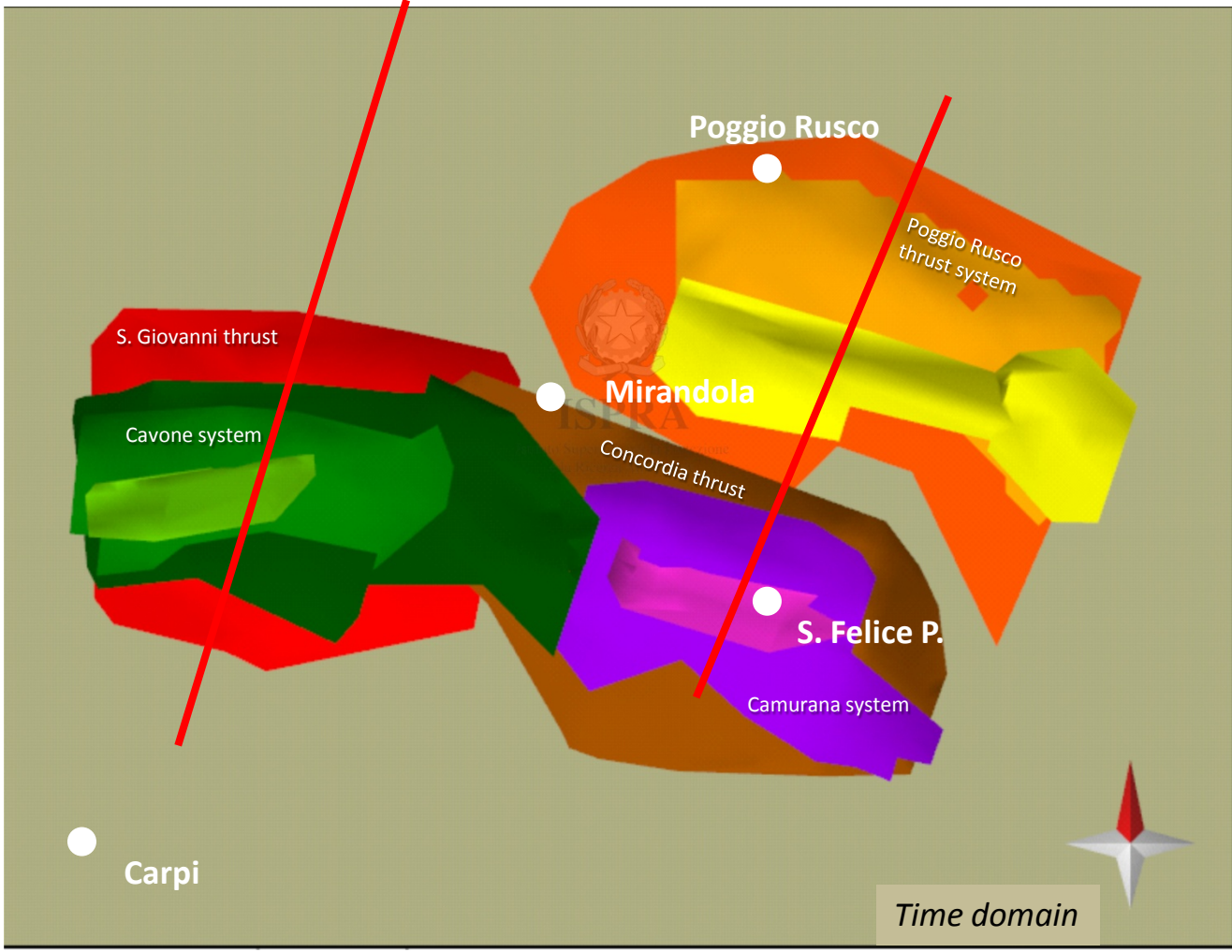




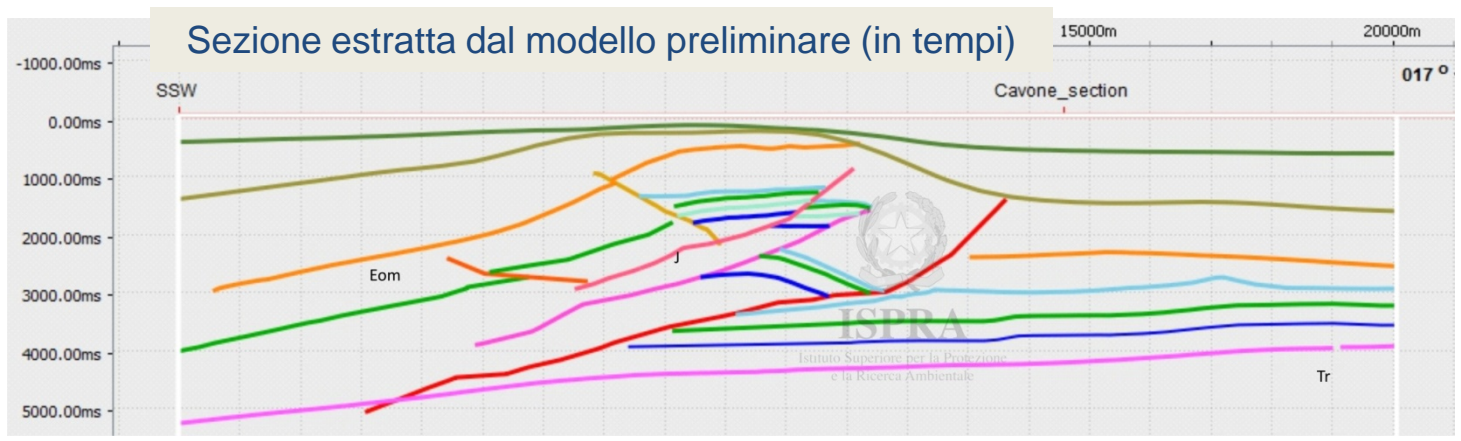
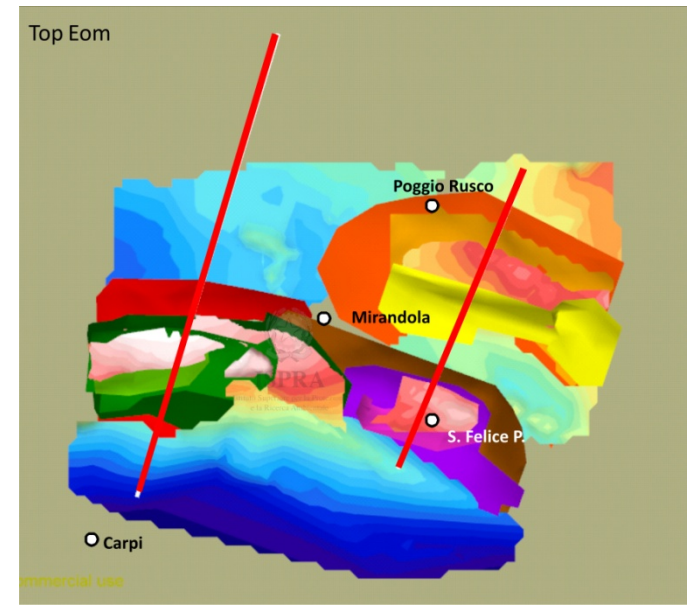
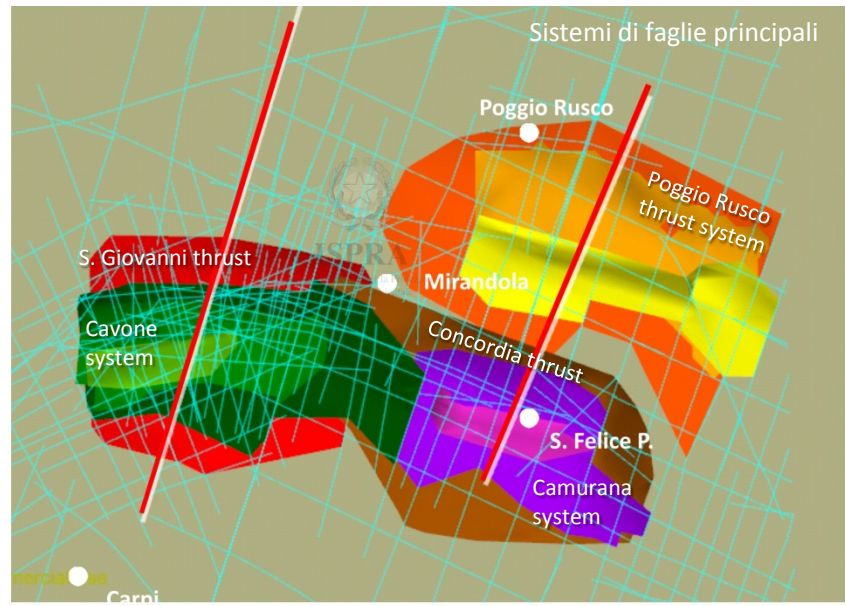
Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

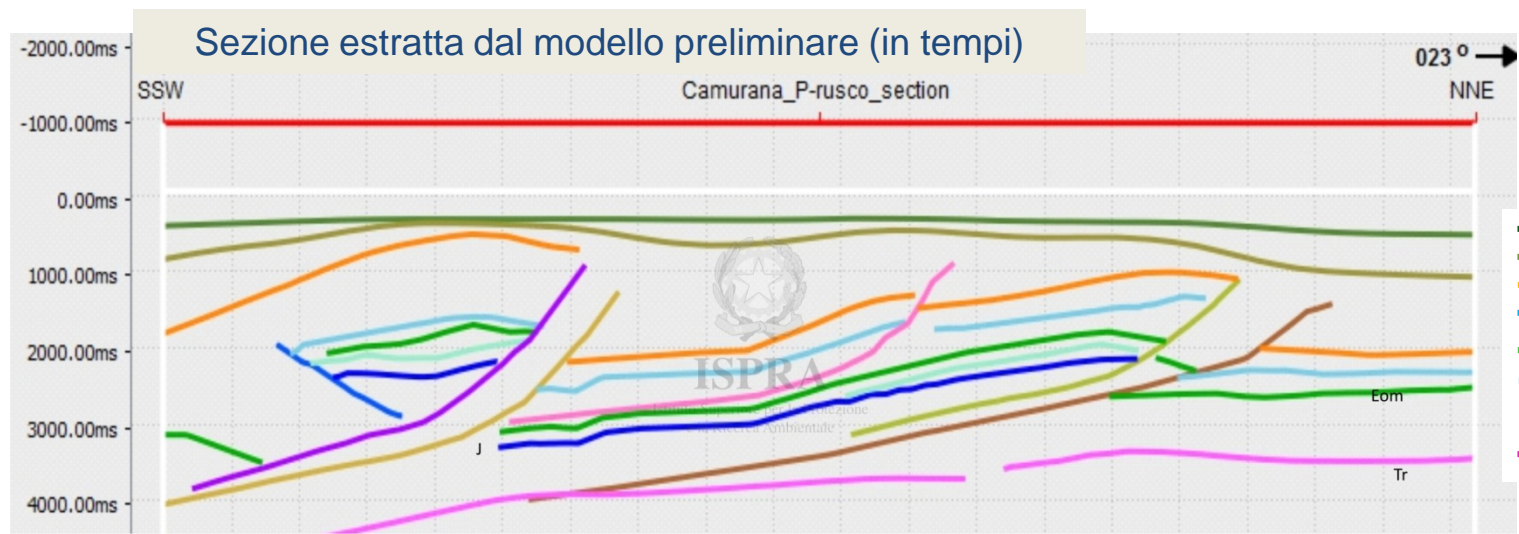
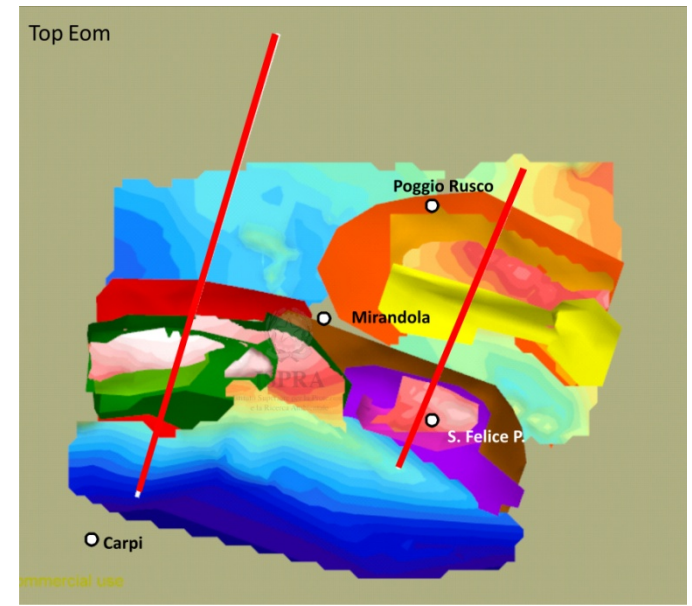
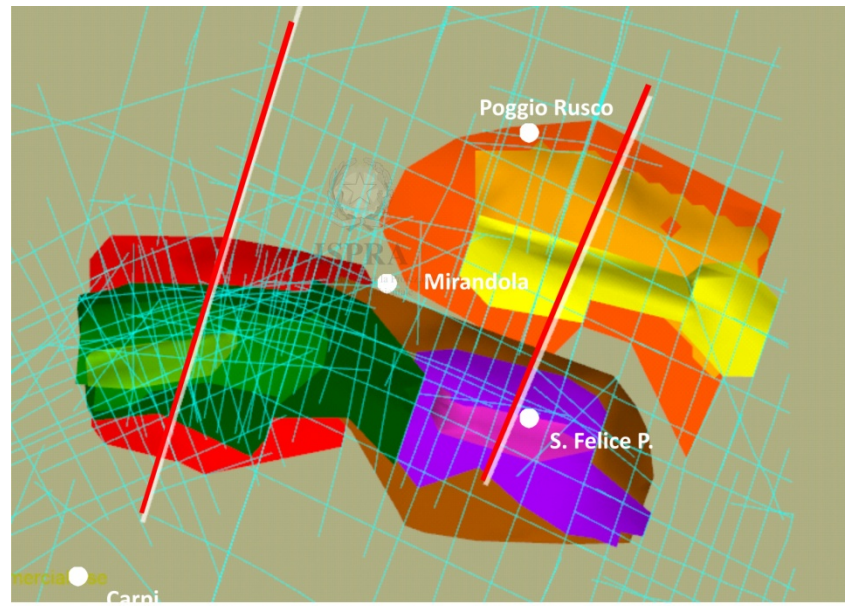


Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



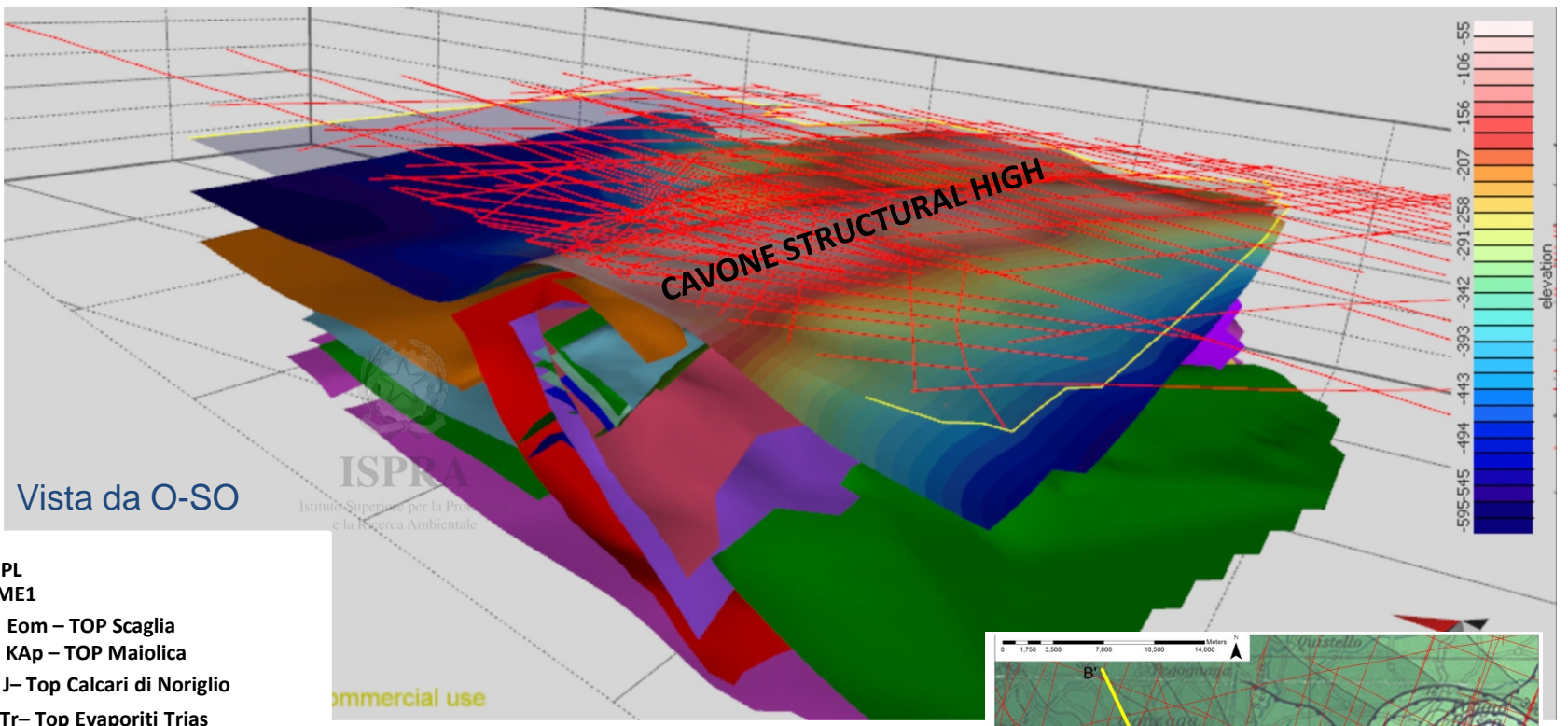
- PLS087
- PLS150
- PL
- ME1
- Eom – TOP Scaglia
- KAp – TOP Maiolica
- J– Top Calcari di Noriglio
- Tr– Top Evaporiti Trias

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

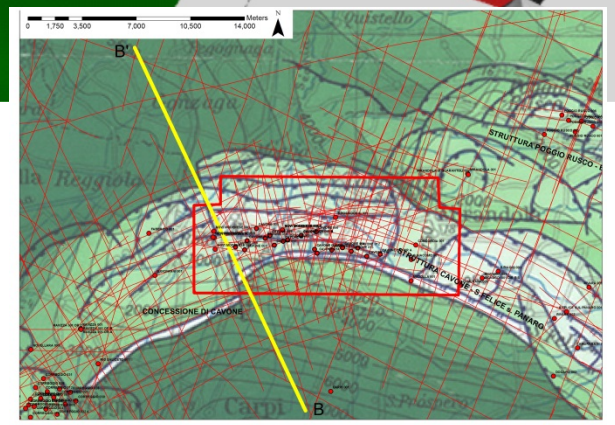


- PLS087
- PLS150
- PL
- ME1
- Eom – TOP Scaglia
- KAp – TOP Maiolica
- J– Top Calcari di Noriglio
- Tr– Top Evaporiti Trias

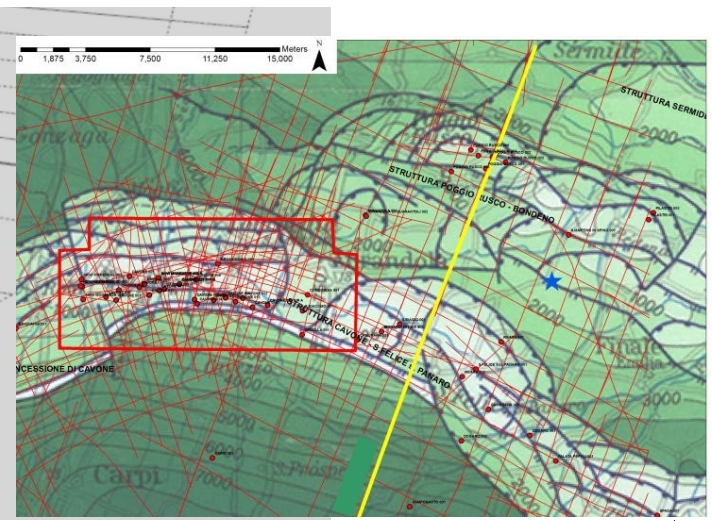
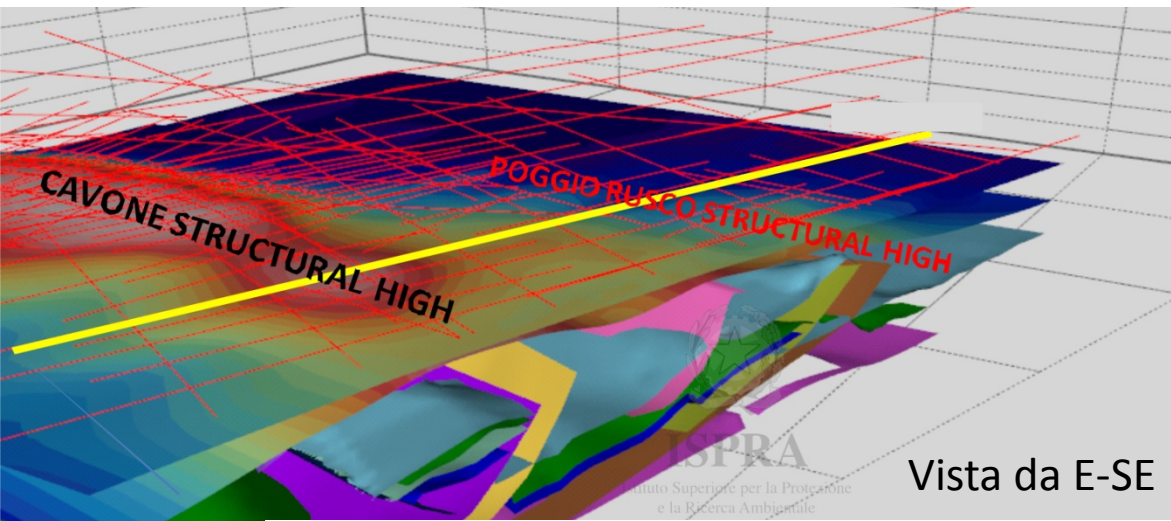
Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



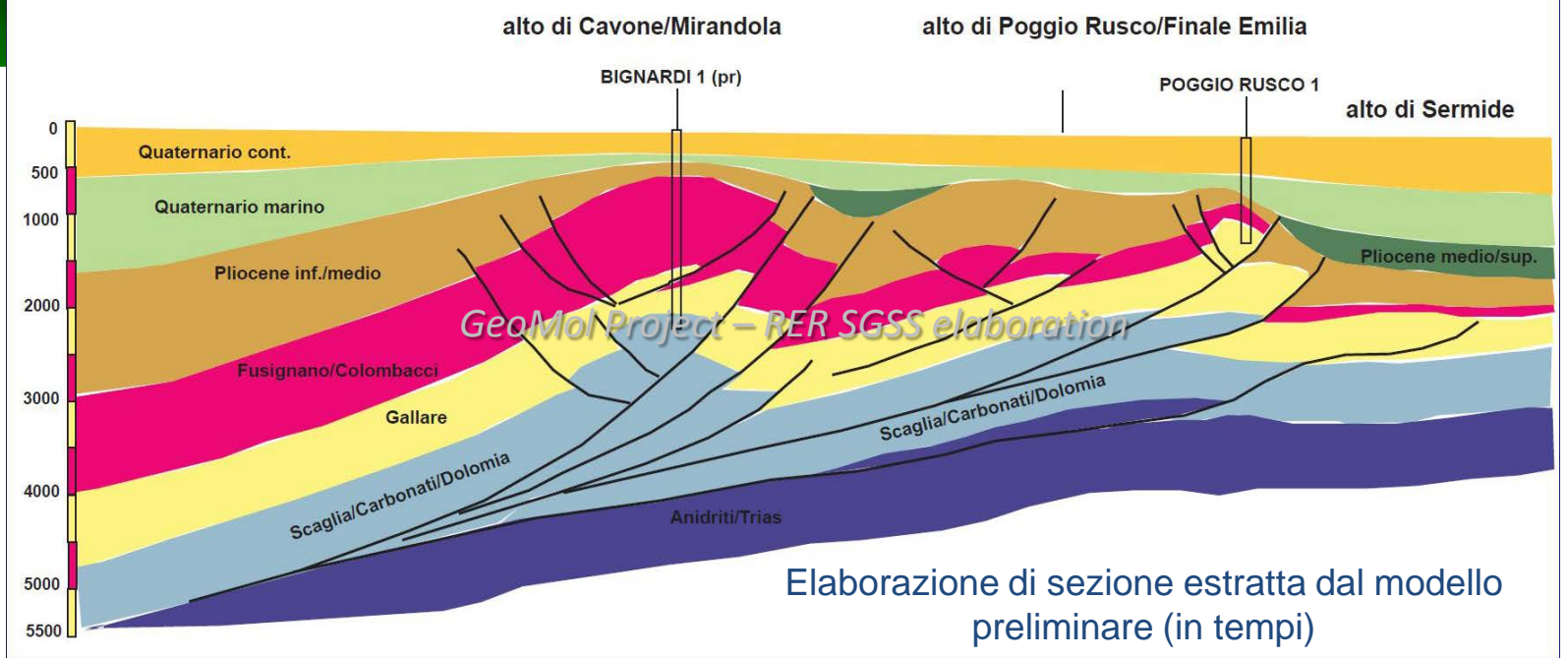
- PL
- ME1
- Eom – TOP Scaglia
- KAp – TOP Maiolica
- J– Top Calcari di Noriglio
- Tr– Top Evaporiti Trias



Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

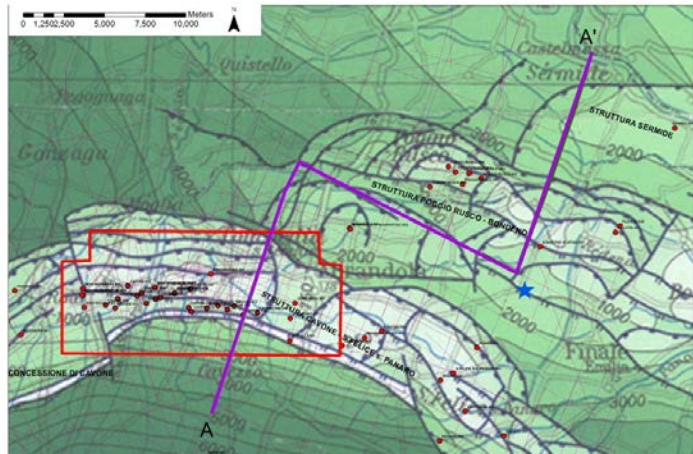


Vista da E-SE

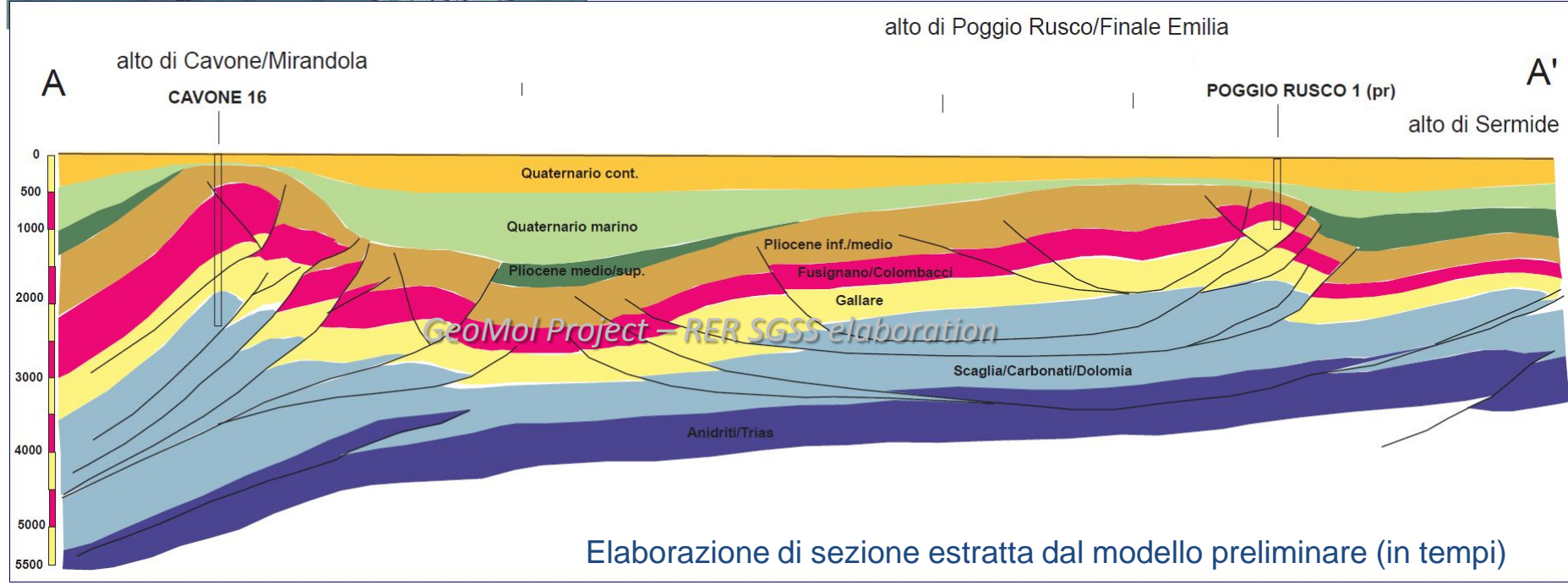


Elaborazione di sezione estratta dal modello
preliminare (in tempi)

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International



Profilo dip-strike-dip interpretato passante per gli alti strutturali di Cavone, Poggio Rusco e Sermide



Elaborazione di sezione estratta dal modello preliminare (in tempi)

Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International