PRESENTATION

With the development of these didactic Guides of Geological Heritage of the Balearic Islands, the Conselleria de Medi Ambient, through the Sustainable Tourism Tax, comes to fill an important gap in the knowledge of the Natural Heritage of our islands.

The law 42/2007 of December 13 of Natural Heritage and Biodiversity indicates in its article 2 the principles on which it is inspired. Among others, "the conservation of biodiversity and geodiversity" is present, as well as "the conservation and preservation of the variety, singularity and beauty of natural ecosystems, geological diversity and landscape". These guidelines are presented as a fundamental tool to publicize the wealth of our Geological Heritage, taking into account that it is not possible to treasure and protect what is not known.

It is worth highlighting the remarkable inventory effort in the characterization of the Balearic Geological Heritage that has been carried out in recent years, through the publication of the books "Illes d'Aigua. Geological and Hydrogeological Patrimoni of the Balearic Islands" and "Els camins de l'aigua de les Illes Balears", carried out in collaboration with the Geological and Mining Institute of Spain (IGME), the Association of Geologists of the Balearic Islands (AGEIB) and the Balearic Federation of Speleology (FBE).

As a result of this intense work, the Ministry of Environment, Agriculture and Fisheries has developed an inventory of 87 Sites of Geological Interest (SGIs) distributed throughout the Balearic Islands. This inventory has been extended and improved by the authors of the work, a total of 46 LIGs in Mallorca and Cabrera, 27 LIGs in Menorca and 26 LIGs in Eivissa and Formentera (99 LIGs in total).

Although the present inventory includes most of the Geological Interest Sites of the islands, it is not a complete or definitive list, since it is a living document, which requires a periodic review.

Given the didactic aspect of the guides, in addition to the SGIs, there are 15 Viewpoints of Geological Interest (VGIs), points where you have a panoramic view of the regional geology, and 25 Itineraries of Geological Interest, where you can see various geological aspects of relevant areas (IGIs).

The guidelines were prepared by the Temporary Union of Companies formed by Geología de Mallorca SL and Geoservei SL, between February 2018 and December 2018, with a work team formed by Agustí Rodríguez Florit (Menorca), Sunna Farriol Cristóbal (Eivissa and Formentera), Josep Juárez Ruiz and Borja López Rallo (Mallorca and Cabrera).

In order to facilitate the understanding of the guides, a compilation of previous definitions of some basic concepts is provided below (Geozona, Geological Interest Site, Geological Interest Viewpoint, Geological Interest Itinerary). In addition, a description of the content of the different types of documents that comprise this work and a glossary of terms present in them are included.

PREVIOUS DEFINITIONS

GEOZONE: Area with more or less homogeneous characteristics due to a common geological genesis of the majority of the materials which compose it. This would be the equivalent of a geological morphostructural domain but at insular scale.

In Eivissa, four GEOZONES can be differentiated: Els Amunts – Sant Vicent, Sant Antoni de Portmany Depression - Santa Eulària des Riu, Atalaia de Sant Josep-Serra Grossa and Es Freus-Formentera.

In Menorca, two GEOZONES can be differentiated: Migjorn and Tramuntana.

In Mallorca, ten GEOZONES can be differentiated: Serra de Tramuntana Nord, Serra de Tramuntana Sud (inc. Dragonera), Serres Centrals, Conques Centrals (Palma, Sa Pobla, Inca and Sa Marineta), Plataforma de Llucmajor, Serra de Llevant nord, Serra de Llevant Sud, Marina de Llevant, Conca de Campos and Cabrera, in addition to the geozone of the Canal de Mallorca.

Site of Geological Interest (SGI): A clearly-delimited area which presents a continuous and homogeneous geological aspect in all its extension which, due to its unique and/or representative character of the

geological territory in which it is located, is interesting to observe from the scientific, didactic and/or recreational point of view.

Each SGI has been assigned an identification code composed of the initials of a particular region (EI: Ibiza, FO: Formentera, ME: Menorca, MA: Mallorca, CA: Cabrera and BA: Canal de Mallorca), the catalogue number and the initials of the principal geological aspect it presents. In addition, in the cases where this has been possible, the code of the SGI according to the IGME list has been added below the identification code.

To facilitate its management and conservation, it has been thought convenient to limit its extension to the observable area of the geological aspect which makes it interesting, and therefore in general the surface areas are less than 1.0 km2.

The most relevant geological aspects which can be presented by a SGI and their initials are the following: stratigraphic (ES), sedimentological (SE), geomorphological (GE), paleontological (PA), tectonic (TE), mineralogical (MM), petrological (PG) and hydrogeological/hydrological (HI).

Viewpoint of Geological Interest (VGI): A point from which one or more aspects are observed which, due to their unique and/or representative character of the geological territory in which they are located, are interesting to study from the scientific, didactic and/or recreational point of view. It can include one or more SGIs.

Itinerary of Geological Interest (IGI): A route in which one or more aspects are observed which, due to their unique and/or representative character of the geological territory in which they are located, are interesting to study from the scientific, didactic and/or recreational point of view. It can include one or more SGIs/VGIs.

The location of each SGI and VGI has been indicated with its U.T.M. coordinates (in Datum 31N ETRS89), the municipality in which it is located and a plan at scale 1:1,000,000.

Accessibility has been evaluated on a scale of 1 to 3, in which 1 indicates that access is very easy and entails no risks, while 3 implies that access is difficult, dangerous or requires great effort. Duration refers to the time taken to reach the SGI/VGI from an accessible point for a vehicle.

The locations of the IGIs have been indicated in three ways: on a general map of the corresponding island, by means of a plan at a more detailed scale, marking the recommended stops, and by means of the track of the route. The duration and difficulty of each itinerary have been evaluated (similar to the accessibility rating of the SGIs/VGIs).

For each SGI/VGI/IGI a series of indications, precautions and prohibitions are expressed in the form of icons:


It is recommended to wear hiking boots.


There is a recreational area.


Take water.


There is an interpretation centre.


Do not leave the marked path.


There is an information point.


There is a public car park.


Restricted visiting hours.

 There is a fountain.

 Watchtower.

 Lime kiln.

 Prehistoric monument.

 Viewpoint.

 Wetland.

 Ravine.

 The SGI is viewed from the sea.

 Danger, cliff.

 Danger of rockfalls.

 Precaution, sensitive fauna.

 Prohibited to remove fossils.

 Prohibited to bring animals.

 Do not walk on the dunes.

 Church.

 Lighthouse.

 Charcoal kiln.

 Heritage asset.

 Beach.

 Watercourse.

 Area of scenic interest.

 Birdwatching area.

 Danger of slipping.

 Danger of drowning.

 Do not feed the animals.

 Prohibited to remove

 Do not make stone piles.

 Access prohibited or restricted.

In addition to the description of the SGI/VGI/IGI, where the relevant geological processes and aspects are explained, a section has been included indicating a series of bibliographical references for enlarging on the information provided, plus a section of recommendations referring to the most suitable equipment or time of year for the visit, along with nearby places also worth visiting.

GLOSSARY OF TERMS

Abrasion: Erosion caused by the friction and collision of particles on a surface.

Allochthonous material: Material whose origin is far removed from its current location because it has been transported a significant distance.

Alluvial deposit: Accumulation of materials transported and deposited by water currents (rivers or streams).

Alluvial fan: Detritic deposit in the form of a fan or cone deposited by water due to an abrupt reduction in the slope of the surface over which it flows, also named dejection cone.

Ammonite: Cephalopod mollusc with a body protected by a fine shell of aragonite, normally in spiral from and with ornamentation. Its abundance and diversity during the Mesozoic makes it a basic fossil for the relative dating of rocks of marine origin.

Anchorage: Metal structure fixed to the embankment by means of a partially cemented perforation. They work by traction and serve to stabilise rocky embankments or soils.

Angular discordance: Contact between two stratigraphical units or series with major deformation degree in the lower one.

Anisotropic: Presenting different properties according to the direction in which it is studied.

Anticline: Type of fold in which the oldest materials are situated in its core.

Antiform: Fold of convex shape.

Aphotic zone: Portion of the water column which sunlight does not reach or is insufficient to perform photosynthesis.

Aragonite: Mineral of calcium carbonate of the rhombic system, with a specific weight of 2.9 T/m3 and a hardness of between 3.5 and 4.0 on the Mohs scale.

Autochthonous material: Material formed in its present location, not having been transported a significant distance.

Bar: Steel rod used in anchorages, less than 15 metres long, so its use is limited to surface anchorages. It is often used to stabilise rocky embankments by fixing loose rocks to the embankment.

Base: Oldest part of a stratigraphical unit or series.

Basalt: Dark-coloured volcanic igneous rock of maphic composition (rich in silicates of magnesium and iron and in silica) composed mainly of plagioclase and pyroxene.

Belemnite: Cephalopod mollusc with a pointed, lengthened internal shell whose most resistant part (rostrum) is commonly found in the fossil record. Its external appearance is similar to that of present-day squid.

Bentonic: Living on the sediments of the seabed or in galleries below the marine sediments.

Bioturbation: Alteration of the structure of sediment by the action of a living organism.

Bivalve: Type of aquatic mollusc with a body protected laterally by a shell composed of two pieces or valves, generally symmetrical in a bilateral plane.

Bouma sequence: Standard sedimentary sequence produced by a current of turbidites which, in an upward direction, consists of: 1) sandstones and granoclassified microconglomerates and with a slightly erosive

base; 2) sandstones with parallel lamination of high flow regime; 3) sandstones with ripples of current; 4) sandstones with parallel lamination of low flow regime; and 5) clays and slimes.

Bottom: Oldest part of a stratigraphical unit or stratigraphical sequence.

Brachiopod: Marine invertebrate with a body protected by a shell composed of two pieces or valves, of unequal size and with a transversal symmetry plane. It tends to live fixed to the seabed by means of a peduncle, although it can also live freely.

Breccia: Detritic sedimentary rock formed by angular pebbles of a size greater than 2 mm and representing at least 50% of the total mass of the rock. The pebbles are united by a cemented material named matrix.

Bryozoan: Invertebrate animal of millimetric size which forms colonies of branching appearance. The ciliate tentacles which compose it are located around the mouth and serve to capture food.

Calamine: Mineral of the silicates group from which zinc is extracted.

Calcarenite: Sandstone whose clasts are of mostly carbonated composition.

Calcite: Mineral of calcium carbonate ordered in a the trigonal system, with a specific weight of 2.7 T/m3 and a hardness of 3.0 on the Mohs scale.

Capillarity: Property possessed by fluids when in contact with a solid the free surface of the fluid ascends or descends. It depends on the surface tension and its effects are especially important in the interior of capillary tubes or between two very close-set laminas.

Carbonates: Group of minerals whose main component is the carbonate ion $(CO3)^{2-}$.

Charophytes: Green algae which present a branched erect vegetative structure with nodes and internodes and both masculine and feminine sexual organs. They live in both fresh and salty waters. Charophytes have been found from the Upper Silurian (around 430 Ma), but they are good stratigraphic markers of the Cenozoic due to their great diversification.

Clast: Solid particle forming part of a detritic sedimentary rock. It refers to pieces of rocks and hard biologic remains which have been eroded and transported.

Clay: Detritic or mineral sediment formed by particles that have dimensions less than 0.002 mm according to the Unified Soil Classification System. It is constituted principally by philosilicates and and presents plasticity.

Colluvial deposit: Collection of detritic sediments which deposit at the foot of reliefs due to gravitational processes or surface currents.

Conglomerate: Coarse-grained sedimentary rock of detritic origin (clasts larger than 2 mm).

Coniferous: Subdivision of gymnosperm plants with straight trunk and horizontal branches which protect their seeds inside structures called cones.

Concordance: Relation between two stratigraphical units or series which are parallel between them.

Conformity: Relation between two stratigraphical units or series which are continuous and concordant.

Contact: Depositional, intrusive or fracture surface which separates two diferenciate geological materials.

Contact aureole: Region of enveloping rock in contact with an igneous intrusion and affected by the high temperature this gives off, causing its recrystallisation. It is also named metamorphic aureole.

Continuity: Relation between two stratigraphical units or series which are consecutive in the time.

Crinoid: Echinoderm equipped with a calyx in its centre, surrounded by articulated arms, covered by regularly-arranged plates. Some species also have a stalk (peduncle) which fixes them to the substrate.

Cyanobacteria: Type of bacteria which can perform the oxygenic photosynthesis, previously known as Cyanophyta. They can be found as solitary single-cell organisms or forming colonies. They are found in numerous terrestrial and aquatic ecosystems. It is believed that the cyanobacteria were the first oxygen-producing organisms, thus favouring the formation of current Earth's atmosphere, relatively rich in this element.

Detritic deposit: Collection of sediments resulting from the physical meteorisation of fragile materials.

Diagenesis: Series of chemical or physical processes which take place in the Earth's surface whereby the sediment is transformed into a sedimentary rock, also named lithification.

Differential erosion: Affecting materials of different resistance, in which some erode more than others.

Dike: Formation constituted by magmas injected into the fractures or joints traversing rocks of another composition. Has a tabular shape and tends to appear in a group, displaying a parallel or radial arrangement.

Dip: Angle of inclination of a layer or stratum with respect to the horizontal, measured in the stratification plane.

Discontinuity: Interruption in the continuity of a sediment or a rock due to processes of a sedimentary nature (stratigraphic discontinuity), tectonic (faults and joints) or igneous.

Discordance: Lack of parallelism between two stratigraphic series or successions.

Discordance: Relation between two stratigraphical units or series which have no parallelism between them.

Doline: Depression of karstic origin with a conical shape due to dissolution of the substrate (dissolution doline), the sudden sinking of a cavity (collapse doline) or progressive sinking of the substrate (subsidence doline).

Dolomite: Rock composed of calcium carbonate and magnesium in a percentage of more than 50%.

Dolomitic limestone: Limestone which has undergone an alteration process in which part of the calcium (Ca) has been substituted by magnesium (Mg) in a percentage less than 50%.

Echinoderm: Marine invertebrate with pentaradial or bilateral symmetry and an exoskeleton with calcareous plates and spines. The family includes sea urchins, sea lilies and starfish. Sea urchins can be divided into two groups: infaunic, which live buried in the marine sediment, and regular, which live on the seabed usually clinging to the rocks.

Eolianite: Detritic rock originated in a deposit formed by action of the wind.

Erosion: Process of alteration and disgregation of materials. It can be physical, chemical or biological.

Erosive lag: Coarse-grained sediment deposited immediately above an erosion surface.

Erosive contact: Surface which contact two stratigraphical units or series which are not consecutive in the time due to an alteration, disgregation and elimination of part of the lower unit or series before the deposition of the later. Is a type of discontinuity.

Eustatic movement: Relative rises and falls of the sea level due to tectonic causes or the growth or fusion of glaciers.

Facies: Set of lithological, sedimentological and paleontological characteristics which present the strata of a stratigraphic unit and reflect the specific environmental conditions in which they were formed.

Fault: Fragile fracture surface accompanied by a relative displacement of the affected blocks. It is a type of discontinuity.

Flank of a fold: Part of a fold situated between two consecutive hinge zones.

Fluvial: Referring to rivers or watercourses.

Fold: Ductile deformation of rocks which gives rise to a curved geometry.

Foraminifer: Single-cell protozoon with a chitinous, calcareous or silicon shell. In general it is a marine organism and its dimensions range from less than one millimetre to a few centimetres (macroforaminifer).

Fossil: In paleontology, remains or signs of the activity of an organism which has undergone a lithification (fossilisation) process. Since it requires special conditions of conservation, in general only the hard parts of the organism fossilise, and marine or lacustrine fossils are more common than their terrestrial counterparts. Occasionally it is used as an informal term to describe geological elements preserved in the stratigraphical record.

Gap: See stratigraphic hiatus.

Gastropod: Mollusc equipped with a fleshy foot and with the body generally protected by a single-piece shell, normally in a spiral shape. The gastropods include snails and limpets, among others.

Gelifraction: Process of fragmentation of rocks due to the tension generated by water freezing in their cracks or fractures.

Geode: Rocky cavity, normally closed and spherical in shape, which tends to be lined with large mineral crystals.

Geological epoch: Third division of the chronostratigraphic unit, composed of several ages. It tends to reflect the abundance or decadence of living species or transitions of geological processes.

Geological era: Second division of the geochronological unit, composed of several periods. It extends from several dozens to hundreds of millions of years.

Geological formation: Formal lithostratigraphic unit with particular lithological and structural characteristics which distinguish it from other formations.

Geological period: Third division of the geochronological unit, composed of several eras. The estimated duration of each period ranges from 30 to 80 million years.

Glacis: Surface with a gentle slope (less than 10%) situated at the foot of an abrupt relief. It is formed by the erosion of the relief and subsequent deposition of the eroded sediment in the flat zones.

Gravel: Particles of dimensions between 4.76 and 76.2 mm according to the Unified Soil Classification System (USCS).

Guide fossil: Also named characteristic or index fossil. It is a fossil that permits dating the stratigraphic unit in which it is found. It must display great dispersion, have a short stratigraphic range and be easy to identify. The most frequent types are trilobites, ammonites, foraminifers and graptolites.

Gymnosperm: Plant which reproduces by means of seeds.

Gyrogonite: Female reproductive organ of the charophytes which is calcified and enveloped in five tabular cells enrolled helicoidally in an anti-clockwise direction. Its appearance is rather similar to that of a pine cone.

Hardground: Surface of a previously lithified ocean bed on which bentonic communities tend to settle. It is indicative of long periods of little or no sedimentation, or of the exposure of a lithified stratum after an erosive period followed by an inundation.

Hinge of a fold: Imaginary line joining the points of maximum curvature in a fold.

Hygrophytic: Referring to an environment with vegetation adapted to humidity.

Hypabyssal rock: Synonym of subvolcanic rock.

Hypogene: Ascent of fluids from the Earth's interior.

Ichnite: Fossilised footprint of a vertebrate.

Ichnofossil: Fossil trace resulting from the activity of an organism.

Igneous rock: Aggregate of minerals formed by the cooling and solidification of magma.

Imbrication: Process whereby sediments are arranged alternately, being partially superimposed in successive layers. It is also used to name the inclined and overlapped distribution of clasts and blocks dragged and deposited by flowings.

Inverse fault: Type of fault in which the movement takes place in the opposite direction to that of the dip of the fault plane. It is a typically compressive structure.

Isotropic: Presenting the same properties irrespective of the direction in which it is studied.

Joint: Fracture in a rigid rock without relative displacement of the two blocks.

Karst: Region of accidented relief due to the development of a complex of forms and conducts of dissolution which transfer the water from charge zones to discharge zones and with predominantly subterranean drainage. It is typical of carbonated rocks (limestones and dolomites) and evaporite rocks (halites and gypsums).

Klippe: Tectonic outcrop in the form of an isolated topographic elevation caused by the erosion of one or more thrust fault strata. The result is an outcrop of allochthonous material surrounded by autochthonous material, also named a tectonic island.

Limestone: Sedimentary rock whose main component is calcium carbonate ($CaCO_3$). Its origin can be chemical, organic or detritic.

Lithology: Branch of geology which studies the characteristics of rocks.

Lithophagus: Organism which perforates galleries in rocks to live in them.

Littoral: Coastline. In geomorphological terms it refers to the fringe situated between the upper and lower limits of wave action.

Llosella: Menorcan term for a mainly clayey sedimentary rock which tends to exfoliate in small flakes, similar to pelite.

Lumaquela: Rock consisting mainly of shells or shell remains.

Lutite: Fine-grained sedimentary rock composed in more than 50% of particles of the size of clay and/or slime.

Mac: Catalan term for pebble.

Magma: Molten material proceeding from the interior of the Earth.

Marès: Name commonly given in the Balearic Islands to the calcarenite rock extracted from quarries.

Marl: Sedimentary rock composed of clay rich in calcium carbonate.

Margo-limestone: Marl containing more than 50% of calcium carbonate, generally between 65 and 90%.

Marine regression: Recession of the sea due to a relative lowering of its level. As a consequence, sediments of deep areas are covered by sediments of shallower areas.

Marine transgression: Advance of the sea and invasion of solid ground due to a relative rise of its level. As a consequence, sediments of shallow environments are covered by sediments of deeper environments.

Mechanical contact: This occurs when the contact between two stratigraphic series is due to a fault.

Mélange: Mappable rocky body formed by broken rock fragments of different origins within a matrix. The size of the fragments varies between centimetric and kilometric. These fragments can be autochthonous or allochthonous. The mélange can have various origins: submarine or tectonic slides, etc.

Metamorphfic rock: Aggregate of minerals originating from the recrystallisation of pre-existing rocks due to changes of pressure and/or temperature.

Metamorphism: Process of change undergone by a rock due to exposure to high temperatures and/or pressures.

Metapelite: Pelite affected by a low degree of metamorphism.

Mollusc: Invertebrate organism having a soft body which can be protected by a shell (occasionally placed inside the body), a muscular foot and a feeding organ called radula. Well-known molluscs are the squids, snails, clams, etc.

Moldic porosity: Type of secondary porosity caused by differential dissolution of the shells.

Myotragus: Extinct caprine endemic to Mallorca, Menorca, Cabrera and Sa Dragonera. The most representative species is *Myotragus balearicus*.

Nectonic: Which swim freely in the water.

Normal fault: Type of fault in which the movement takes place in the same direction as that of the dip of the fault plane. It is a typically distensive structure.

Nucleus of a fold: Innermost zone of a fold.

Olistolith: Block of exotic rock which, due to gravitational slip, has been incorporated into a more recent sedimentary series or forms part of an olistostrome.

Olistostrome: Sedimentary deposit composed of a chaotic mass of rocky blocks, gravels and sands, embedded in a muddy matrix, of an older age than the sedimentary series in which it is located. It is caused by large gravitational slips.

Oncolite: Generally ovoid structure formed by the deposition of concentric layers of calcium carbonate due to the metabolic activity of cyanobacteria. Its genesis is similar to that of stromatolites, but developed on a base not fixed to the substrate. They are normally small in size, from 2 to 3 cm in diameter, but occasionally they can reach decimetric dimensions.

Oolite: Spherical or subspherical particle, of diameter less than 2 mm (sand class, rarely slime), formed by the superimposition of successive carbonated laminas around a detritic core.

Orbitolina: Flat bentonic foraminifer with a small protuberance in the centre. They are millimetric in size but can reach a centimetre in some cases. They lived during the Cretaceous and are considered marine guide fossils of shallow platform and warm waters.

Ore: Mineral or association of minerals containing a sufficient quantity of a prized chemical element to be extracted and exploited economically.

Orogeny: Deformation of a compressive type which produces a shortening and folding of the Earth's crust, with the consequent formation of mountain ranges.

Orography: Physiographical and geomorphological characteristics of an area of the territory.

Ostreid: Bivalve mollusc with an irregular pearly shell. The family includes the common oyster.

Outcrop: Extension of geological materials which can be observed on the surface due the erosive, tectonic, eustatic or antropical processes.

Paleorelief: Erosion surface which is fossilised by sediments of a later stratigraphic series.

Paralic environments: Sedimentary environments lying close to the sea, such as deltas, estuaries, swamps, marshes, etc.

Pectinid: Bivalve mollusc which tends to present radial ribs. The family includes the scallops, among others.

Pedra de cot: Menorcan term given to the red quartzose sandstone, little cemented and with a slime-clay matrix, which is used for sharpening knives thanks to its abrasive characteristics. In Mallorca it is known precisely as *pedra d'esmolar,* "sharpening stone".

Pelagic: Defines an area of open sea of greater or lesser depth (*pelagos*). It extends from the edge of the continental shelf to the deepest seabeds, normally coinciding with ocean trenches. This adjective is also applied to organisms which inhabit this medium.

Pelite: Type of detritic sedimentary rock formed by clay.

Peperite: Volcano-sedimentary rock which is formed when lava comes into contact with wet sediments, cooling abruptly. The result is similar to that of breccias, in which the fragments correspond to igneous rocks and the matrix to sedimentary rocks.

Philonian rock: Synonym of subvolcanic rock.

Photic zone: Portion of the water column where sunlight penetrates and performs photosynthesis.

Planktonic: Organism which floats freely in the water.

Polje: Large closed depression (generally kilometric) with a flat bottom and steep walls, associated with karstic processes.

Ponor: Sinkhole of karstic origin through which water infiltrates. If the water table rises, the ponor can have the opposite effect and act as a spring.

Porosity: Percentage of empty spaces (pores) present in a material in relation with its volume. It is named primary or intergranular porosity if it originates during the deposition process of the material, and secondary if it originates later, during diagenesis.

Progressive discordance: Has a syntectonic origin. The series of strata is arranged in the shape of a fan, the underlying strata being concordant between themselves and forming an increasing angle with the upper strata.

Pupation: State of apparent relative inactivity which some insects pass through during the course of metamorphosis. It consists in the transformation from the late larva stage into the adult stage.

Pyroclastic deposit: Accumulation of solid fragments of volcanic material expelled by a volcano in eruption.

Radiolarite: Sedimentary rock composed fundamentally of radiolaria, single-cell organisms usually with a siliceous shell.

Rasa: Rocky coastal platform at the low tide level which appears in front of a rocky cliff due to marine erosion, also named marine abrasion platform.

Rhizocretion: Structure originated out of the cementation of the sediment surrounding a root. When the root rots and disgregates, tubular structures remain in the shape of the root.

Rhodolith: Calcareous core constituted by remains of rhodophyta (red algae) growing around a nucleus.

Rhythmite: Facies formed by the rhythmic alternation of two different types of strata.

Rill: Furrow produced in terrains with a certain slope due to erosion by a concentrated flow of surface water.

Ripple: Undulating sedimentary structure generated by the action of a current of water or wind on a substrate of loose sand.

Rudist: Extinct bivalve mollusc which was characterised by having asymmetric valves, the lower one being fixed to the substrate. It was adapted to a sedentary mode of life and formed large colonies. The rudists lived in seas of warm waters during the Upper Jurassic and especially during the Cretaceous, at the end of which they became extinct.

Sand: Sediment formed of particles with dimensions between 4.76 and 0.074 mm according to the Unified Soil Classification System.

Sandstone: Detritic rock composed of sand-sized clasts.

Schistosity: The property of certain metamorphic rocks which are structured into laminas because of the orientation of tabular and acicular minerals.

Seam: Mineral or stony mass which fills a crack in a geological formation.

Sedimentary rock: Aggregate of minerals resulting from the consolidation and transformation (diagenesis) of sediments on the Earth's surface.

Sedimentation rate: Speed at which a sediment deposits.

Silicate: Mineral composed of silicon and oxygen. The silicates constitute the most abundant group of minerals in the Earth's crust.

Sill: Sheet which intrudes horizontally along strata of the embedding rock.

Slime: Sediment composed of particles with dimensions between 0.002 and 0.074 mm according to the Unified Soil Classification System.

Slump: Gravitational slip in favour of a slope of a coherent mass of poorly-consolidated materials.

Speleothem: Formation which develops inside caverns due to the precipitation of minerals, commonly calcite, aragonite and gypsum.

Spilitisation: Hydrothermal alteration process of basalt due the substitution of some of its minerals to form a type of rock named spilite.

Stratification: Property of sediments to arrange themselves in superimposed layers or strata.

Stratigraphic column: Graphic representation of a stratigraphic series deposited during a determined interval of geological time.

Stratigraphic hiatus: Absence of stratigraphical record due a prolonged period of no sedimentation and/or erosion. It evidences a discontinuity.

Stratification plane: Continuous surface limiting a stratum.

Stratigraphic section: Part of a stratigraphic succession which can be observed in an outcrop. It is represented graphically by means of a stratigraphic column.

Stratigraphic series: Vertical succession of strata in which the upper stratum is more modern than the lower.

Stratigraphic stage: Fifth division of the chronostratigraphic unit. It covers few millions of years.

Stratigraphic succession: Particular arrangement of strata which maintain their order of deposition.

Stratigraphic unit: Series of strata with a certain relationship between them according to lithological, paleontological or chronological criteria.

Stratigraphy: Branch of geology dedicated to the study of strata and the relationship between them.

Stratotype: The stratigraphic section situated in a particular locality (type locality) which serves as a standard model for the rest of the sections of its class. It tends to be the most complete, including the greatest quantity of the geological record, presenting the best-defined geological structures, and so on.

Stratum: Each one of the layers into which sediments and stratiphied rocks are divided, of essentially homogeneous origin, limited by continuous surfaces (stratification planes) where the process which formed them has been interrupted.

Stromatolite: Laminated calcareous structure formed by the metabolic activity of cyanobacteria in shallow waters, which capture and fix carbonated particles. Although its morphology is varied, it tends to appear as a mound or dome.

Subsidence: Process of progressive sinking of materials due to their own weight.

Subvolcanic rock: Aggregate of minerals formed by the cooling and solidification of magma in fractures or cracks of the interior of the Earth's crust, also named philonian or hypabyssal rock.

Syncline: Type of fold in which the younger rocks are close to the centre.

Synform: Fold of concave morphology.

Synsedimentation: Geological process occurring at the same time as sedimentation.

Tectonic: Relating to the deformation of the Earth's crust and its causes.

Tectonic impingement: Wedge formed between two faults.

Tectonic plate: Individualised fragment of the lithosphere, limited by active zones (plate margins) which move over the asthenosphere, also named lithospheric plate.

Tempestite: Sedimentary deposit caused by a storm and deposited in a shallow environment.

Terra Rossa: Relic soil composed of reddish clays, originated by the meteorisation and washing of limestone terrains. The reddish colour is due to the oxidation of minerals rich in oxides. It is typical of Mediterranean climates.

Terrestrial mantle: Internal layer of the Earth located between the core and the crust, composed mainly of silicates.

Terrigenous: Proceeding from the land.

Teschenite: Subvolcanic rock which due to its grain size could be classified as plutonic rock. It has a grainy appearance, with large, dark, lengthy crystals of amphibole.

Thickness: Interval between the botton and top of a stratigraphical unit or stratigraphical sequence.

Thrust fault: Inverse fault in which the dip of the fault plane is at a low angle (generally less than 45º). It tends to refer to large-scale (regional) structures.

Thrust fault layer: Complex of thrusting and folded materials in which the flanks of the folds are approximately horizontal.

Top: Youngest part of a stratigraphical unit or sequence.

Tractive current: Powerful flow of water capable of dragging materials along a channel bed.

Travertine: Sedimentary rock originated by the precipitation of calcium carbonate from supersaturated waters, especially in zones of karstic emergences.

Trilobite: Marine arthropod proper to the Paleozoic with a body segmented into three regions (cephalon, thorax and pygidium) which in turn are divided by two longitudinal grooves which give it a trilobular appearance.

Tuffite: Volcano-sedimentary rock originated by the alteration of clays or limestones on coming into contact with pyroclastic materials (in a quantity greater than 50%).

Turbidite: Sedimentary deposit left by a current of high density (turbidity current). In general it tends to be a deposit from deep seawater situated close to the continental slope.

Unconformity: Relation between two stratigraphical units or series which are discontinuous and concordants but with a markedly irregular contact. Is a kind of erosive contact.

Vacuole: Small hollow in a rock which may be originated by an escape of gases in volcanic rocks, by dissolution of minerals, etc.

Vergence: Direction in which an asymmetric fold is inclined.

Volcanic rock: Aggregate of minerals formed by the cooling and solidification of magma on the surface.

Volcano-sedimentary rock: Rock composed of a mixture of volcanic and sedimentary material.

Water table: Top level of subterranean water where the hydraulic pressure is equal to the atmospheric pressure.

Weathering: Process of alteration and disgregation of materials due to climatic processes which take place on the surface such as rain, wind, etc. It can be physical, chemical or biological.