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The Italian view on OneGeology Europe and INSPIRE

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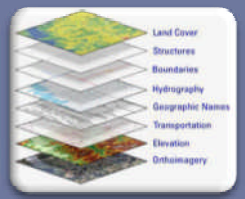
OneGeology-Europe addresses

Who's worked on it?

1:1M pan-European Scientific Data Specification, Identification and Sourcing working group (WP 3)



Specification for geological spatial data

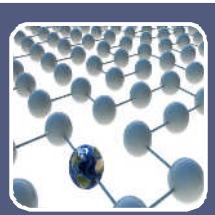
Realization of an interoperable 1:1M scale dataset

Make progress in scientifically harmonising the dataset, including conflict resolution across political boundaries

Why harmonise?

The INSPIRE directive starts from the consideration that:

- Many initiatives are taken at national and Community level to collect, harmonise or organise the dissemination or use of spatial information.



Art. 7, Chapt. 3: Interoperability of Spatial Data Sets and Services

- Implementing rules laying down technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and services .... shall be adopted

Relevant user requirements, existing initiatives and international standards for the harmonisation of spatial data sets .... shall be taken into account in the development of the implementing rules

Where organisations established under international law have adopted relevant standards to ensure interoperability or harmonisation of spatial data sets and services, these standards shall be integrated

Which procedure?

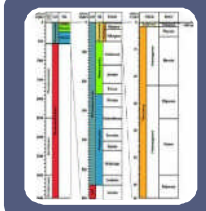
Analysis of individual datasets

Realization of a common vocabulary

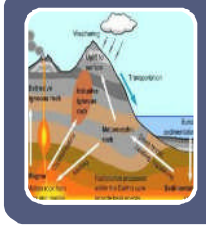
Comparison and adaptation to the GeoSciML vocabulary

Vocabulary topics, themes, ...

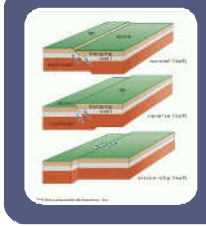
Lithology



Geochronology (age)



Genesis (necessary for Quaternary)



Structures and faults

Yellow=mandatory
White=optional

- Lithology
- Age
- EventEnvironment
- EventProcess
- OrogenicEvent
- MetamorphicFacies
- MetamorphicGrade
- GeologicUnitType
- GeologicUnitMorphology
- GeologicUnitPartRole
- ProportionTerms
- ContactType
- FaultType
- FeatureObservationMethod
- MappedFeatureObservationMethod

…., terms and definitions

Table 4-6: The 1G-E vocabulary for Sedimentary material (continued).

1G-E ID	1G-E Term	1G-E Broader Concept	Definition	Source	CGI_URN	Complete URN
1.2.2.3.1.1.1	Dolomite	dolomitic_or_magnesian_sedimentary_rock	Pure carbonate sedimentary rock with a ratio of magnesium carbonate to calcite (plus aragonite) greater than 1. Synonym: dolostone.	CGI SimpleLithology, 2010.	dolostone	urn:cgi:classifier:CGI:SimpleLithology:201001:dolostone
1.2.2.3.1.2	Limestone	pure_carbonate_sedimentary_rock	Pure carbonate sedimentary rock with a calcite (plus aragonite) to dolomite ratio greater than 1 to 1. Includes limestone and dolomitic limestone. SeeAlso: dolomitic limestone.	CGI SimpleLithology, 2010.	limestone	urn:cgi:classifier:CGI:SimpleLithology:201001:limestone
1.2.2.3.1.2.1	Chalk	limestone	A generally soft, white, very fine-grained, extremely pure, porous limestone. It forms under marine conditions from the gradual accumulation of skeletal elements from minute planktonic green algae (coccoliths), associated with varying proportions of larger microscopic fragments of bivalves, foraminifera and ostracods. It is common to find flint and chert nodules embedded in chalk.	Harris, 2009.	chalk	urn:cgi:classifier:CGI:SimpleLithology:201001:chalk
1.2.2.3.1.2.2	Travertine	limestone	Biotically or abiotically precipitated calcium carbonate, from spring-fed, heated, or ambient-temperature water. May be white and spongy, various shades of orange, tan or gray, and ranges to dense, banded or laminated rock. Macrophytes, bryophytes, algae, cyanobacteria and other organisms often colonize the surface of travertine and may be preserved, to produce the porous varieties. SeeAlso: calcareous sinter, onyx marble, tufa.	Neuendorf et al., 2005; Chafetz & Folk, 1984.	travertine	urn:cgi:classifier:CGI:SimpleLithology:201001:travertine
1.2.2.3.2	Impure carbonate sedimentary rock	carbonate_sedimentary_rock	Sedimentary rock in which between 50 and 90 % of the primary and/or recrystallized constituents are composed of carbonate minerals. Synonym: marlstone. SeeAlso: marlstone.	CGI SimpleLithology, 2010.	impure_carbonate_sedimentary_rock	urn:cgi:classifier:CGI:SimpleLithology:201001:impure_carbonate_sedimentary_rock
1.2.2.3.2.1	Impure limestone	impure_carbonate_sedimentary_rock	Impure carbonate sedimentary rock with a calcite (plus aragonite) to dolomite ratio greater than 1. Synonym: calcareous marlstone. SeeAlso: marlstone.	CGI SimpleLithology, 2010.	impure_limestone	urn:cgi:classifier:CGI:SimpleLithology:201001:impure_limestone

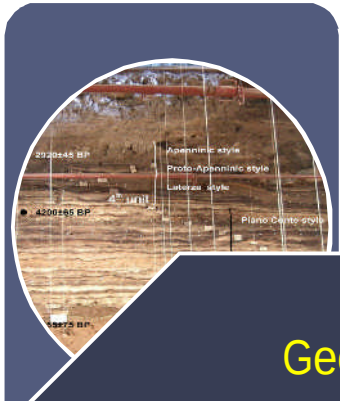
Geologic unit: composition part

Composition part 1

Lithology

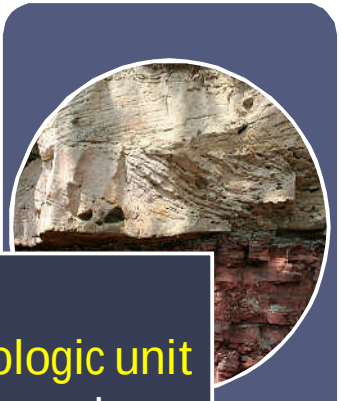
Role of composition part

Proportion of composition part



Role

Proportion of composition part



tion

osition

Proportion of composition part

Composition part 4

Lithology

Role of composition part

Proportion of composition part

Composition part 5

Lithology

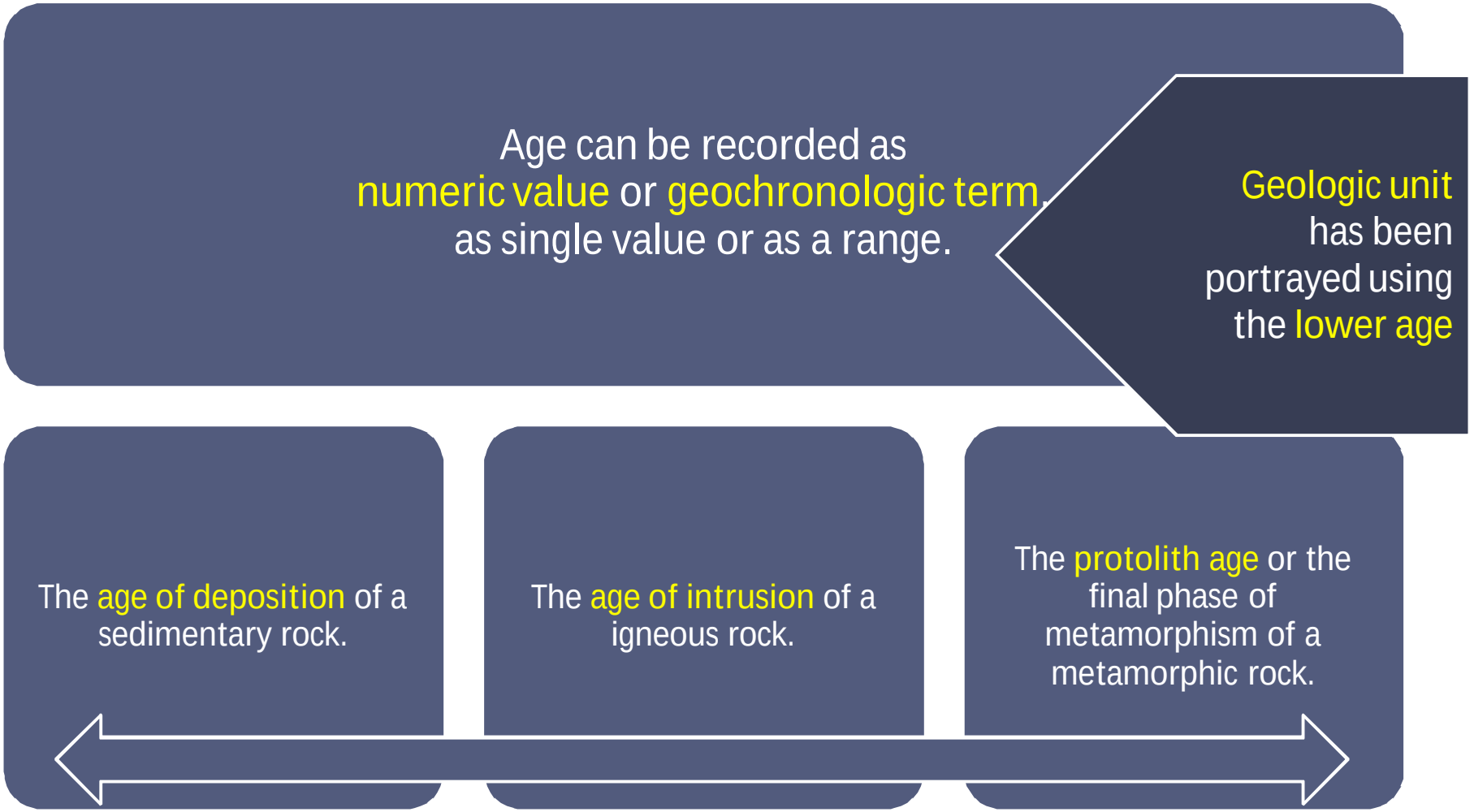
Role of composition part

Proportion of composition part

Geologic unit as been portrayed using Lithology of Composition part 1

from 1 up to 5

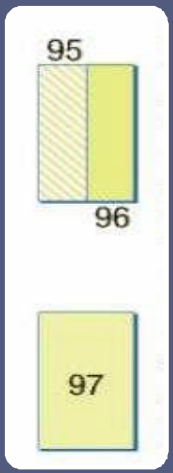
Geologic unit: geologic event



Italian dataset features

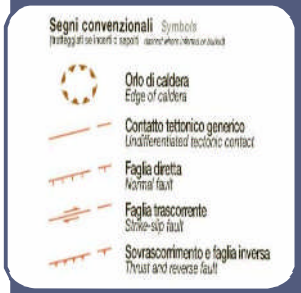
- 1:1M scale geological map
- Realized in 2008, printed in 2011
- Bedrock and Quaternary deposits
- Legend in Italian and English

Legend features



3 levels of subdivisions for 104 units:

- lithogenetic
- depositional domains (+ orogenic cycle)
- lithological (+ chrono attribute, sometimes at Age level)



Structural elements:

fault, thrust and caldera

Examples of critical units description

SEDIMENTARY ROCKS	criticity
1 Deltaic, alluvial and coastal plain deposits; aeolian deposits	description based on depositional environment
2 Terraced alluvial deposits; aeolian deposits; travertines	mixed description: depositional environment & lithology
3 Marls, pelites, sands and conglomerates, with gypsum	many lithologies, different grain size, plus subordinate lithology
4 Limestones, marls, pelites, sandstones and conglomerates	very different lithologies (ranging from limestone to conglomerate)
5 Ophiolites: peridotites, gabbros, basalts, serpentinites and ophiolitic breccias	ophiolites: as it is or something else?
VOLCANIC ROCKS	
6 Rhyolites, rhyodacites, pantellerites with subordinate quartz latites and trachytes: pyroclastic rocks and lavas	no problem: we can use petrology or volcanic facies
PLUTONIC ROCKS	
7 Tonalites, quartz monzonites, monzonites, monzogabbros and monzodiorites	different petrology
METAMORPHIC ROCKS	
8 Phyllites, micaschists with subordinate quartzites, gneisses and marbles	very different lithologies (ranging from phyllite to gneiss and marble)

Lithology

ROCCE SEDIMENTARIE
SEDIMENTARY ROCKS

DEPOSITI MARINI E CONTINENTALI TARDO E POST-OROGENESI ALPINA E CONTINENTALI PLIO-QUATERNARI *LATE AND POST-ALPINE OROGENY MARINE AND CONTINENTAL DEPOSITS, PLIO- QUATERNARY CONTINENTAL DEPOSITS*

Depositi continentali e paralici *Continental and paralic deposits*

1 — Depositi deltizi, delle piane alluvionali e costiere; depositi eolici
Olocene
Deltaic, alluvial and coastal plain deposits; aeolian deposits
Holocene

2 — Alluvioni terrazzate; depositi eolici; travertini
Pleistocene, localmente fino all'Olocene
Terraced alluvial deposits; aeolian deposits; travertines
Pleistocene, locally up to Holocene

Interpretative problems

- #1 description based on depositional environment
- #2 mixed description: depositional environment & lithology

Lithology

Problems in definition of "main" lithology

- #7 many lithologies, different grain size, plus subordinate lithology
- #8 very different lithologies (ranging from limestone to conglomerate)

Lithology

15

Torbiditi arenacee e pelitico-arenacee; calcari marnosi, marne e peliti
Pliocene inferiore
Arenaceous and pelitic-arenaceous turbidites; marly limestones, marls and pelites
Lower Pliocene

16

Torbiditi arenacee e arenaceo-pelitiche, talvolta marne bituminose, gessi e gessareniti torbiditiche; a luoghi nella parte inferiore intercalazioni di calcari marnosi, marne e brecce carbonatiche
Alla base marne calcaree, marne e peliti emipelagiche del Serravalliano superiore-Messiniano inferiore
Messiniano
Arenaceous and arenaceous-pelitic turbidites, sometimes bituminous marls, gypsum and turbiditic gypsarenites; locally interbedded marly limestones, marls and carbonate breccias in the lower part
Upper Serravallian-Lower Messinian emipelagic calcareous marls, marls and pelites at the base
Messinian

Problems in interpretation and in definition of "main" lithology

- #15 depositional environment + different lithologies
- #16 depositional environment + very different lithologies

Lithology

Problems in definition of "main" lithology

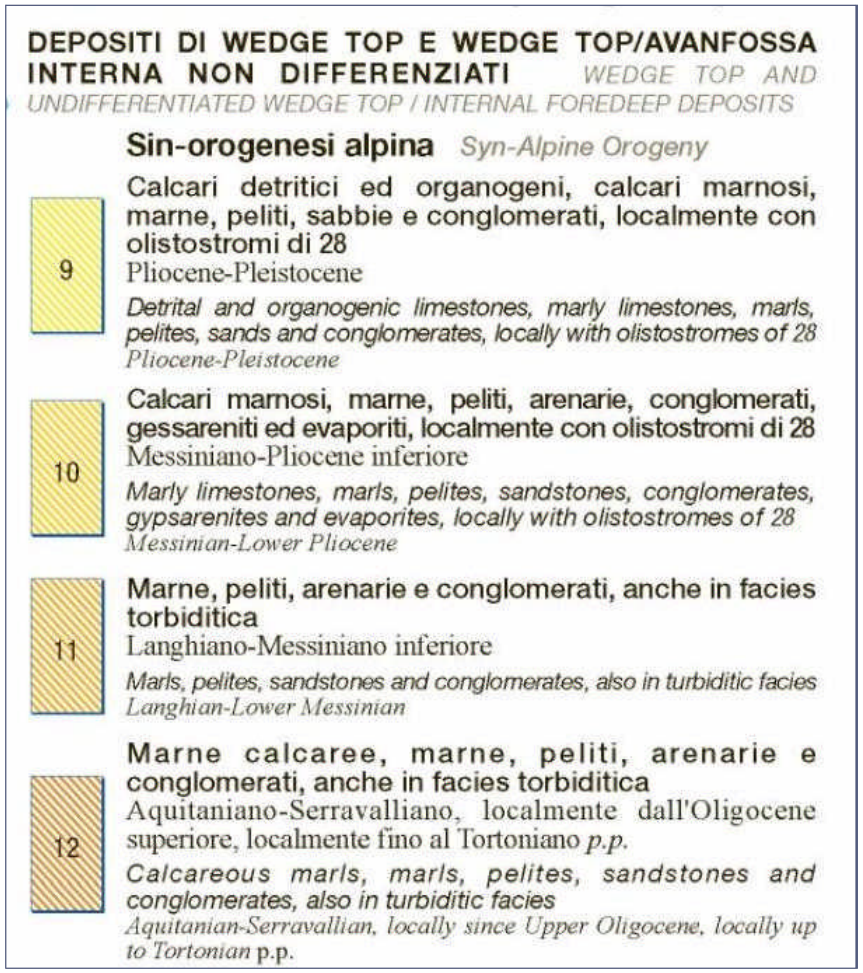
- #98 very different lithologies (ranging from phyllite to gneiss and marble)

Age

Problems in different age level of detail

- #25 defined at level of period (Carboniferous)
- #26 defined at level of epoch (Lower Carboniferous)

Age



Problems in different age level of detail

- #9 detailed at level of epoch
- #10 detailed at level of age
- #11 detailed at level of age/sub-age

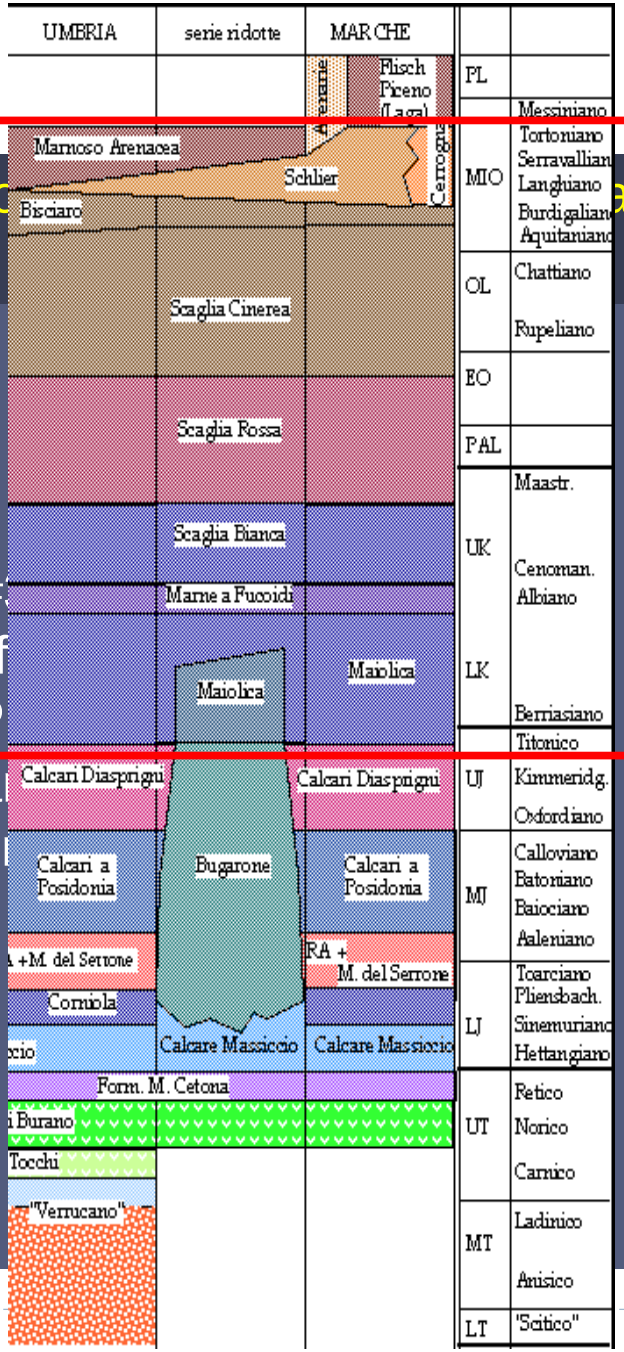
Lithology and Age

34

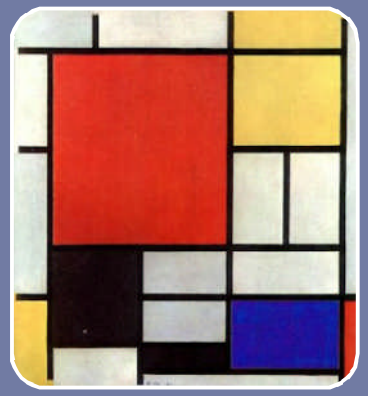
35

Calcari e calcari marnosi con selce, radiolariti, marne calcaree, marne e peliti localmente con intercalazioni di calcareniti torbiditiche (34)
idem, con prevalenti intercalazioni di torbiditi calcarenitiche e arenacee, localmente calcari e marne condensati (35)
Cretacico-Tortoniano, localmente fino al Pliocene

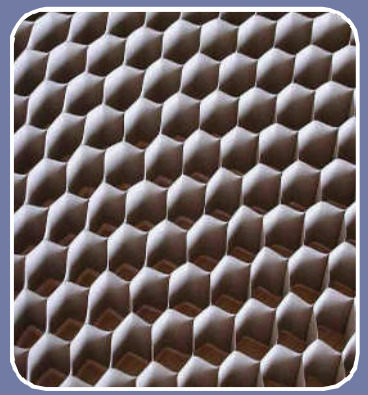
Limestones and marly limestones with chert, radiolarites, calcareous marls, marls and pelites, locally interbedded turbiditic calcarenites (34)
idem, frequently interbedded with calcarenitic and arenaceous turbidites, locally condensed limestones and marls (35)
Cretaceous-Tortonian, locally up to Pliocene



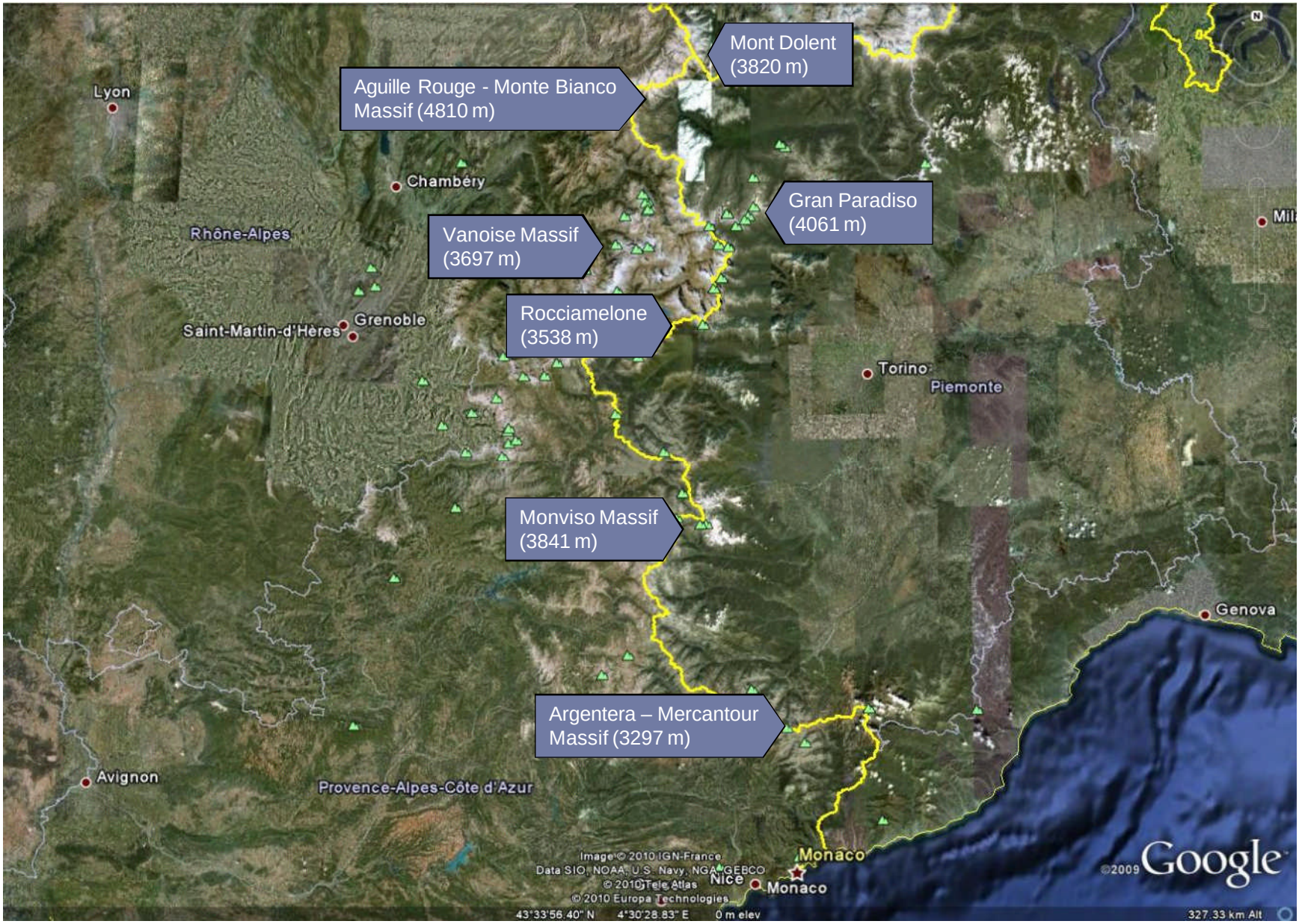
Geometric harmonisation



Geometric consistency along the state border



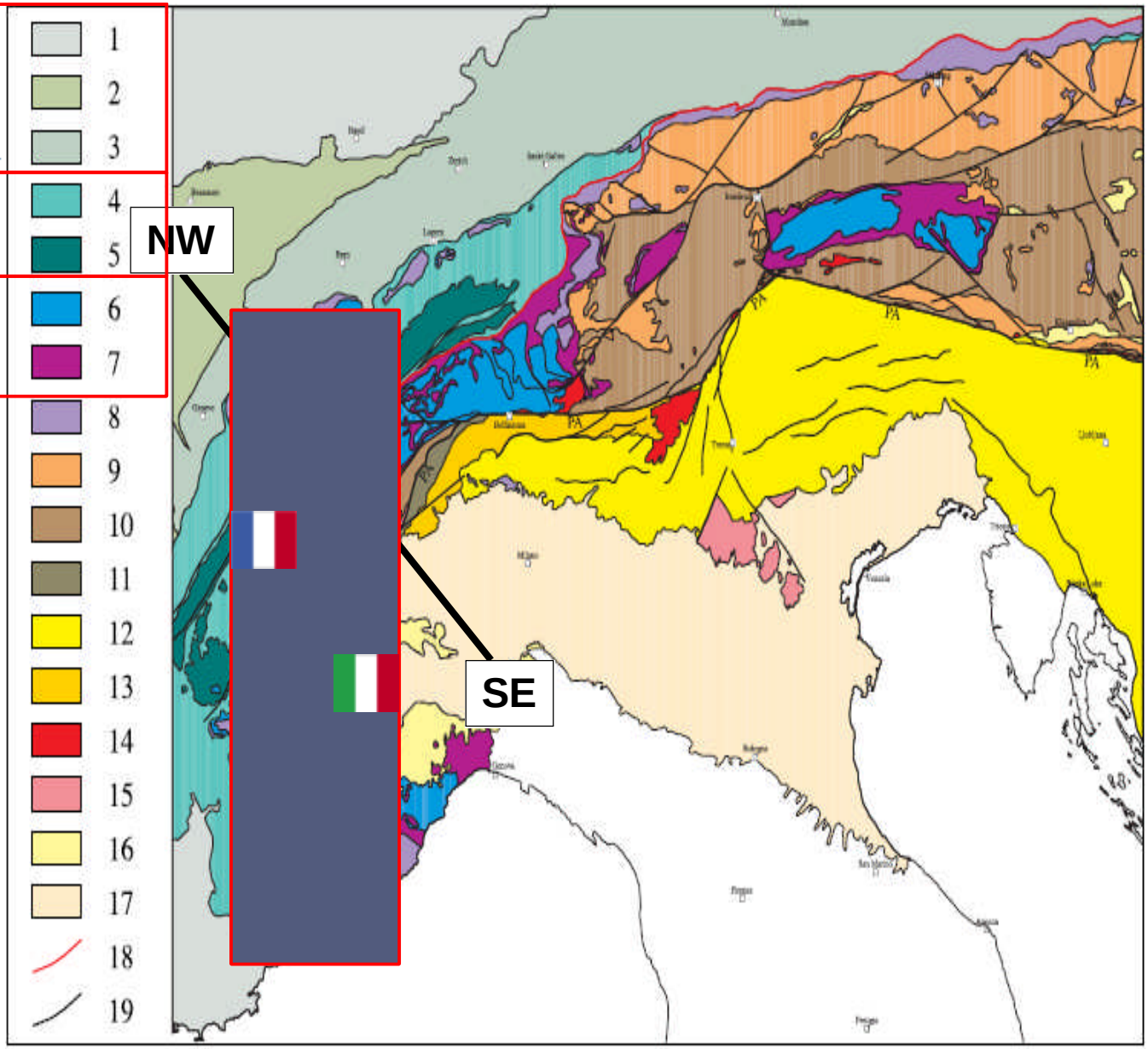
- Geologic unit (lithology) poligons
- Geologic unit (age) poligons
- Structures

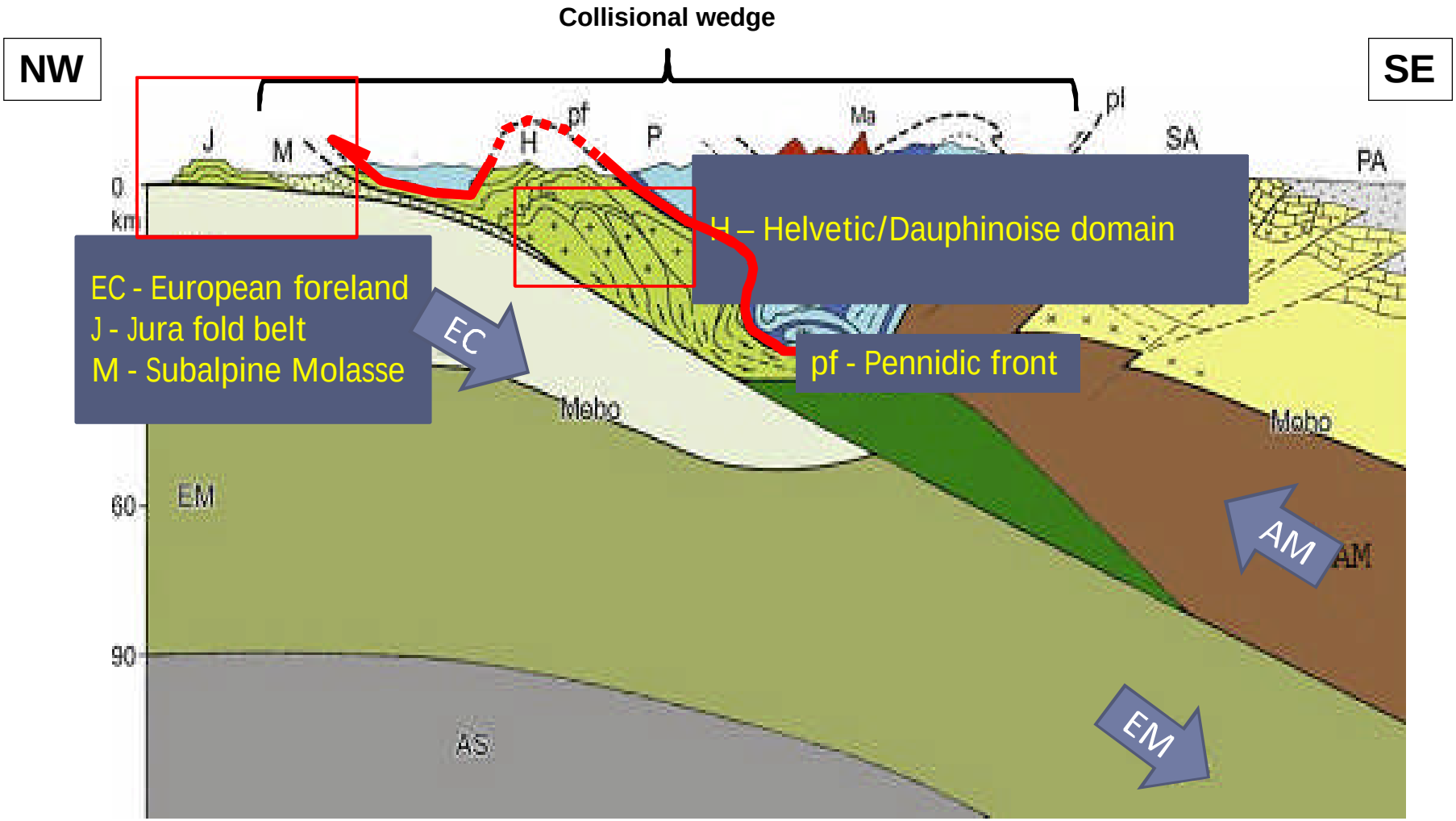

Mont Dolent
(3820 m)
Aguille Rouge - Monte Bianco
Massif (4810 m)
Gran Paradiso
(4061 m)
Vanoise Massif
(3697 m)
Rocciamelone
(3538 m)
Monviso Massif
(3841 m)
Argentera – Mercantour
Massif (3297 m)
Lyon
Chambéry
Rhône-Alpes
Saint-Martin-d'Hères
Grenoble
Torino
Piemonte
Genova
Avignon
Provence-Alpes-Côte d'Azur
Monaco
Nice
Monaco
Image © 2010 IGN-France
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2010 Tele Atlas
© 2010 Europa Technologies
©2009 Google
43°33'56.40" N 4°30'28.83" E 0 m elev
327.33 km Alt

1 - European foreland
2 – Jura fold belt
3 – Subalpine Molasse

4 – Helvetic cover
5 – Helvetic basement

6 - Pennidic nappe
7 - Pennidic ophiolite-bearing nappes

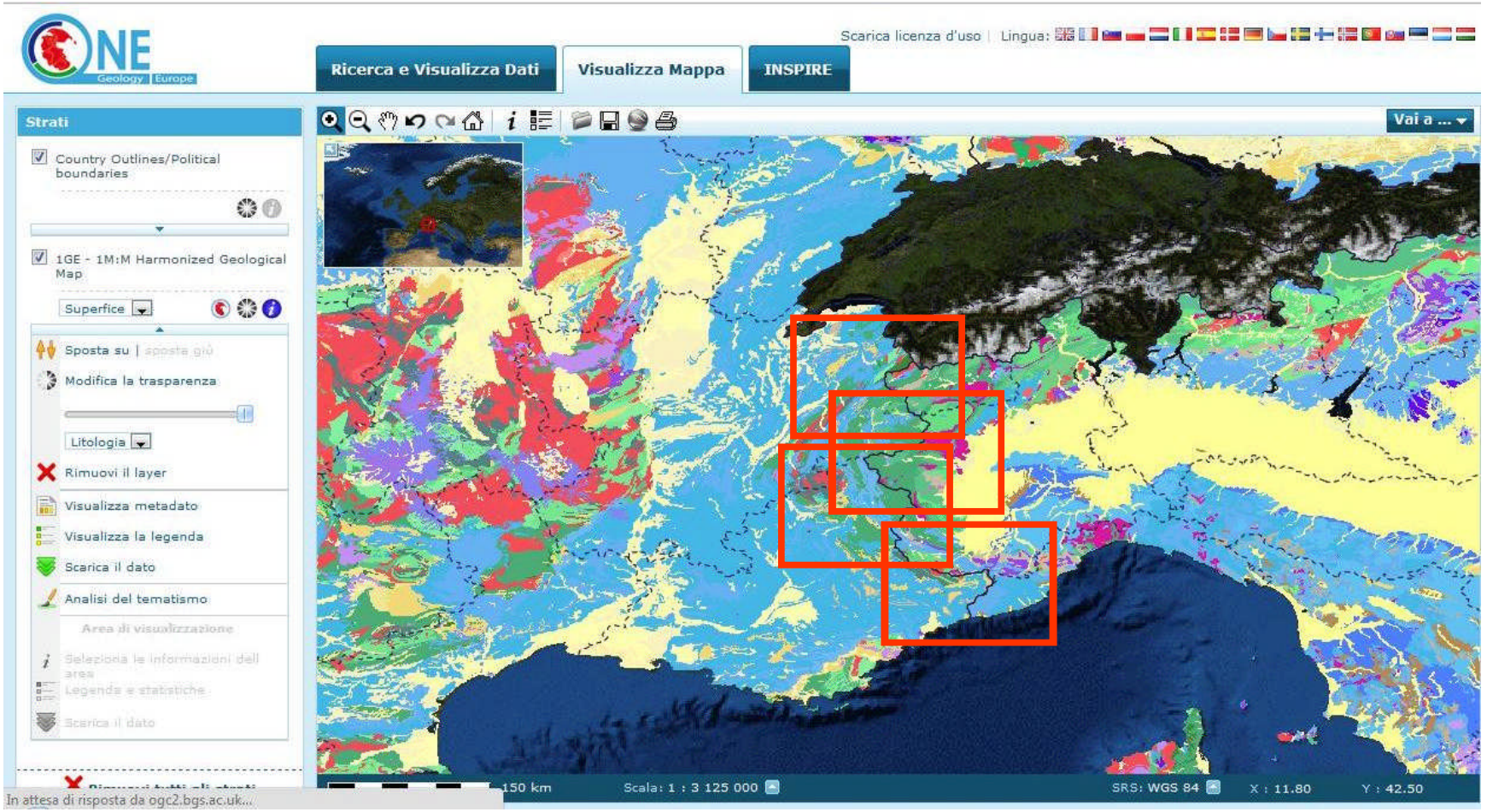


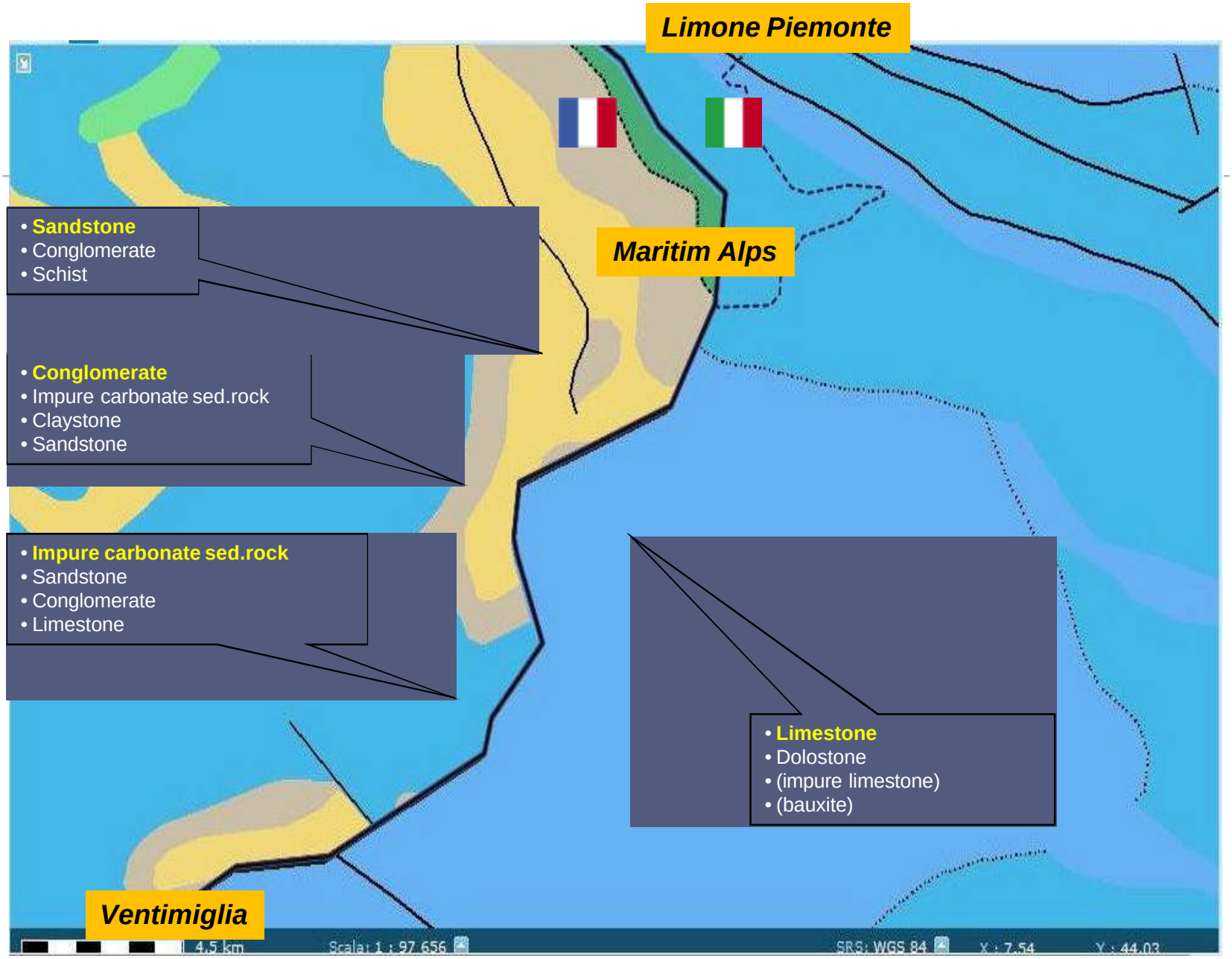


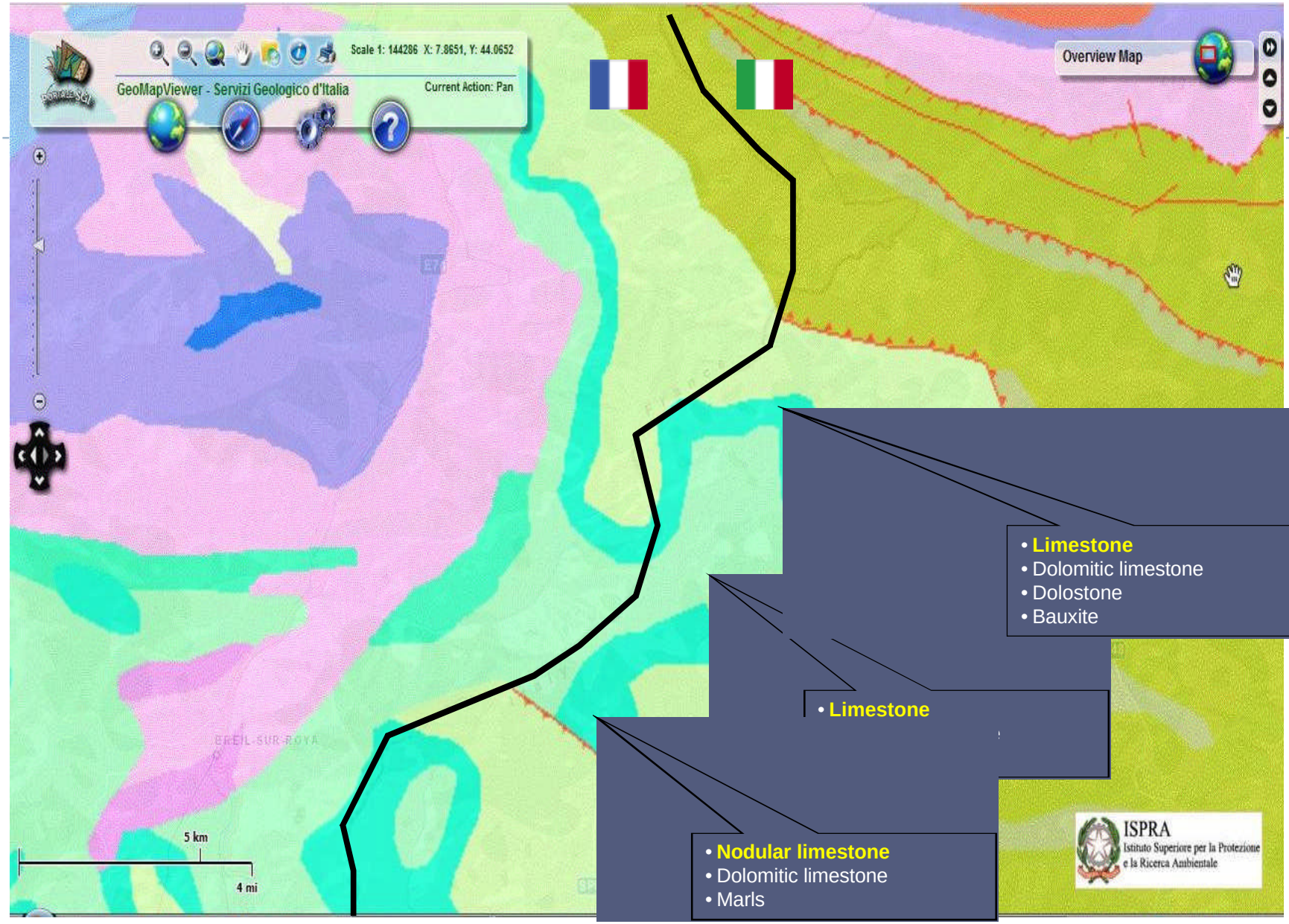
Europe vergent collisional belt

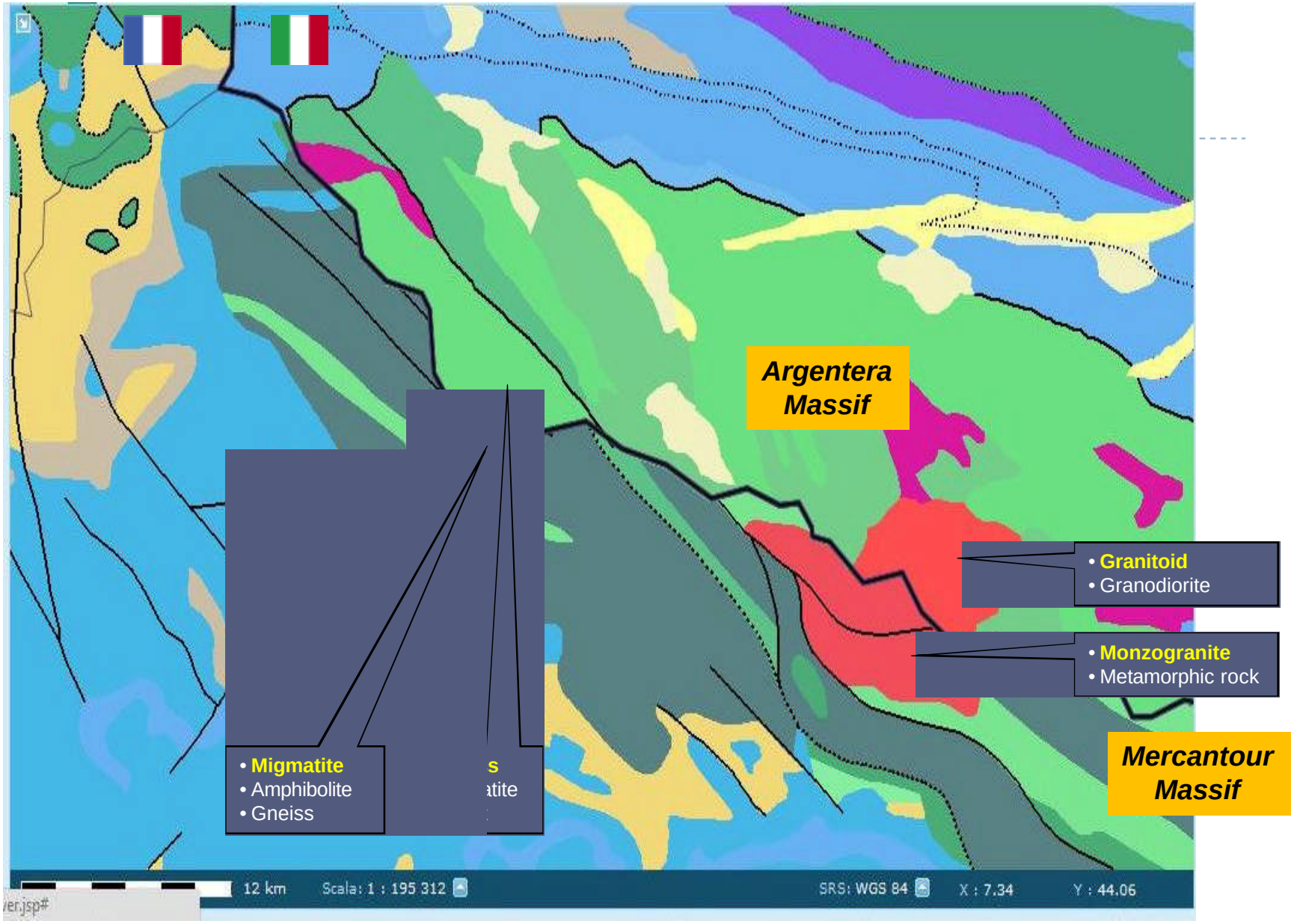
- **Western Austroalpine (WA)**
- **Penninic domain:** continental and ophiolitic (***o***) nappes in western Alpine arc (***P***)
- **Penninic front (*pf*)**
- **Helvetic-Dauphinois domain (*H-D*)**
- **Molasse foredeep (*M*)**
- **Jura belt (*J*)**

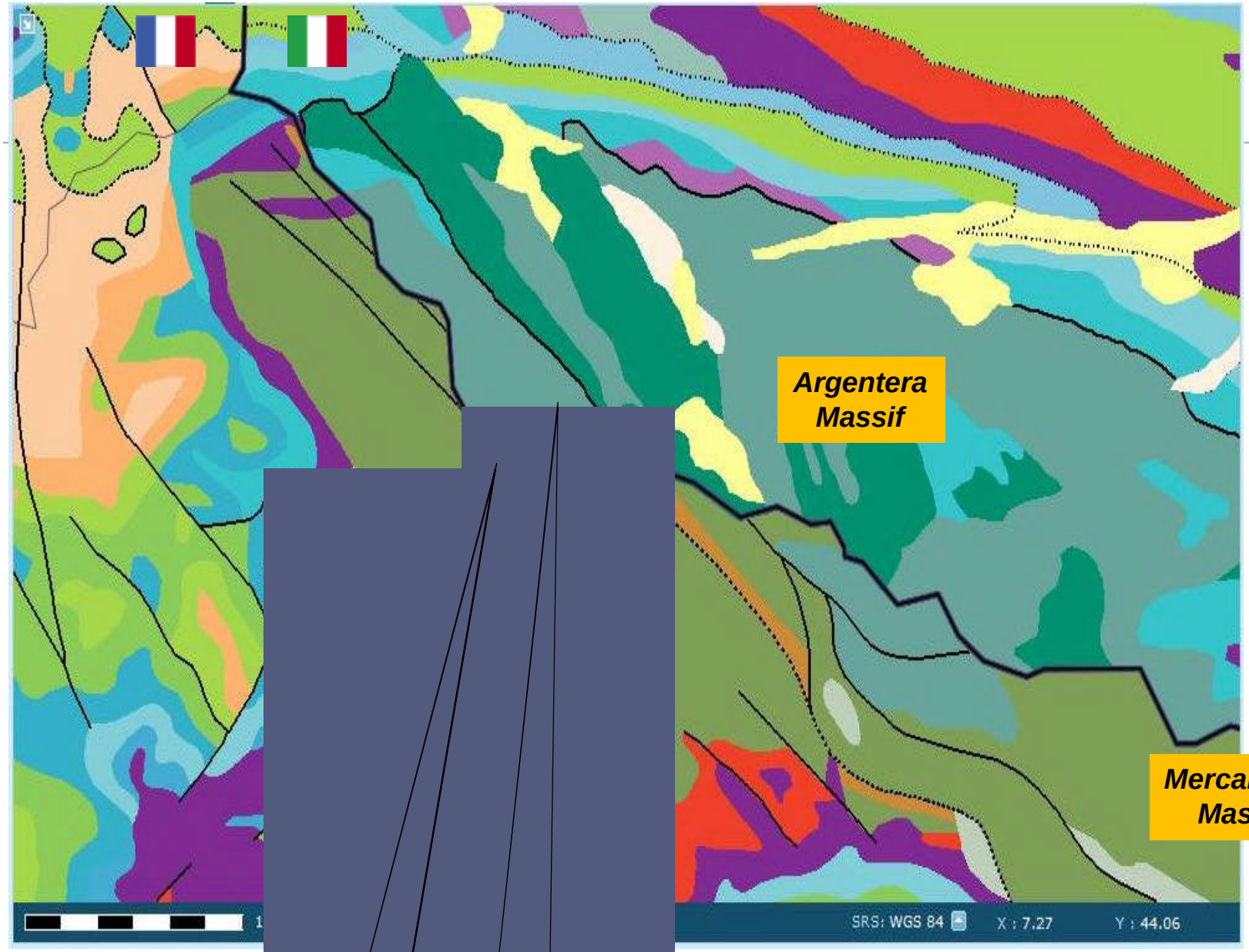
Ma: Cervino-Matterhorn
EC: European crust
EM: European mantle
AS: Asthenosphere
AM: Adriatic mantle

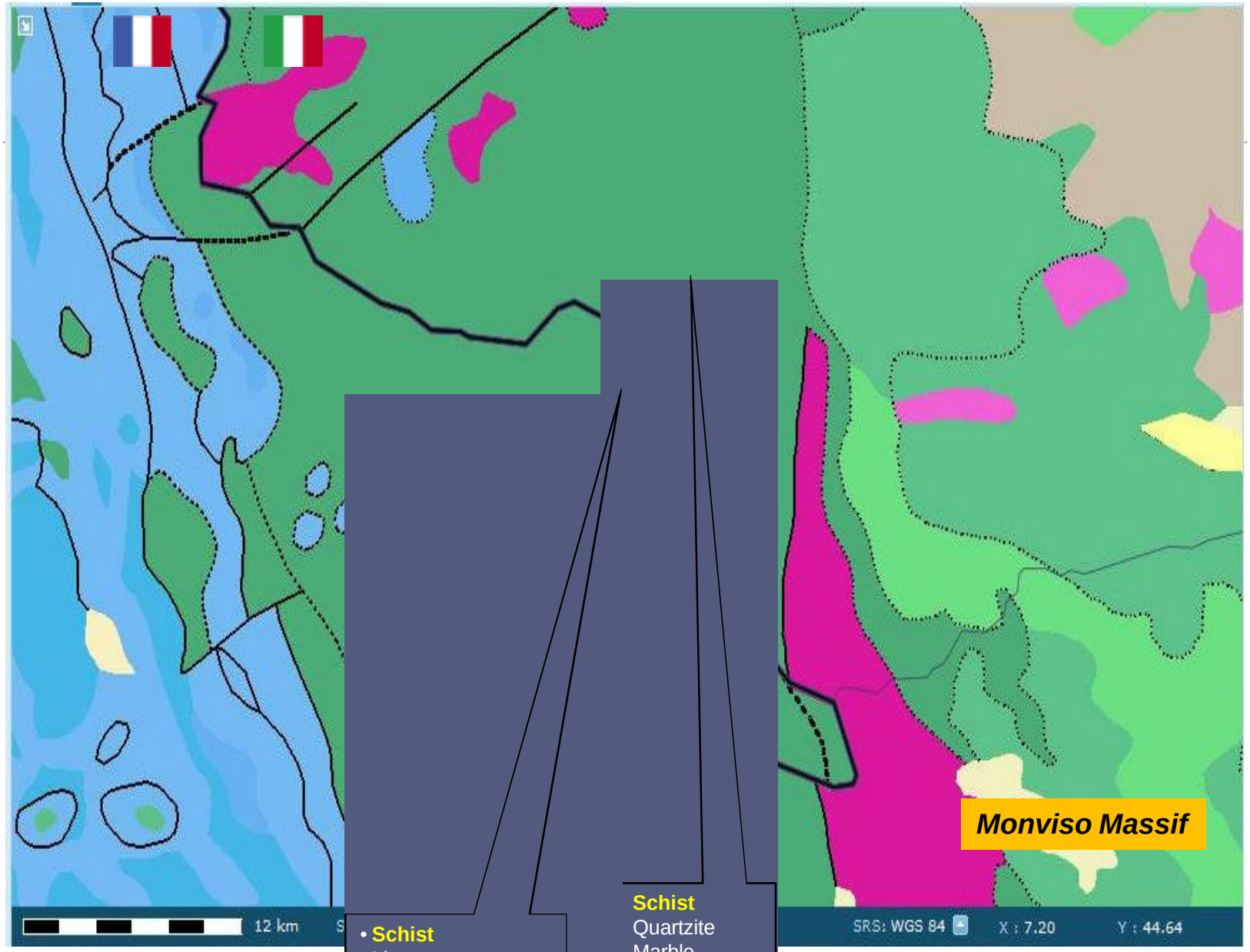

ONE
Geology Europe
Scarica licenza d'uso | Lingua:
Ricerca e Visualizza Dati
Visualizza Mappa
INSPIRE
Strati
Country Outlines/Political boundaries
1GE - 1M:M Harmonized Geological Map
Superfice
Sposta su | sposta giù
Modifica la trasparenza
Litologia
Rimuovi il layer
Visualizza metadato
Visualizza la legenda
Scarica il dato
Analisi del tematismo
Area di visualizzazione
Seleziona le informazioni dell area
Legenda e statistiche
Scarica il dato
Vai a ...
150 km
Scala: 1 : 3 125 000
SRS: WGS 84
X : 11.80
Y : 42.50
In attesa di risposta da ogc2.bgs.ac.uk...


Limone Piemonte
Maritim Alps
• Sandstone
• Conglomerate
• Schist
• Conglomerate
• Impure carbonate sed.rock
• Claystone
• Sandstone
• Impure carbonate sed.rock
• Sandstone
• Conglomerate
• Limestone
• Limestone
• Dolostone
• (impure limestone)
• (bauxite)
Ventimiglia
4,5 km
Scala: 1 : 97 656
SRS: WGS 84
X : 7,54
Y : 44,03

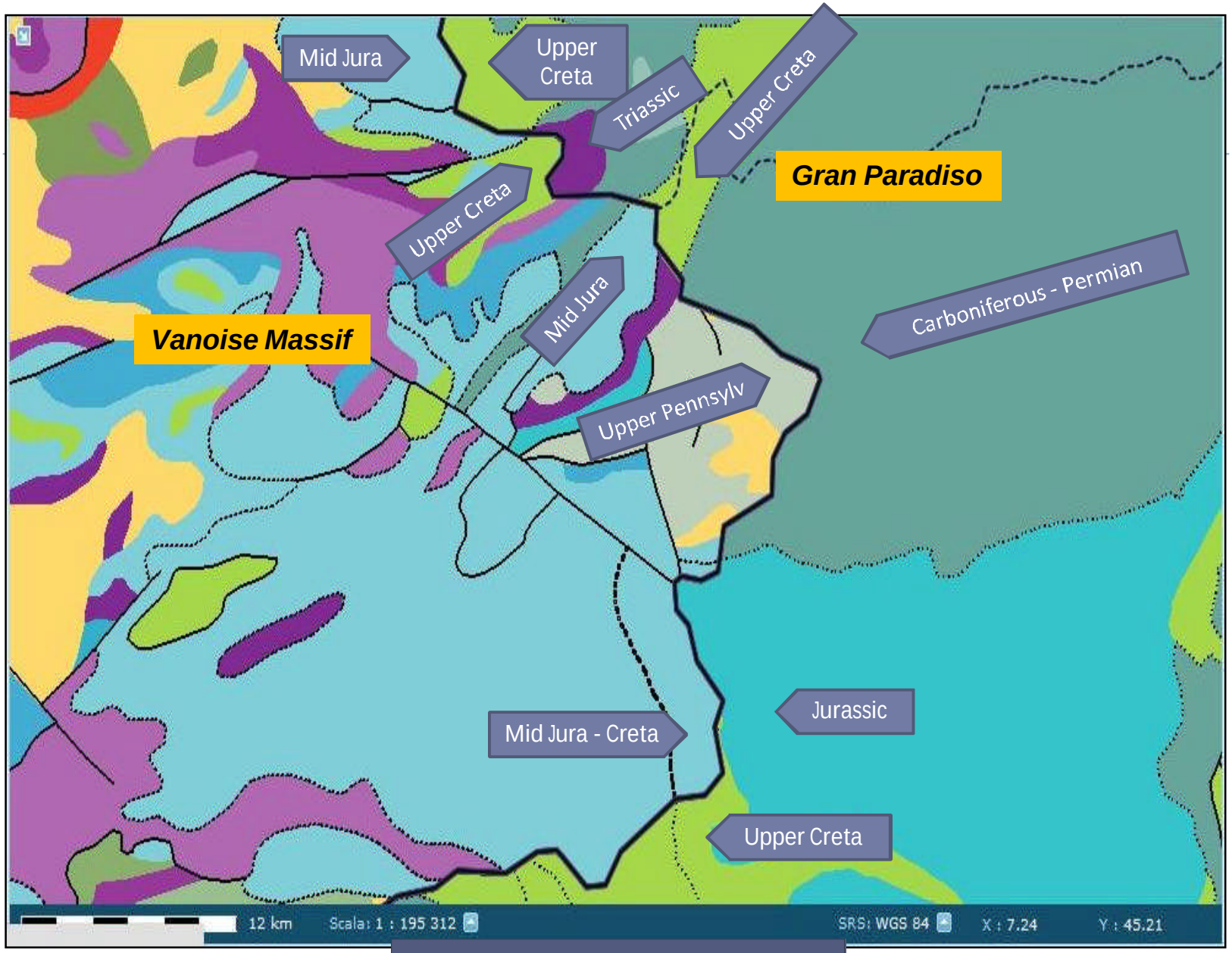

Scale 1: 144286 X: 7.8651, Y: 44.0652
GeoMapViewer - Servizi Geologico d'Italia
Current Action: Pan
Overview Map
• Limestone
• Dolomitic limestone
• Dolostone
• Bauxite
• Limestone
• Nodular limestone
• Dolomitic limestone
• Marls
ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale
5 km
4 mi


Argentera Massif
• Granitoid
• Granodiorite
• Monzogranite
• Metamorphic rock
Mercantour Massif
• Migmatite
• Amphibolite
• Gneiss
12 km
Scala: 1 : 195 312
SRS: WGS 84
X : 7.34
Y : 44.06

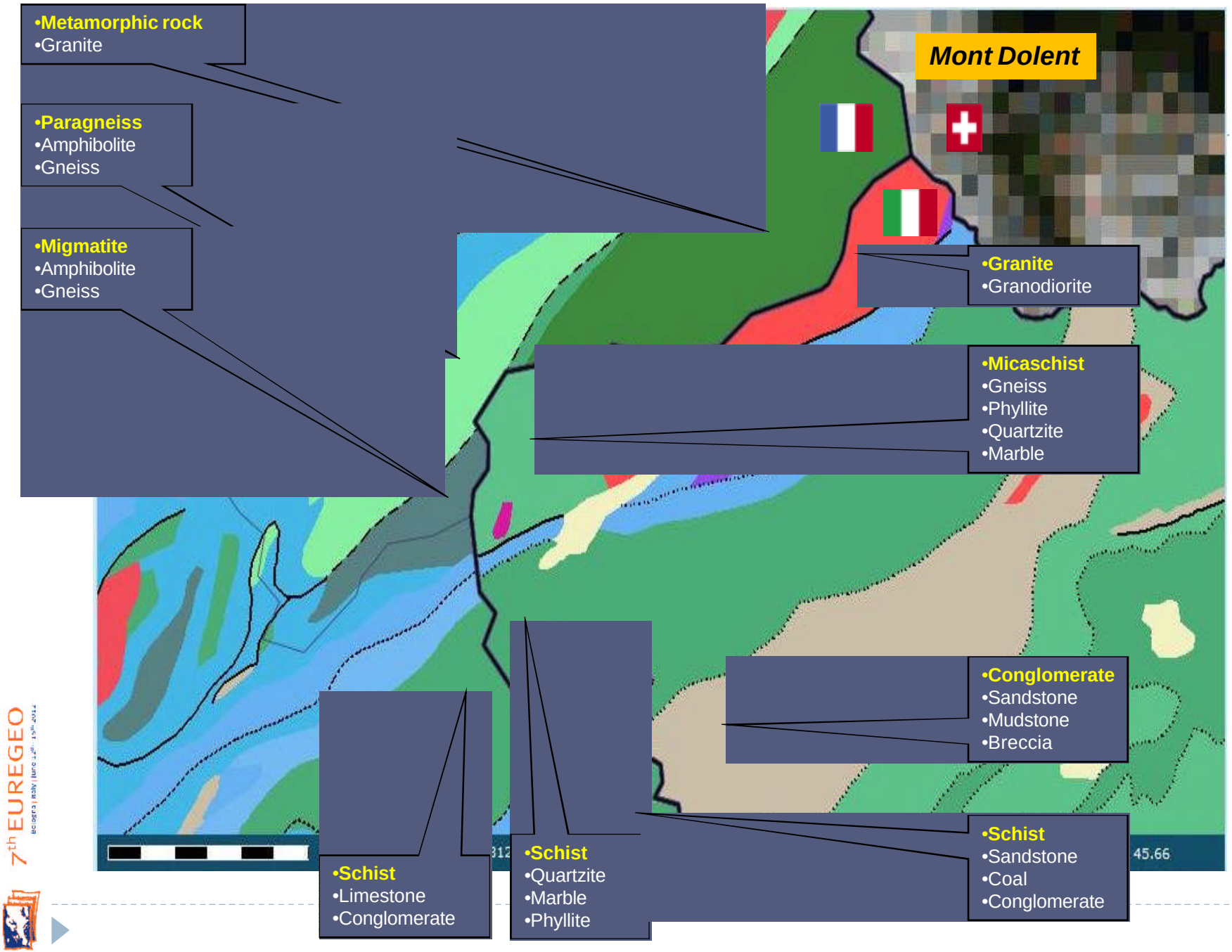

Argentera Massif
Mercantour Massif
SRS: WGS 84
X : 7.27
Y : 44.06
• Cambrian
Carboniferous


12 km
SRS: WGS 84
X : 7.20
Y : 44.64
Monviso Massif
• Schist
• Limestone
• Metamorphic rock
Schist
Quartzite
Marble
Phillite

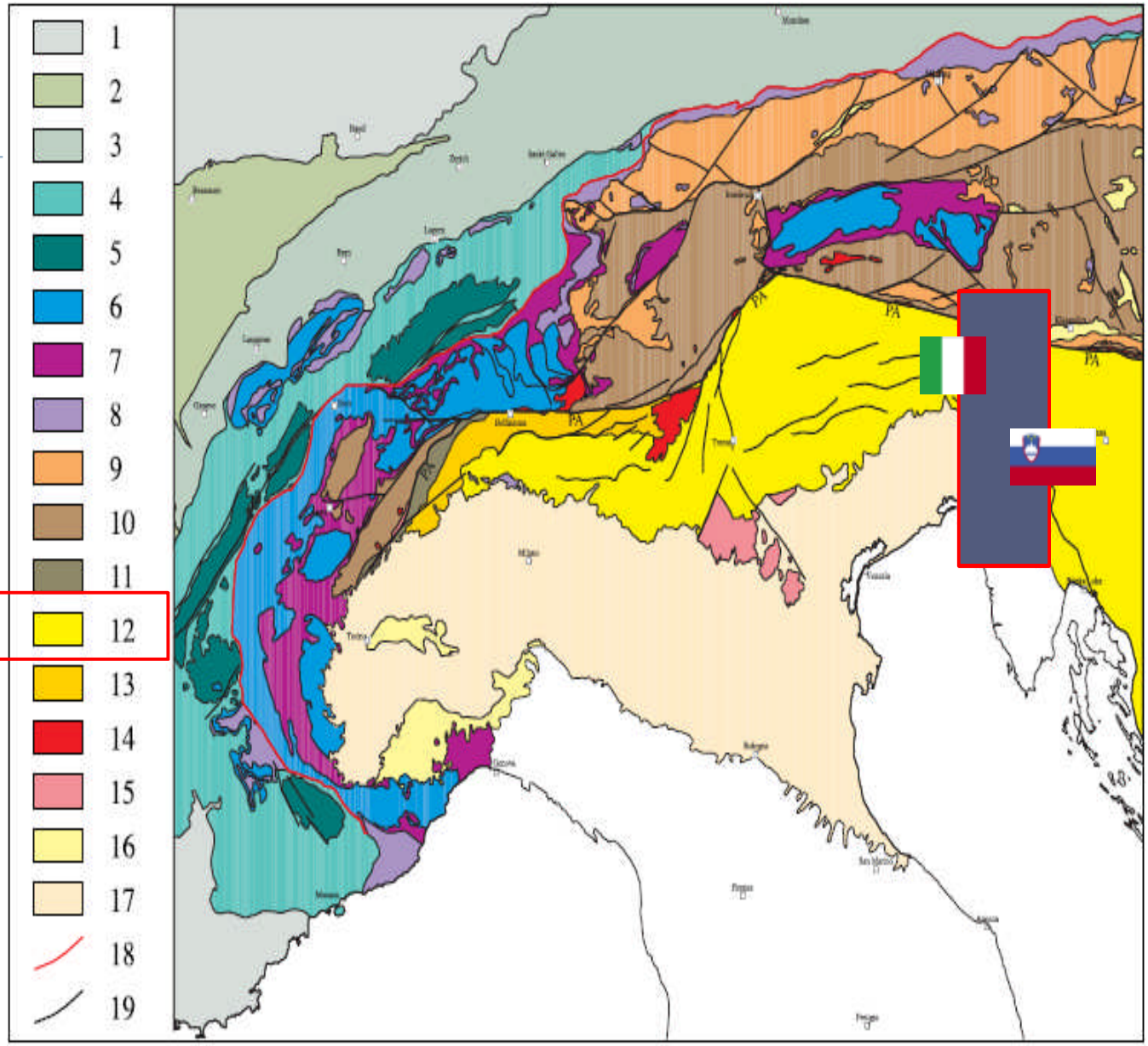

Monviso Massif
X : 6.68
Y : 44.97
• Middle Jurassic - Cretaceous
Upper Cretaceous - Miocene

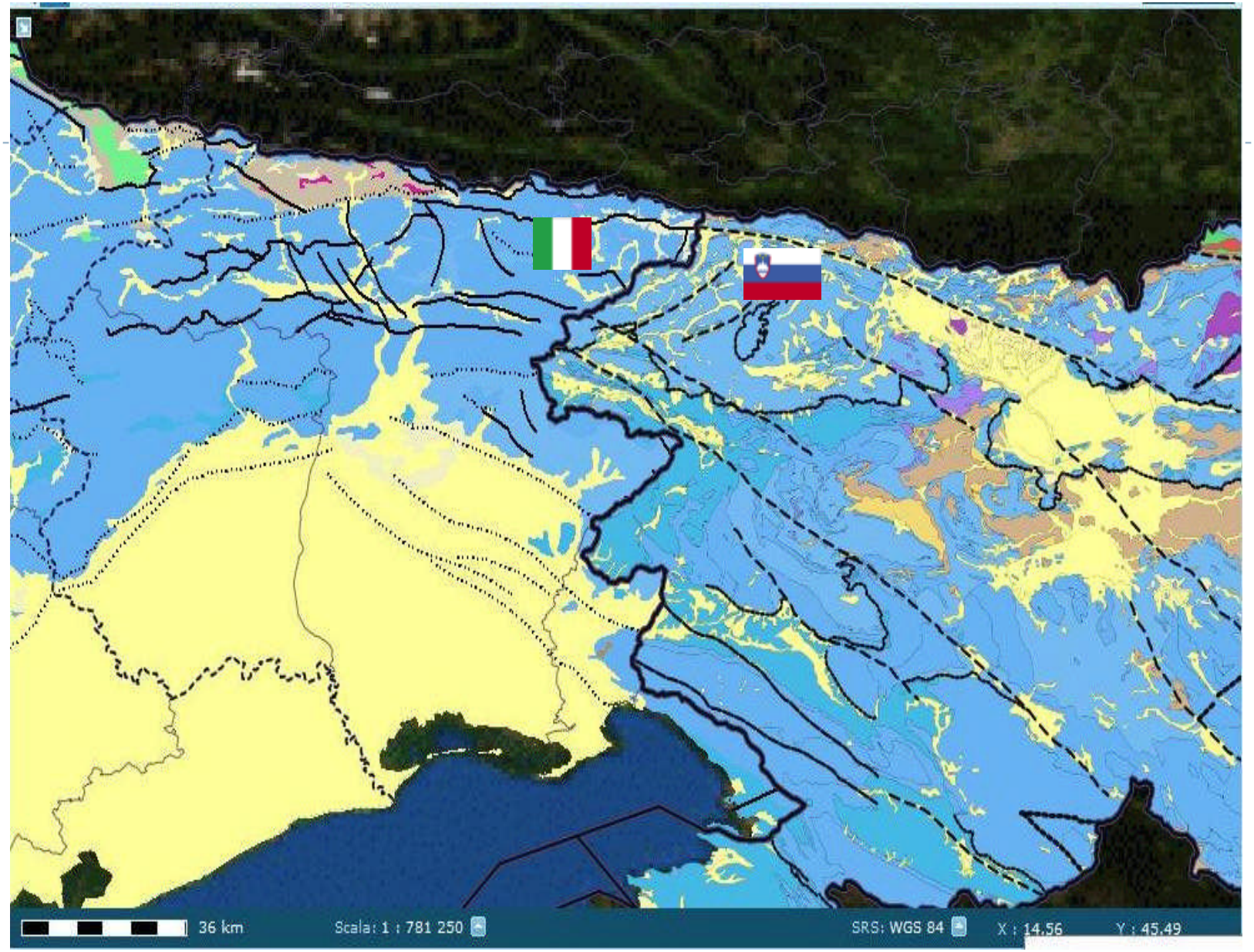


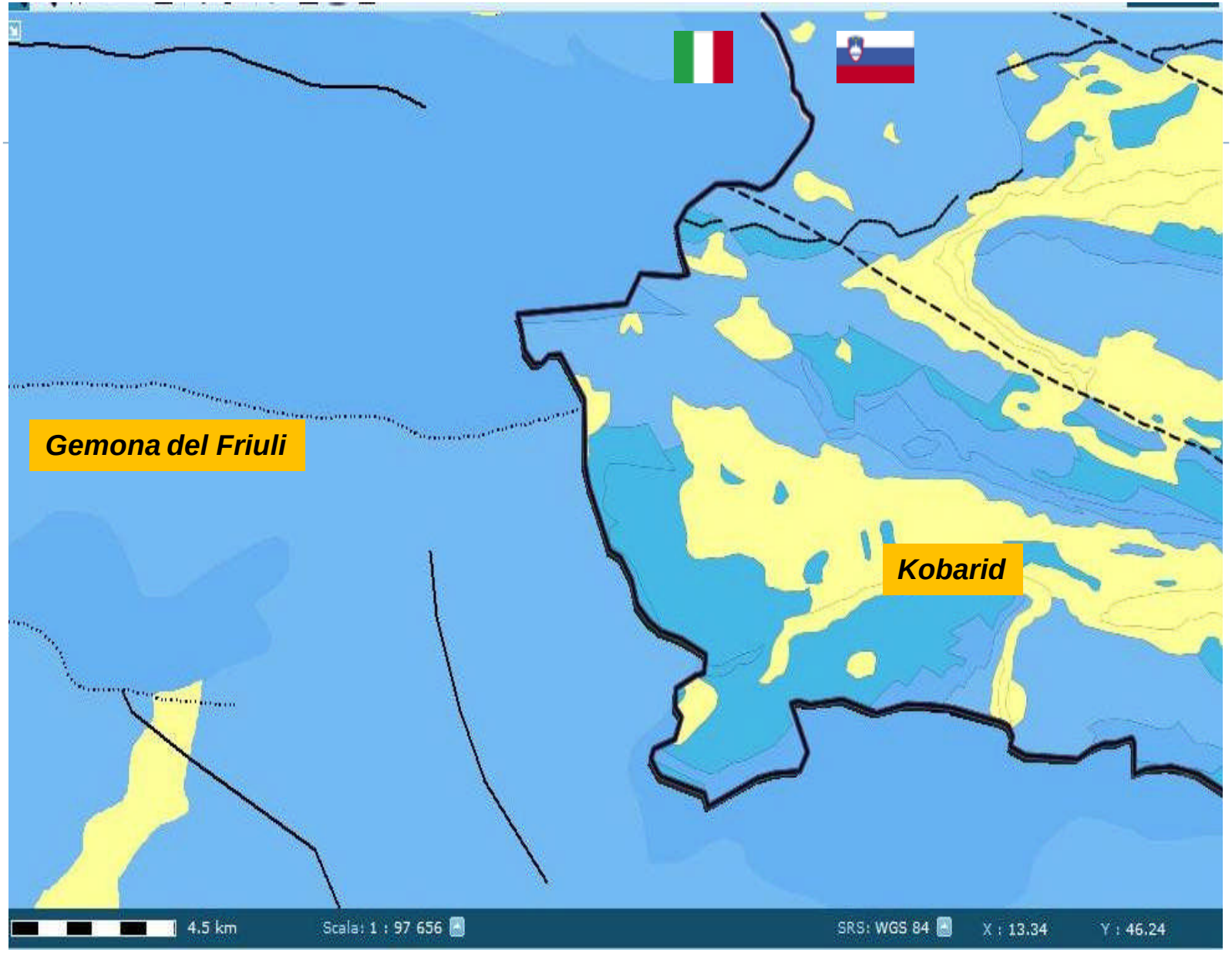
No match in age

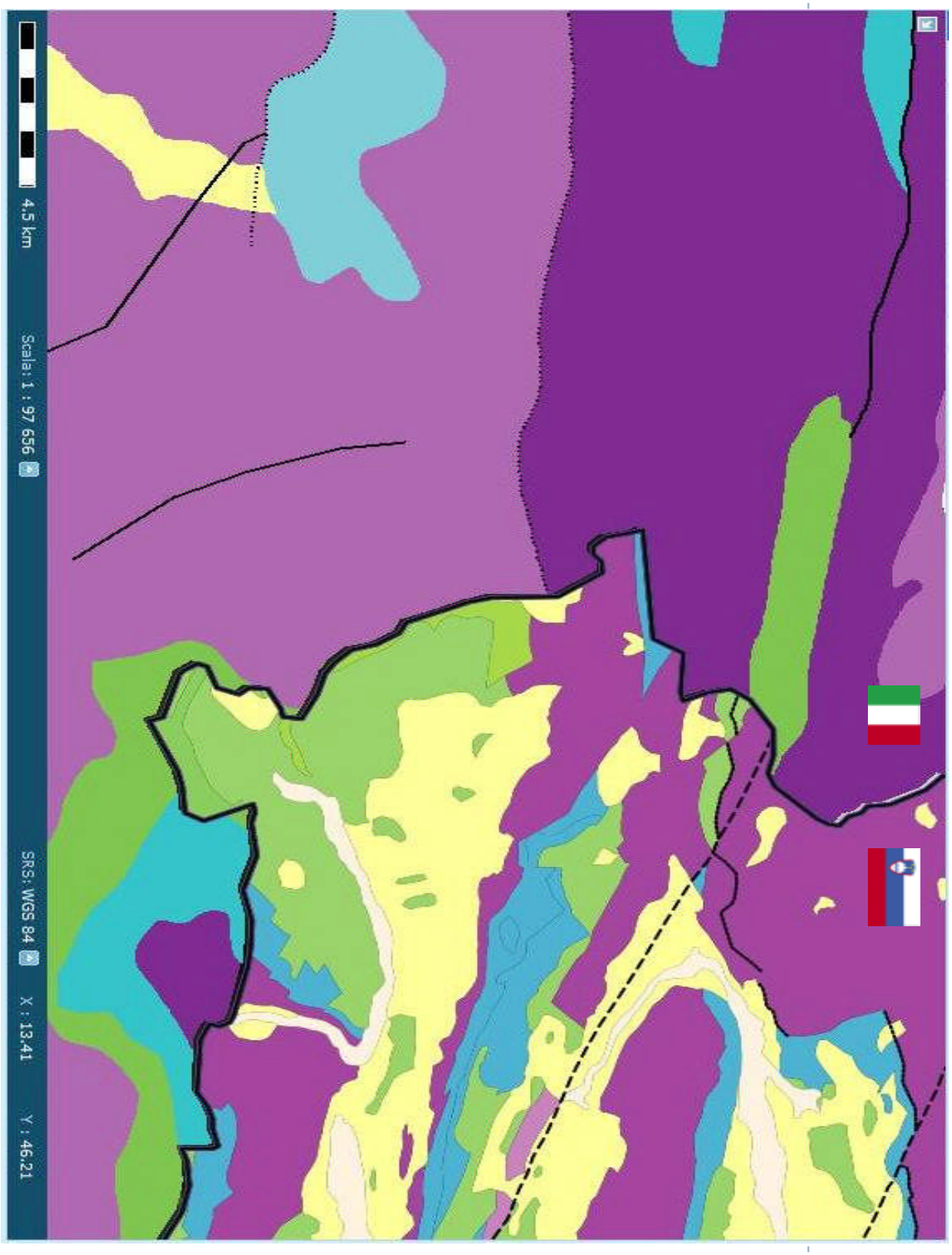

•Metamorphic rock
•Granite
•Paragneiss
•Amphibolite
•Gneiss
•Migmatite
•Amphibolite
•Gneiss
Mont Dolent
•Granite
•Granodiorite
•Micaschist
•Gneiss
•Phyllite
•Quartzite
•Marble
•Conglomerate
•Sandstone
•Mudstone
•Breccia
•Schist
•Limestone
•Conglomerate
•Schist
•Quartzite
•Marble
•Phyllite
•Schist
•Sandstone
•Coal
•Conglomerate
45.66

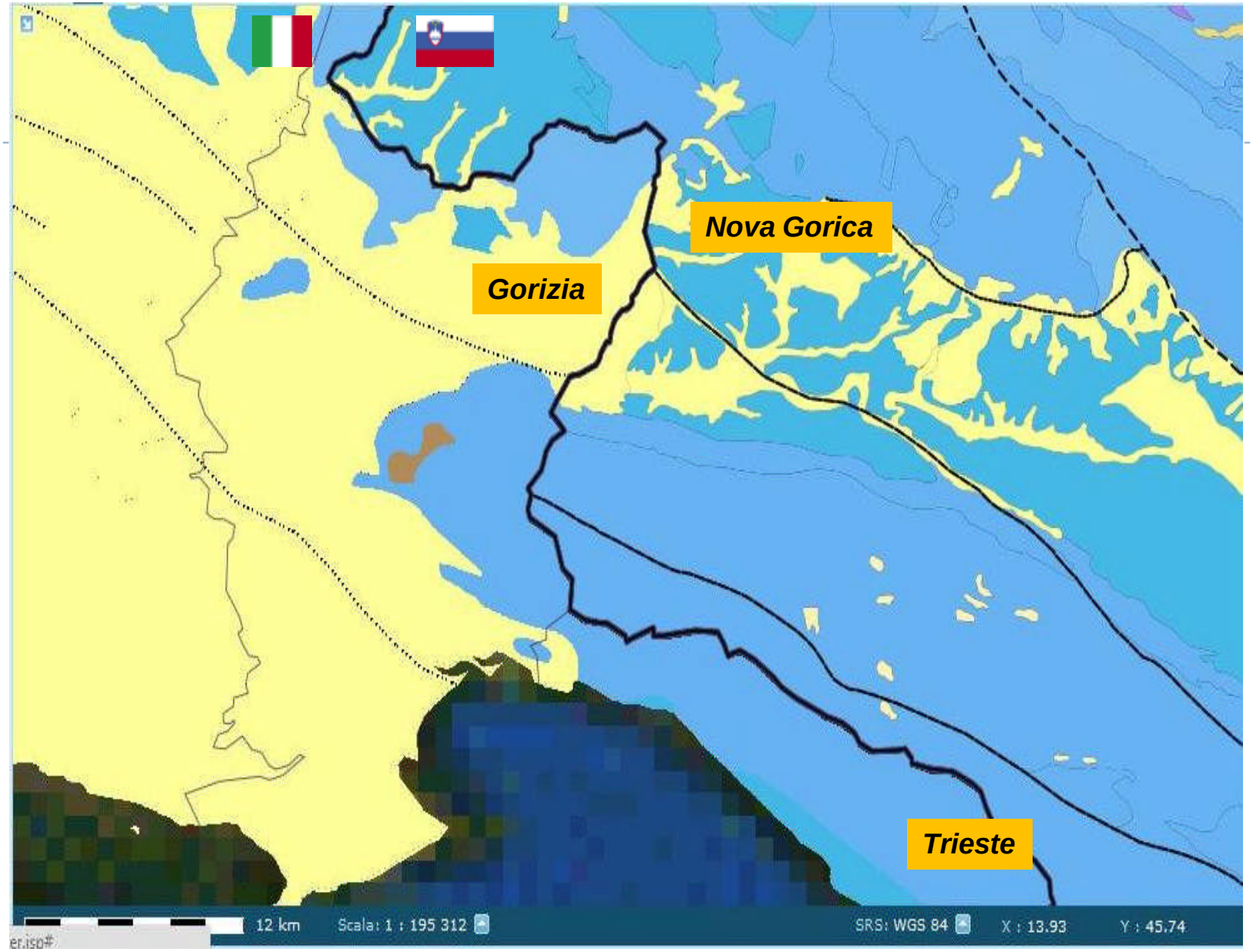
12 – South alpine cover




36 km
Scala: 1 : 781 250
SRS: WGS 84
X : 14.56
Y : 45.49


Gemona del Friuli
Kobarid
4.5 km
Scala: 1 : 97 656
SRS: WGS 84
X : 13.34
Y : 46.24


4.5 km
Scala: 1 : 97 656
SRS: WGS 84
X : 13.41
Y : 46.21


Nova Gorica
Gorizia
Trieste
12 km
Scala: 1 : 195 312
SRS: WGS 84
X : 13.93
Y : 45.74

Conclusions

- The harmonisation of geodatasets is a fundamental issue, because:
  - The European Commission (and INSPIRE directive) require consistent data about geology; they does not change its attribute or portrayal crossing political boundaries.
  - Geology does not recognise political boundaries (contrary to what geologists do).
- OneGeo-Europe has approached but not solved all the harmonisation issues.
- The use of the same semantic base and data model is a necessary but not sufficient condition.
- It is important to start from similar level of geo-database detail.
- The geologic unit description based on 1 up to 5 different composition part is fundamental for small scale geodataset to avoid loss of information, but its use introduces high level of non-harmonisation:
  - To assure a useful harmonisation, at geodataset scale level increase will be necessary the reduction of the number of composition part.
- In most cases a review of the geologic unit description is necessary.
- Inter-State boundary conciliation process is necessary, and becomes mandatory for boundaries along complex geological situations (Pyrenees, Alps, Dinaric Alps, Bohemian Massif, Carphatians, etc.).

What we expect from a harmonisation procedure?

A harmonised pear?

Or a quasi-harmonised pear?