View Point 1 (P.O. 1) 1. Inghiottitoio della Battaglietta

The "Inghiottitoio della Battaglietta" is a small cave located at the northern footwall of Monte Spina Puci (1596 m a.s.l.), in the south-eastern side of the Battaglietta depression.
The cave, about 80 - 100 m long and 30 m deep, is characterised by narrow and low galleries, rarely exceeding one metre in height and width, with landforms related to the underground water flow. Speleothems are absent. The sinkhole is also the point where the surface water flow disappears underground. These waters come from the drainage of the Battaglietta depression.
The visit of the cave is recommended to expert speleologists.

View Point 2 (P.O. 2). Panoramic view of Battaglietta Polje

Going back towards **Board A**, you can see the Battaglietta Polje; this is a large karst depression stretching along an ENE - WSW direction and bounded by the carbonatic steep slopes of Pizzo della Principessa, Monte Spina Puci and Monte Ferro. The floor of the Battaglietta Polje consists of soil and clays referred to as Numidian Flysch.
In the polje there are also some small dolines and sinkholes representing preferential points through which the waters disappear underground.

View Point 3 (P.O. 3). Coral Limestone

Returning to the main road, you proceed short way (about 300 m) and go towards the Rifugio Marini. Take the little road to the "Rifugio Marini" and you will see a really interesting and beautiful outcrop rock **(P.O. 3)**, consisting of grey coral limestone. These rocks derive from the lithification of an old coral reef (age: Jurassic - Lower Cretaceous) that was in a marine shallow water environment. There are mainly large coral branched colonies (one metre and a half) and look like coral living in an actual tropical reef.

View Point 4 (P.O. 4). Panoramic view of Piano Battaglia Polje
View Point 5 (P.O. 5). Sinkholes

Once past the "Rifugio Marini" you come to Piano Battaglia Polje. Together with the Battaglietta depression, this forms the largest karst depression in the Madonie Mountains, reaching 2500 m in length and 800 m in width.
The Polje is bounded by the carbonatic steep slopes of Monte Mufara, in the south, and Pizzo Carbonara, in the north; residual hills of limestone *(hum)* protrude through the clayey floor. Small-scale solutional sculptures *(Karren)*, like solution pans *(Kamenitza)*, cavernous Karren and rounded solution runnels *(Rundkarren)*, develop on carbonatic blocks and slopes.
In the polje there also are some small dolines and sinkholes, like these located on the north-western side of the depression ***(P.O. 5)***. The southernmost depression presents a funnel shape with a diameter and depth of a few metres; the main feature of the other depression is its flat floor, and the absorbing point is covered by debris and soil sediments.

View Point 6 (P.O. 6). Sponge e limestones

After crossing the polje and returning to the main road, you will arrive in front of a wall made up of sponge limestones ***(P.O. 6)***. In this area, grey limestones with fossilized sponges and algae outcrop. As for the coral limestones, these rocks derive from the lithification of an old coral reef, in a shallow water environment (-100 m). These rocks are older (Upper Triassic) than those of P.O. 3.

View Point 7 (P.O. 7). Dolostones and dolomitic breccias
(Portella Arena)

Abandoning the main road (towards Portella Colla), after a few metres you have to turn left. You will find yourself in a thick wood. After walking some 500 m you are at Portella Arena. Here the landscape is completely different from the previous area. Light grey-whitish dolostones and dolomitic breccias (Quacella Formation, aged Upper Triassic - Lower Jurassic) outcrop. The dolostones are powdery and greatly weathered. The dolostones were formed in a shelf margin of the carbonate platform. In this area carbonatic breccias coming from the near reef complex accumulated in large amounts. The dolostones lack clear evidence of fossils owing to heavy dolomitization processes that have nearly obliterated the rock's original texture.

Here you can see isolated needle rocks due to selective physical weathering, such as frost wedging, that evolved more strongly along the faults and joints of the rock. You can also see these landforms along the western slope of Monte Mufara.

View Point 8 (P.O. 8). Panoramic view

From Portella Colla the path continues across the mountainside along the western slope of Monte Mufara.
At P.O. 8 you have an amazing view of the Madonie landscape. To the east you can see the western slope of Monte Mufara, characterised by weathering and slope landforms, such as a scree slope, isolated needle rocks, talus cones, and nivation niches located above 1500 m a.s.l. Looking west you can see the Cozzo Piombino - Piano Zucchi area. This is characterised by Imerese Tectonic Unit rocks. These rocks, formed in a deep sea environment (basin l.s.), are made up of thin layers of radiolarites and reddish cherty marls, with intercalated carbonatic breccias that are very rich in marine fossils (Crisanti Formation, Jurassic - Middle Cretaceous). The latter rocks derive from the accumulation of carbonatic fragments coming from the close reef complex.
The different rocks have favoured selective erosion processes, creating a landscape made up of steep and slight slopes respectively of carbonatic and radiolarite rocks. Some walls are fault scarps due to tectonics.
From south to north you can see, in the foreground, Cozzo Piombino (1620 m a.s.l.), Pizzo Colla (1676 m a.s.l.) and Pizzo Antenna (1697 m a.s.l.); in the background, Monte dei Cervi (1794 m a.s.l.), which is the highest peak in this part of the Madonie Mts.

View Point 9 (P.O. 9). Overlie of the Panormide Tectonic Unit on the Numidian Flysch Unit

Just before P.O. 9 the rocks change their features completely: the change goes from grey carbonatic rocks (Panormide Tectonic Unit) to pelitic shales with intercalated quartzarenitic layers (Numidian Flysch Unit). The rocks are not in stratigraphic sequence (in a normal temporal succession the young rocks overlie the old ones) but are disturbed by tectonics (the rocks above are older than those below).

View Point 10 (P.O. 10). Panoramic view of dome-like relief

Walking down the path towards Portella Colla, you reach Piano Trifoglio (1460 m a.s.l.); this is a wide flat surface representing a back-tilting area due to large landslide movements developing from the western slope of Monte Mufara. On the surface there are several aligned small dome-like reliefs. These are manmade formations, consisting of debris mounds created by former mining activity in the nearby quarries; the self-sown vegetation has turned them into small and singular grass hills .

View Point 11 (P.O. 11). Panoramic view of the structural relationship between Panormide Tectonics Units (on the top) and the Numidian Flysch shale

From this point you can enjoy once again the view of the Panormide Tectonics Units, particularly its lower part, consisting of calcilutites, grey yellow marls of the Upper Triassic age (Mufara Formation dating back 220 million years) that overlie the Numidian Flysch shales aged at least 24 million years. The Mufara Formation "type locality" was instituted near here, where the rock successions were first studied and described

View Point 12 (P.O. 12). Panoramic view of "Anfiteatro della Quacella"

About 150 metres from P.O. 11 the path curves 90° to the right; you need to leave the path and walk some metres to the left to reach P.O. 12. Here you can view the marvellous "Anfiteatro della Quacella. This is a concave slope, made up of the same dolomitic rocks seen at ***P.O. 7***, affected by intensive weathering. You can see deep tracks, from where talus cone and debris flow start, isolated needle rocks, and nivation niches. A large scree slope partially covers the Numidian Flysch shales. The slope, slightly inclined, is characterised by several detachment niches, undulations, and back-tilting areas due to large landslide movements.
The "Anfiteatro della Quacella" and the western slope of Monte Mufara represent the detachment area of the great Portella Colla landslide; this is one of the most extensive landslides in Sicily, about 6 km long and 2-3 km wide, of which the western end finishes at the Imera Settentrionale river bed.

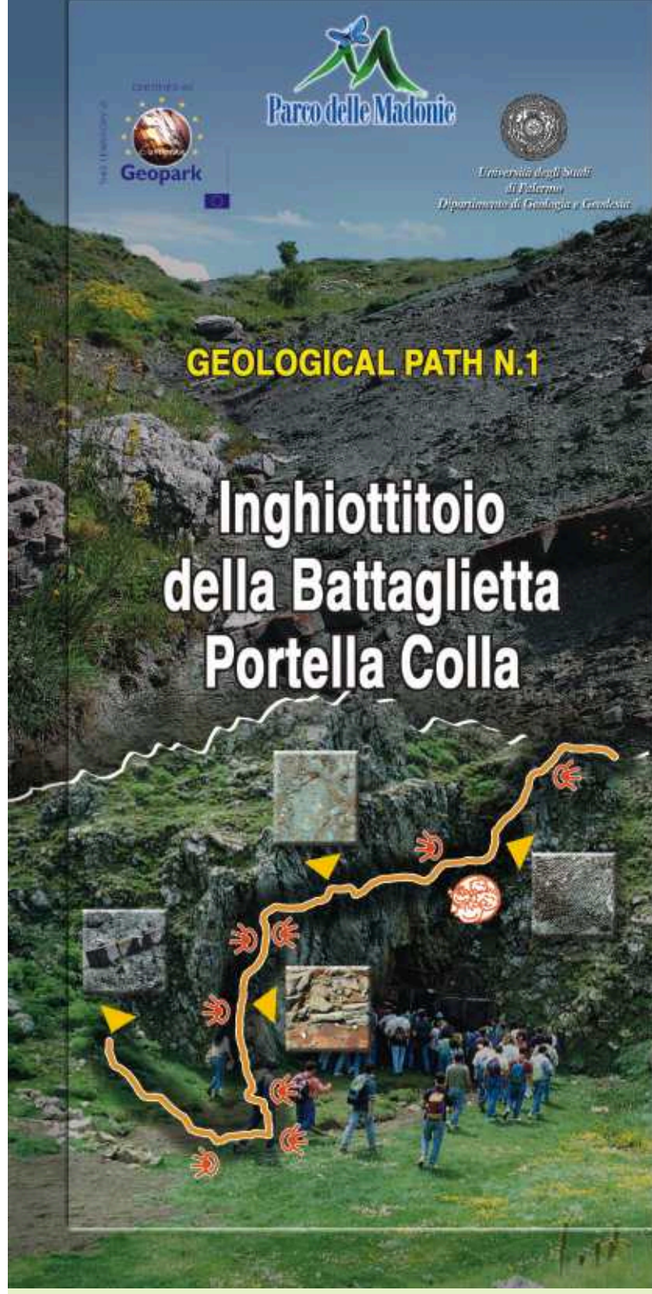
View Point 13 (P.O. 13). Panoramicview of blocks rafted in the landslide body

From Provincial Road S.P. 119 you can see two asymmetrical and parallel reliefs. These are made up of cemented debris blocks that have slid down and back-tilted.
The path continues along the road, skirting the vast, inactive quarry of Piano Trifoglio, as far as Portella Colla.

View Point 14 (P.O. 14). Numidian Flysch

After walking about 700 m, you will arrive at Portella Colla (Board D). A few metres before the crossroads you turn left along the dirt road and come to P.O. 14. Here the Numidian Flysch shales outcrop again. In this area the succession is called "Membro di Portella Colla" and has different features from the former Numidian Flysch: there are intercalations of arenaceous layers with macroforaminifera and an increase of iron oxide content.

The geological path ends at P.O. 14, where you can return to Board A by walking along the road in the direction of Piano Battaglia. Estimated time for the return is about one hour.



GEOLOGICAL PATH N. 1: "Inghiottitoio della Battaglietta - Portella Colla"

INTRODUCTION

The "Inghiottitoio della Battaglietta - Portella Colla" path is in the central part of the Park. It enables us to observe some of the main geological and geomorphological features of the Madonie Mountains.
Sedimentary rocks, deposited in a shallow and deep water environment, outcrop along the course; these rocks, of various age, subsequently moved and took up their present-day position owing to the tectonic movements that generated the mountain chain.
These show us the geological story of the Madonie Mountains in the last 220 million years.
The path illustrates several landforms, resulting from different geomorphological processes, with very picturesque and interesting landscapes.

It is recommended to follow the path from the Inghiottitoio della Battaglietta (1596 m a.s.l.) to Portella Colla (1420 m a.s.l.).

HOW TO GET THERE

PA-CT A19 Highway (Buonfornello, Scillato, and Tremonzelli exits), direction Piano Battaglia
PA-ME A20 Highway (Cefalù and Castelbuono exits), direction Piano Battaglia.

From Piano Battaglia, get to the crossroads near the "Rifugio Marini", where you turn left (if you come from Collesano or Polizzi Generosa) or right (if you come from the Petralie), until the first board - **Board A**.

You can reach the starting path ***(P.O. 1)*** walking eastward along the dirt road and crossing the depression of Battaglietta. On the right there is the sinkhole - the path starts here.

For further information contact:

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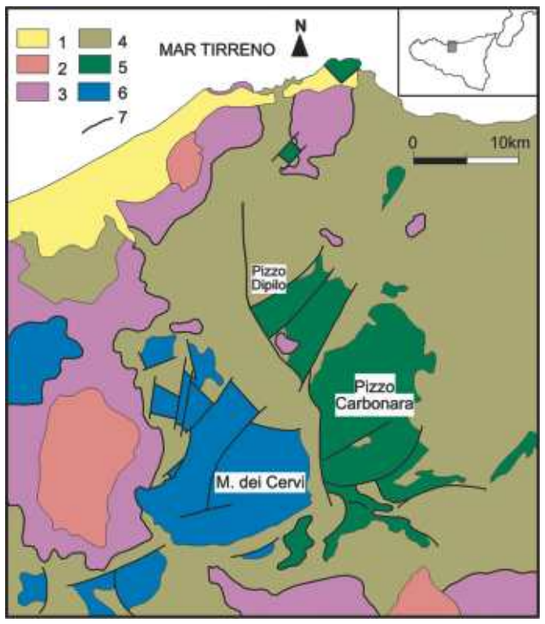
Parco delle Madonie

Geopark

Università degli Studi di Palermo
Dipartimento di Geologia e Geodesia

GEOLOGICAL PATH N.1
"Inghiottitoio della Battaglietta Portella Colla"

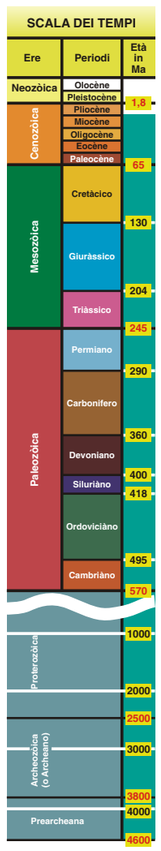
The Madonie Mts. consist of a South-East trending pile of tectonic imbricates, deriving from the deformation of Mesozoic - Cenozoic rock successions ascribed to old paleogeographic domains of the Southern Tetide; the successions are covered by late and post orogenic rocks.



Structural-Geological sketch of Madonie Mts. (Grasso et al. 1978, Abate et al. 1982, Abate et al. 1988, modified).

Legend:

1) Quaternary deposits;
2) Post and syntectonic Upper Tortonian to Lower Pliocene terrigenous, evaporitic and carbonatic rocks;
3) "Sicilidi" Tectonic Units derived from more Northern domains and characterized by variegated clays and tufitic marly limestones (Cretaceous-Oligocene);
4) Numidian Flysch Units constituted by Lower Miocene foredeep clastic deposits (mostly quartzarenitic), unconformably overlying the Mesozoic - Cenozoic Panormide and Imerese domains;
5) Panormide Tectonic Units derived by the deformation of the Mesozoic - Cenozoic rock successions ascribed to carbonate platform facies;
6) Imerese Tectonic Units derived by the deformation of the Mesozoic - Cenozoic rock successions ascribed to basin environment;
7) Faults and thrusts.



The geologic scale time subdivides the Earth-s history in time intervals (era, period, epoch, etc.) arranged in chronological order based upon relative age relationships. The numerical ages are obtained by absolute dating methods.

Sentiero geologico
Geological path

Sentiero percorribile anche da bambini
Path for children

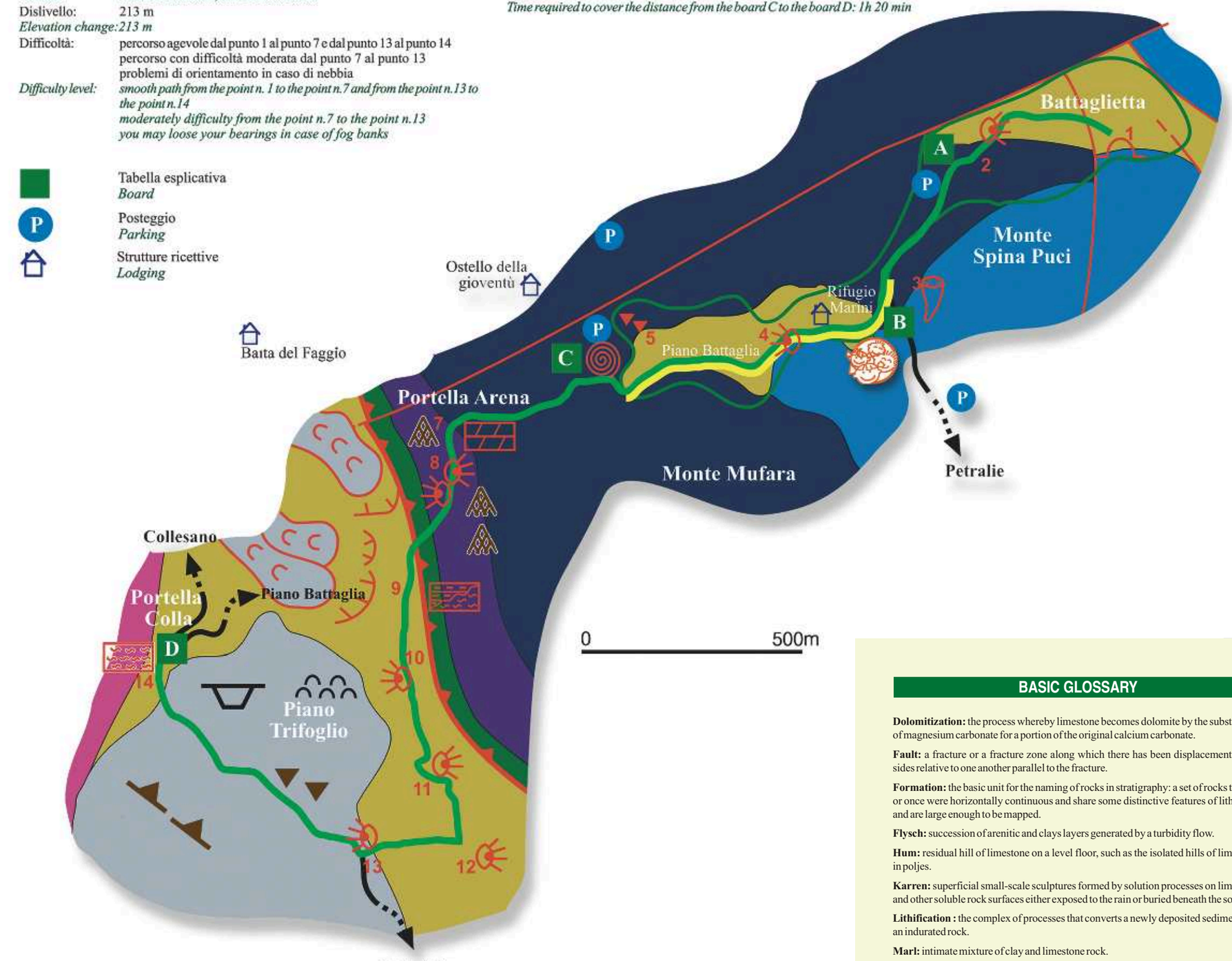
Lunghezza: 5.2 km
Length: 5.2 km
Altitudine: max 1633 m s.l.m., min 1420 m s.l.m.
Altitude: max 1633 m a.s.l., min 1420 m a.s.l.
Dislivello: 213 m
Elevation change: 213 m
Difficoltà: percorso agevole dal punto 1 al punto 7 e dal punto 13 al punto 14
percorso con difficoltà moderata dal punto 7 al punto 13
problemi di orientamento in caso di nebbia
Difficulty level: smooth path from the point n. 1 to the point n.7 and from the point n.13 to the point n.14
moderately difficulty from the point n.7 to the point n.13
you may loose your bearings in case of fog banks

Tabella esplicativa
Board

Posteggio
Parking

Strutture ricettive
Lodging

- Tempo di percorrenza totale: 2h
  Time required to cover the entire path: 2h
- Tempo di percorrenza Tabella A - Punto n.1: 10 min
  Time required to cover the distance from the board A to the point n.1: 10 min
- Tempo di percorrenza Tabella A - Tabella B: 10 min
  Time required to cover the distance from the board A to the board B: 10 min
- Tempo di percorrenza Tabella B - Tabella C: 20 min
  Time required to cover the distance from the board B to the board C: 20 min
- Tempo di percorrenza Tabella C - Tabella D: 1h 20 min
  Time required to cover the distance from the board C to the board D: 1h 20 min



Legenda - *Legend*

Detrito caotico, di natura argillosa e carbonatica, legato alla grande frana di Portella Colla.
Età: Attuale.
Clayey and carbonate chaotic debris connect to the Portella Colla landslide.
Age: Recent.

Unità del Flysch Numidico
Numidian Flysch Units

Peliti con intercalazioni di livelli quarzarenitici e di brecce calcaree.
Età: Oligocene superiore - Miocene inferiore.
Pelitic shales with intercalated quartzarenitic layers and calcareous breccias.
Age: Upper Oligocene - Early Miocene.

Unità Tettoniche Panormidi
Panormide Tectonic Units

Calcari a coralli e brecce calcaree (complesso di scogliera).
Età: Cretaceo inferiore - Giurassico.
Coral limestones and calcareous breccias (reef complex).
Age: Lower Cretacous - Jurassic.

Calcari a spugne e coralli, brecce e calcari algali (complesso di scogliera).
Età: Trias superiore.
Sponge and coral limestones, breccias and algal limestones (reef complex).
Age: Upper Triassic.

Dolomie e brecce dolomitiche.
Età: Trias superiore - Giurassico inferiore.
Dolostones and dolomitic breccias.
Age: Early Triassic - Early Jurassic.

Calcilutiti, marne grigie e biocalcareniti risedimentate (Formazione Mufara).
Età: Trias superiore (Carnico).
Calcilutites, grey marls and redeposited biocalcarenites (Mufara Formation).
Age: Upper Triassic (Carnian).

Unità Tettoniche Imeresi
Imerese Tectonic Units

Calcilutiti, marne e calcilutiti a liste e noduli di selce (Formazione Caltavuturo).
Età: Cretaceo superiore - Oligocene.
Calcilutites, marls and cherty calcilutites (Caltavuturo Formation).
Age: Upper Cretaceous - Oligocene.

Limite stratigrafico
Stratigraphic boundary

Faglia
Fault

Sovrascorrimento
Thrust

Polje

Scarpata di frana
Landslide scarp

Corpo di frana
Landslide body

Guglia isolata per erosione selettiva
Small needle rock due to selective erosion

Blocco di detrito in frana
Drift block rafted in the landslide body

Blocco detritico ruotato
Rotated drift block

Rilievi domiformi di natura antropica
Anthropic dome-like reliefs

Cava inattiva
Inactive quarry

BASIC GLOSSARY

Dolomitization: the process whereby limestone becomes dolomite by the substitution of magnesium carbonate for a portion of the original calcium carbonate.

Fault: a fracture or a fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

Formation: the basic unit for the naming of rocks in stratigraphy: a set of rocks that are or once were horizontally continuous and share some distinctive features of lithology, and are large enough to be mapped.

Flysch: succession of arenitic and clays layers generated by a turbidity flow.

Hum: residual hill of limestone on a level floor, such as the isolated hills of limestone in poljes.

Karren: superficial small-scale sculptures formed by solution processes on limestone and other soluble rock surfaces either exposed to the rain or buried beneath the soil.

Lithification : the complex of processes that converts a newly deposited sediment into an indurated rock.

Marl: intimate mixture of clay and limestone rock.

Polje: large flat-floored closed karst depression, with sharp slope breaks between the floor and the marginal limestone. The flat floor of the polje may consist of bare limestone, of a nonsoluble formation or of soil. Streams or springs drain into poljes and the outflow is underground through sinkholes. Sometimes the sinkholes are covered by impermeable rocks, so that many poljes turn into wet-season lakes.

Radiolarite: the lithified sedimentary rock formed from a siliceous deep-sea sediment composed largely of the skeletons of radiolaria.

Rounded solution runnels (*Rundkarren*): Karren form comprising rounded channels, commonly 50-500mm deep and wide and separated by rounded ridges. Rundkarren are the characteristic dissolutional forms created beneath superficial material such as soil, or beneath a cover of plants or mosses.

Tectonic unit: geological body delimited by two thrust planes. The thrust is a dip-slip fault in which the upper block above the fault plane moves up and over the lower block, so that older strata are placed over younger ones.

Selective erosion: erosion processes affected by a rock's geological structure. The less hardy and more fractured rocks are more erodible than hardier and less fractured rocks.

Solution pan (*Kamenitza*): a small depression in a level calcareous surface, enlarged by the solution effect of water collecting between slight undulations. It is initially developed vertically by stagnant water; the steep sides thus created then induce the flow of water which flutes the slope and thus eventually widens the basin.

Università degli Studi di Palermo
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The geological path was created in association with the **Ente Parco delle Madonie** and the **Department of Geology and Geodesy of Palermo University** (March 2004).

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