



Geodiversity Workshop - 3

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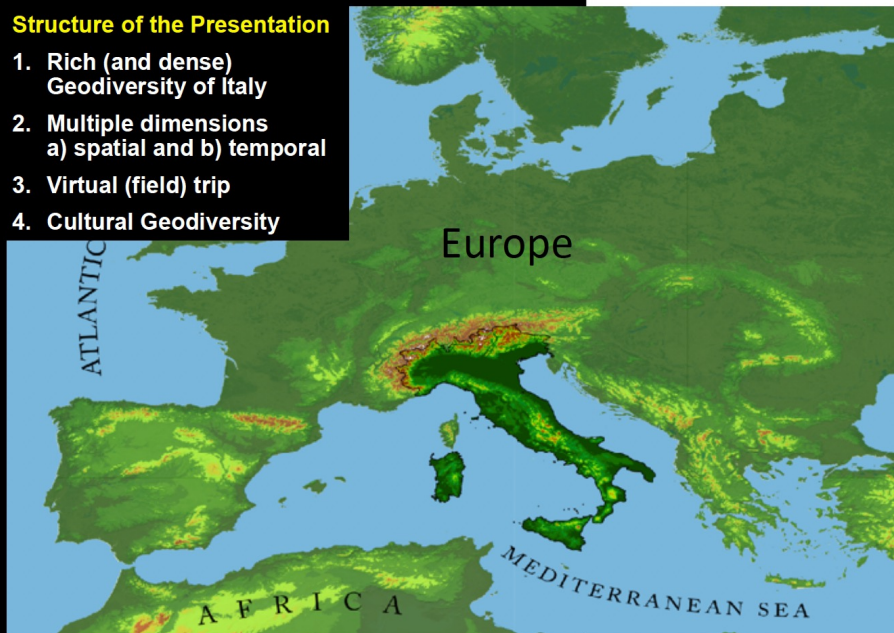
Geodiversity of Italy...

and its importance for the European Cultural landscape

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Structure of the Presentation

1. Rich (and dense) Geodiversity of Italy
2. Multiple dimensions
 - a) spatial and b) temporal
3. Virtual (field) trip
4. Cultural Geodiversity



Geodiversity storyline:

1. Nature-humans factors interactions
2. Approaches and maps:
 - a) Regional Geology and b) Local Morphodynamics
3. Images from Geoparks and Geosites
4. Historical landscapes

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Geodiversity of Italy

The natural range (diversity) of **geological** (rocks, mineral, fossils), **geomorphological** (landforms, topography, physical processes), **soils** and **hydrological features**. It includes their assemblages, structures, systems and contribution to landscapes

Gray, 2013

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Inspiration and sources:

- Scientific literature, Geological Maps,
- **AIGEO and IAG Working Groups on Geodiversity and Geomorphosites,**
- **Discussions with nice colleagues!**
- **UNESCO IGCP and Global Geopark Network**

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Nebbiolo vineyards, Langhe Hills



Morgex vineyards, Mt. Blanc



Montorfano Quarry



Venice Lagoon



Venice city

Val Grande UGG

Geodiversity in Italy

Not only geological materials, landforms and natural processes contributes to Geodiversity, but also human activities and culture

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(Regional)
Geodiversity: a matter of abiotic nature...

Major physiographic elements of the Italian Peninsula

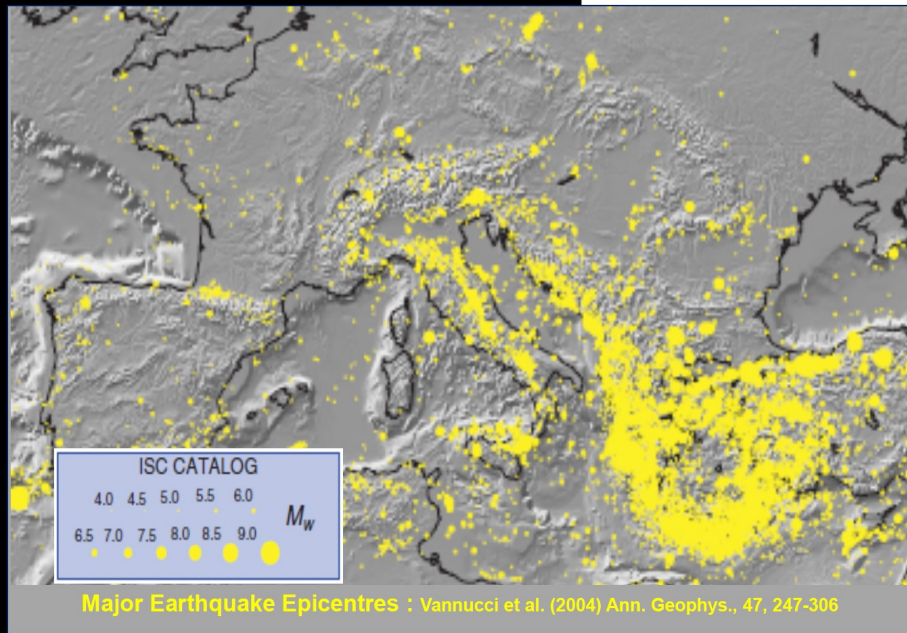
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(Local)
Geodiversity: also a matter of human contents...

A satellite nightview of the expanding metropolitan areas in S-Europe and the Mediterranean area,

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«Dynamic» Geodiversity and natural risks

Earthquakes ($M > 4$) in
the Mediterranean
area (1904 to present)

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«Dynamic» Geodiversity

multiple effects
on territories
(examples):

- L'Aquila earthquake (6/4/2009, M 5.8-6.3)
- Rock Ice Avalanche Brenva Glac., Monte Bianco (18/1/1997)
- Tanaro Flood, (5-6/11/1994)

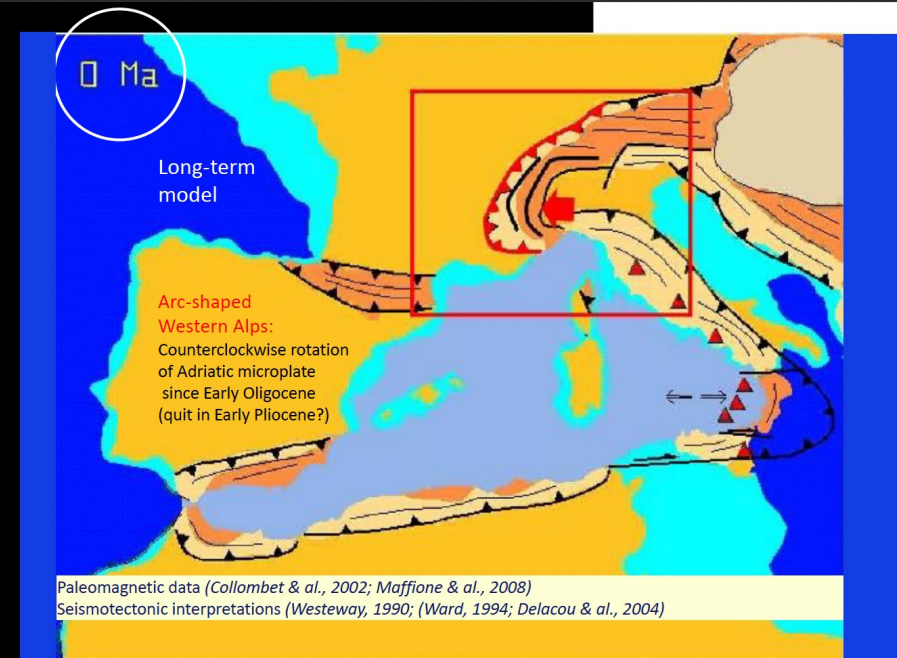
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Geodiversity of tectonic processes and environments

Present-day
geodynamics of
perimediterranean
mountain ranges

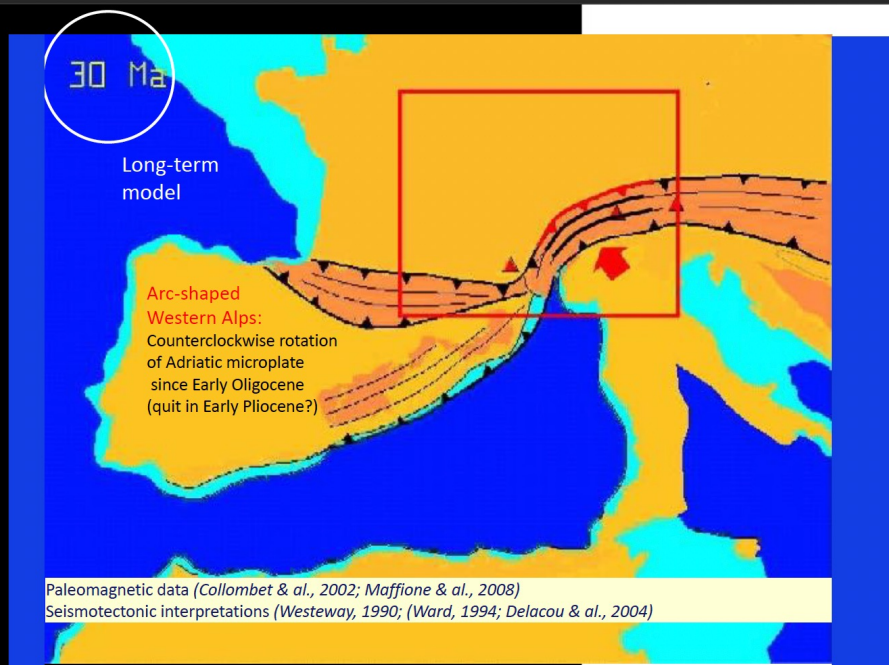
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Long-term factors of Geodiversity

A cartoon of
geodynamics
evolutionary
stages of the
Italian peninsula

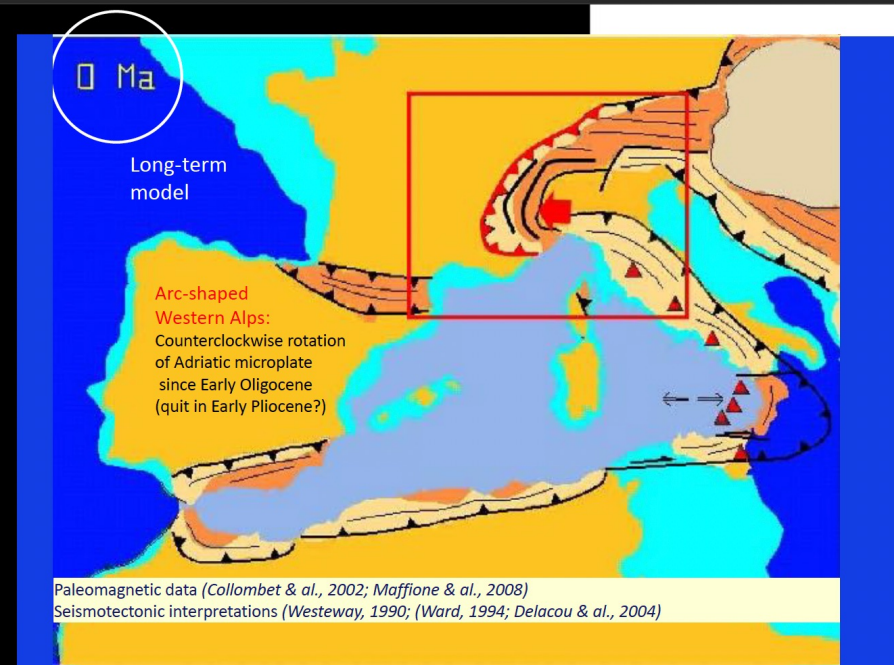
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A jump back in geologic time

A cartoon of geodynamics evolutionary stages of the Italian peninsula

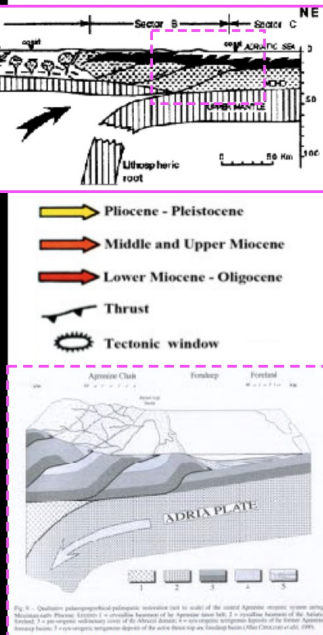
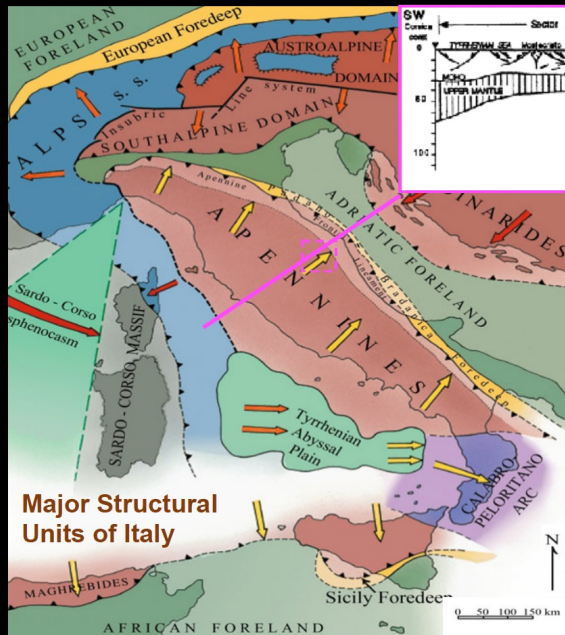
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Let's animate the geological scene...

A cartoon of geodynamics evolutionary stages of the Italian peninsula

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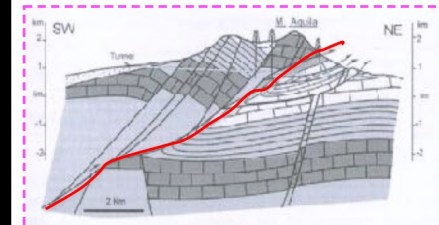
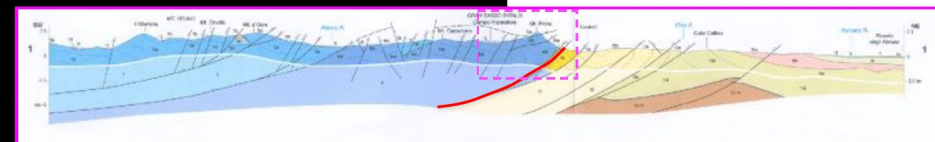
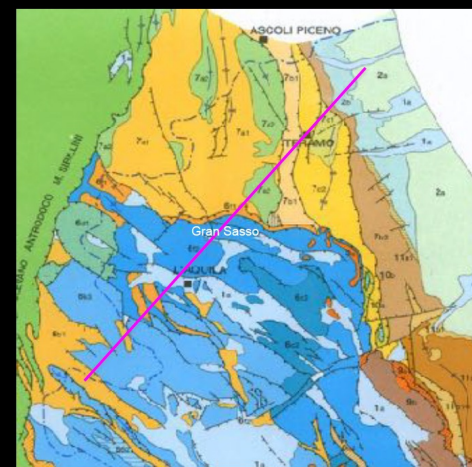
This is Deep Geodiversity

Apennines crustal cross sections

Directions and ages of last orogenetic phases

Major Structural Units of Italy

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I.e. Mountain Geodiversity

Apennines Crustal cross section

Thrust faults, folds (compressive tectonics)

Carbonatic units of Central Apennines



Geodiversity factors

1) Compressional tectonics and uplift

2) Neotectonic Surface Faults

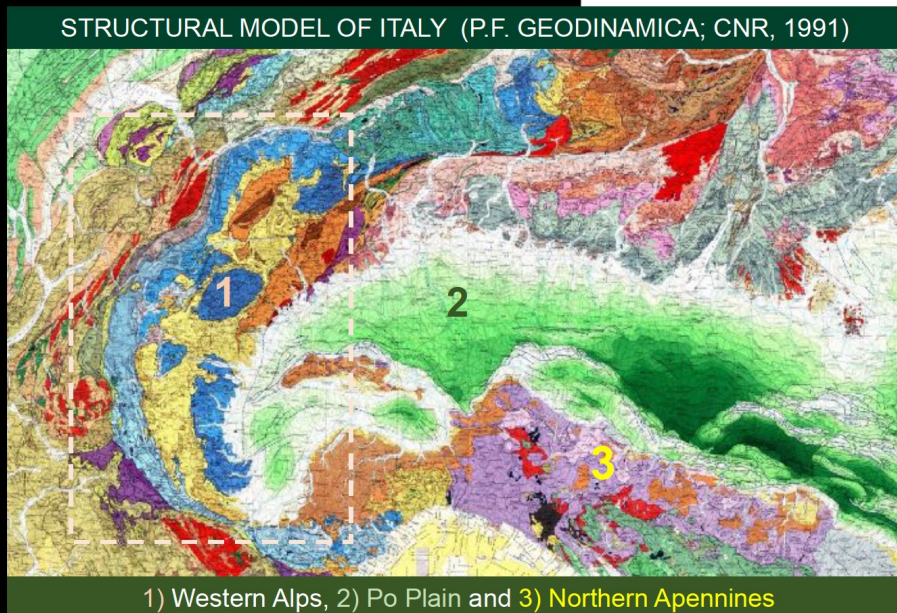
3) Geomorphic modelling (glaciers, running waters, ...)



Geodiversity elements

1) Landforms at the Alpine front range (Po Plain, piedmont hills, major valleys and mountain peaks)

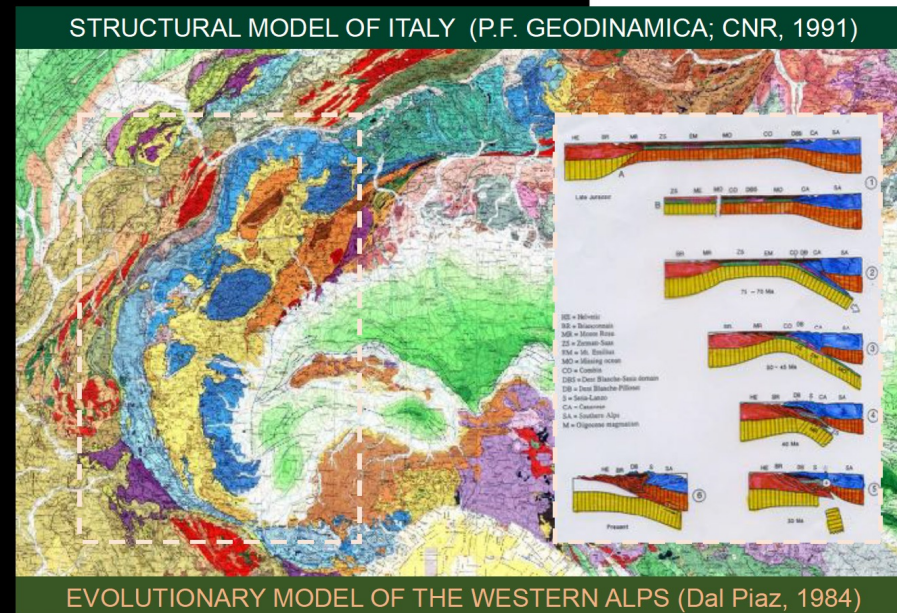
2) Geological Units (bedrock and surface deposits)



Geodiversity maps

1) Major structural Alpine units and paleogeographic settings (Europe, Adria plates, Thetian ocean)

2) Padan foredeep contours (*0,5 km) of the base of the Pliocene deposits



Long-term factors: Gedynamics

A cartoon of geodynamics evolutionary stages of the Western Alps (cross-section)

A topographic map of the Indonesian archipelago and surrounding regions. The map shows the Indonesian Sea, Celebes Sea, and various islands including Sumatra, Java, and Irian Jaya. The map includes a scale bar indicating 1000 km.

A topographic map of the Iberian Peninsula and surrounding regions. The map shows the Mediterranean Sea to the east, the Atlantic Ocean to the west, and the Strait of Gibraltar. The landmasses are colored in shades of green and brown, indicating elevation. A scale bar is located in the bottom right corner.

Padan Gulf and shorter peninsula

Glaciations and marine regression

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Legend:

- Italian dialects:**
 - Sicilian (red)
 - Sardinian (purple)
 - Ligurian (yellow)
 - Tuscan (orange)
 - Venetian (green)
 - Ladin (dark green)
 - Friulian (light green)
 - Romansh (pink)
- Other languages:**
 - German (dark blue)
 - French (light blue)
 - Provençal (dark blue)
 - Occitan (light blue)
 - Spanish (dark blue)
 - Portuguese (light blue)
- Historical boundaries:**
 - Historical boundaries (dashed line)
 - Historical boundaries of the Kingdom of Italy (dotted line)
 - Capital of each region (black dot)

modified after APAT- ISPRA 2005

[illegible]

From Landscapes and Landform of Italy, 2017

[illegible]

<http://www.pcn.minambiente.it/mattm/>

Geoportale Nazionale WebGIS



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Geodiversity different geomorphological landscapes

Glaciers, N-W Alps



*Belvedere
Glacier,
Monte Rosa*

From Landscapes and Landform of Italy, 2017, photo G. Gnemmi

Geodiversity different geomorphological landscapes

High Mountain, Central Alps



*Lago d'Aviolo,
Adamello Massif*

photo Michele Guerini

Geodiversity different geomorphological landscapes

Dolomites, N-E Alps



*Torre Venezia,
Civetta Group*

photo Michele Guerini

Geodiversity different geomorphological landscapes

Lowland



*Alpine Piedmont
and Po Plain,
Cavour*

photo Marco Giardino

Geodiversity different geomorphological landscapes

Peri-alpine Lakes



From www.Pixabay.com

*Lake Maggiore
and the NW-Alps*

Geodiversity different geomorphological landscapes

Vulcanic Lakes



From www.Wikipedia.org

*Lake Vico,
Viterbo, Central
Italy*

Geodiversity different geomorphological landscapes

Hills



From www.flickr.com photo Bernd Thaller

*Tuscan Hills,
Siena*

Geodiversity different geomorphological landscapes

Volcanos



From www.Pixabay.com

*Pompeii and the
Vesuvius*

Geodiversity different geomorphological landscapes

Coastal areas



From www.Pixabay.com

Amalfi Coast,
Campania

Geodiversity different geomorphological landscapes

Caves



From www.flickr.com photo Yousif al Mulla

Frasassi Caves,
Apennines

Geosites



Great geodiversity
requires knowledge for
management



Article
**Advances in Geoheritage Mapping: Application to Iconic
Geomorphological Examples from the Italian Landscape**

Paolo Coratza ^{1,*}, Irene Maria Boffali ^{2,*}, Valeria Panizza ³, Pierluigi Brandolini ⁴, Daniele Castaldini ⁵,
Frances Cacchi ⁶, Giacomo Deluca ⁷, Maurizio Del Monte ⁷, Francesco Facchini ⁸, Furio Finocchiaro ⁹,
Dario Glia ¹⁰, Rita Mella ¹¹, Carmine Marzulli ¹², Olivia Nenci ¹³, Guido Pailaga ¹⁴, Milla Panzetta ¹⁵,
Luigi Piccoli ¹⁶, Alessia Pica ¹⁷, Federico Tognetti ¹⁸, Alfredo Trocena ¹⁹, Laura Valentini ²⁰,
Marco Giardino ²¹ and Manuela Pelfini ²²

Geosites



Geosites

Lithostructural control on karst features



Bila Pec residual relief



Eastern Canin Glacier

LEGEND		
Lithologies	Karst features	Shaped landforms
Quaternary deposits	Doline	Fault or fault escarpment
Weakly karstifiable rocks	Collapse doline	Cuesta
Karstifiable rocks	Soft-sediment doline	Mountain ridge
Fluvial landforms and deposits	Cave entrance	Residual relief
Escarpment	Structural, glacial or karstic hollow	Glacial and periglacial landforms
Geomorphosites		Cirque
Hydrological		Terminal moraine
Karst		Sheepback
Glacial		



Geosites

Lithostructural and Morphoclimatic controls on Alpine glacio-karst

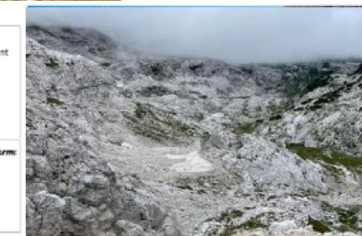


Erratics and rochees mountonnees



Eastern Canin Glacier

LEGEND		
Lithologies	Karst features	Slope landforms
Quaternary deposits	Doline	Fault or fault escarpment
Weakly karstifiable rocks	Collapse doline	Cuesta
Karstifiable rocks	Soft-sediment doline	Mountain ridge
Fluvial landforms and deposits	Cave entrance	Residual relief
Escarpment	Structural, glacial or karstic hollow	Glacial and periglacial landforms
Geomorphosites		Cirque
Hydrological		Terminal moraine
Karst		Sheepback
Glacial		



Geosites

Present and Past Impacts on Geosite



Tourists at old Infrastructures



II World War bombing

Geosites

Past and Present Morphoclimatic conditions



LGM modelling rochees mountonnees



Post-LGM corrosion

Geosites

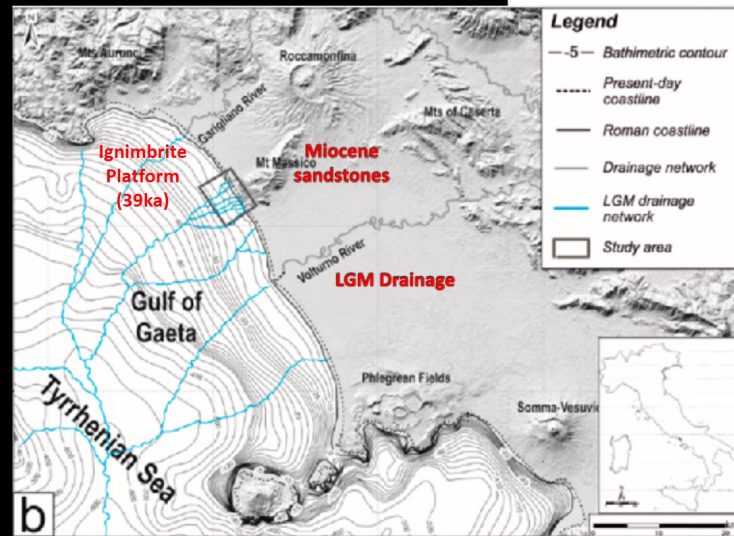
Multitemporal
comparison
of glaciers



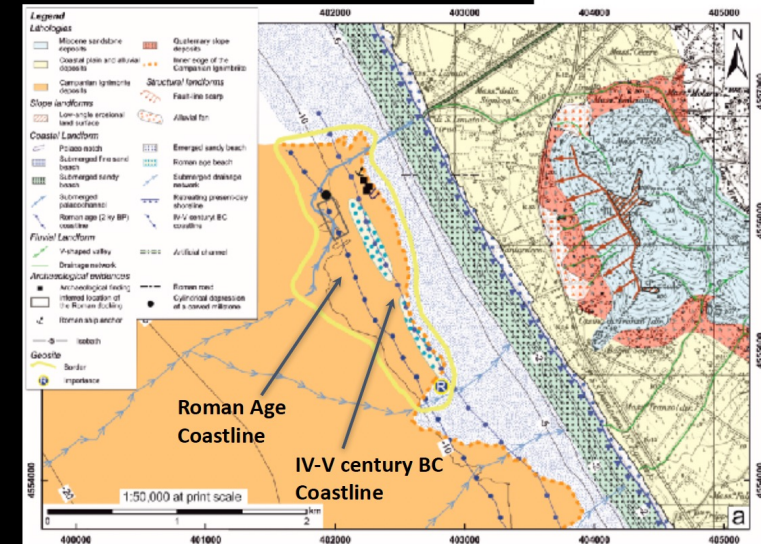
Geosites



Geosites

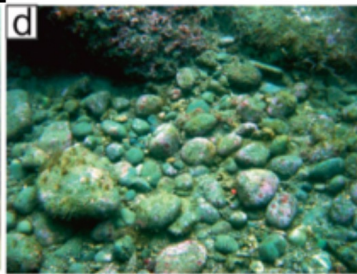
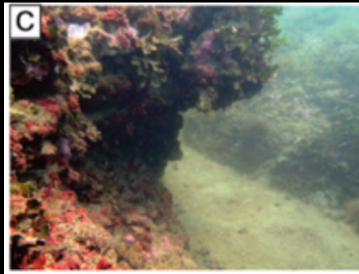


Geosites



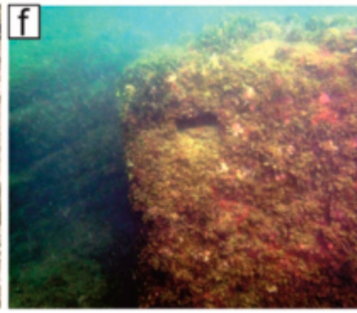
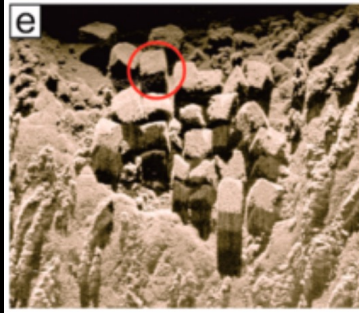
Geosites

Palaeo-sea notch at -7.5 m depth along the submerged palaeo-channel walls



Pebbles of a Roman-age beach

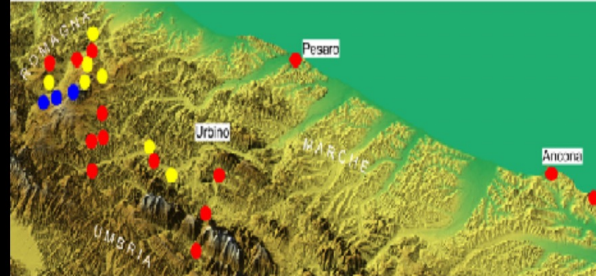
Pilae of concrete Roman blocks in a 8m depth depression (Archaeological value)



detail of a concrete block

Geodiversity and Culture An Outdoor Museum...

Digital model of the territory where the backgrounds of the most important Renaissance artists are to be found



A research project by Rosetta Borchia e Olivia Nesci
landscape hunters
<https://montefeltroartviews.it/en/>

Landscape in diptychs by...



Leonardo Da Vinci

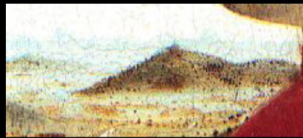


Raffaello



Piero della Francesca

An Outdoor Museum.... Landscape in diptychs



Piero della Francesca
Diptych of the dukes of Urbino



Some comparisons between real landscape and paintings

An Outdoor Museum.... Landscape in diptychs

Leonardo Da Vinci
Landscape behind GIOCONDA



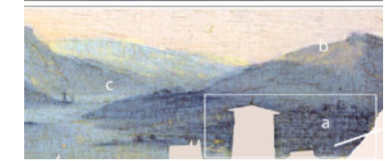
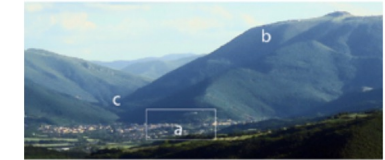
An Outdoor Museum... Landscape in diptychs



An Outdoor Museum... Landscape in diptychs

Raffaello

Diptych «Vision of a knight»



Comparisons between real landscape and paintings

Geodiversity, History and Culture in Italy



Geodiversity of Italy

and its importance for the European Cultural landscape

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