Geology of System 3

Pale di San Martino, San Lucano, Dolomiti Bellunesi, Vette Feltrine

The largest island in the Dolomite archipelago

This sizeable system contains a wide variety of rocks, from the Permian to the Cretaceous periods. It can be divided into two sections marked by the prominent tectonic line of Valsugana, leading to the Cereda pass, separating the northern section (Pale di San Martino, Pale di San Lucano, Civetta, Moiazza) from the southern section (Dolomiti Bellunesi, Vette Feltrine, Brendol, Piani Eterni, Cimonega, Schiara, Talvena, Pramper, Cime di San Sebastiano).

Pale di San Martino, Pale di San Lucano, Civetta, Moiazza

The stratigraphic sequence in this northern section covers a period of about 150 million years, from the early Palaeozoic to the late Carnian/Norian periods. Most of its rocks belong to the Permian-Triassic eras, with those from the Anisian-Ladinian periods particularly well represented.

On the north-western slopes, just beyond Pale di San Martino (Veneggia, Passo Valles, Passo Rolle) there are outcrops of rock that tell of the arrival of the first Dolomite Sea, starting from the Athesian volcanic events, and the gradual erosion of the ancient Hercynian mountains. This imposing system that includes Pale di San Martino, together with some parts of the Coldai, Pelsa, Agner and Pale di San Lucano peaks, contains traces of a large Ladinian island, its original geometries intact (island-deep sea; island-volcanic material).

The major deposits of volcanic origin are mainly concentrated in the northern area, while on Monte Pelsa and Agner rocks have been found that bear witness to the emergence of the Ladinian island, its surfaces marked by erosion and paleokarst formations. This irregular surface formed the bedrock for the subsequent coral islands of the Carnian period.

On the slopes of Civetta, and in the more eastern section, there are widespread deposits that tell of the disappearance of the Triassic

archipelago and the establishment of a plain, initially crossed by rivers and then becoming the Norian flood plain.

The southern section near the entry to the Cereda Pass contains outcrops of Palaeozoic rock from the metamorphic base in which have been found the oldest macro-fossils in the Dolomites, graptolites dating back 430 million years.

Geomorphology

This system is dominated by the huge Ladinian-Carnian carbonate platform of Pale di San Martino-Agner-San Lucano-Pelsa-Coldai that erosion has caused to re-emerge, doing away with the thin layers of basin, volcanic and terrigenous material that once covered it. The dizzying faces to the sides of these mountains were once the ancient underwater slopes of the island, while the broad plateau of Fradusta, San Lucano and Pelsa now replaces the lagoon that once topped the island.

Unlike the erosion that occurred in the Pale di San Martino-San Lucano and Agner chain which carried away all the younger rocks, the Civetta-Moiazza chain still displays such breath-taking vertical walls as the north wall of Civetta and the south wall of Moiazza, reaching up over 1,000 metres rising up from the level beds of Dolomite and calcareous rock of the late-Triassic-early Jurassic era.

The general orientation of the crests and the distribution of the many towers, pinnacles and spires that make the silhouettes of this system so striking, reflect the layout of the subvertical faults and fractures that cut through the rocky mass. The hydrographic network is also heavily dependent on the tectonic faults in the rock resulting in the formation of numerous new canyons and deep valleys branching out from them, such as Val di Gares, Val Canali, Val Corpassa. The imposing vertical walls bounding Valle di San Lucano (the northern edge of Monte Agner rises over 1,000m) are at the mercy of a system of vertical faults, running E/NE and W/SW.

From the morphoclimatic point of view, there are innumerable forms of erosion and deposits that can be traced back to ancient glaciation such as cirques, nunataks, sheepbacks, hanging valleys, banks of moraine and glacial erratics. Some glaciers still exist, such as Travignolo and Fradusta on Le Pale and Cristallo and Giazzer on Monte Civetta, but they are rapidly thawing.
The widespread pronival ramparts and rock glaciers and the extensive

debris fields and detrital cones found at the foot of all the walls are evidence of the importance of freezing and thawing processes in the current morphogenesis of this section of the Dolomites.

Rock falls and collapses are common, producing a great deal of boulders and smaller rubble. One fall in 1908 which broke away from the southern walls of Pale di San Lucano hit the villages of Prà and Lagunaz causing 28 deaths.

Vette Feltrine – Brendol – Piani Eterni – Cimonega – Schiara – Talvena – Pramper – Cime di San Sebastiano

In this southern section the thick layers of rock tell of a continuous history from the Ladinian period, for the Dolomite rock of Mount Sciliar, to the Scaglia Rossa of the Cretaceous period, covering some 165 million years. Starting from the west, it runs along the Vette Feltrine ridge, providing a unique section of the southern Jurassic edge of the Trento platform, yielding rare fossils of calcareous and siliceous sponges.

The cetaceous rocks, Majolica and Scaglia Rossa, making up the upper part of the Vette peaks, and of the mountains surrounding the Piani Eterni, have been eroded in some very particular ways.

The Cimonega and Pizzocco peaks are of typical Dolomite rock, while on Piz de Sagron there are outcrops of Dolomite rock forming an edge of the large Ladinian island of Pale di San Martino, severed by a major thrust, the Valsugana fault, and overlaying younger rocks. The inaccessible walls of the Schiara and Talvena chains show the directions of the fault planes along which the gradual sinking took place of the great tidal plain, the origin of the Main Dolomite rock which is predominant in the area around the peaks of San Sebastiano, Pramper and Moiazza.

The south-eastern belt, starting from La Schiara up to Van de Zità, is littered with traces of the ancient tectonic activity that caused the Jurassic sinking and the opening up of the Belluno basin.

Geomorphology

To the north this section displays typical Central Dolomite outlines, isolated massifs and ridges punctuated by towers and jagged crests rising abruptly from gentle slopes. To the south the morphology is more quintessentially pre-Alpine with elongated, barely accessible ridges with rocky stretches overlaid with gentle, grassy slopes and surrounded by deeply carved valleys and gorges.

This is a geomorphological transitional landscape, deeply influenced by the Valsugana fault that overlaid the varied collection of rocks of the mid and late Jurassic period, making up the Pramper, Cime di San Sebastiano peaks and the Cimonega chain, with the more homogenous, compact formations of the Triassic-Jurassic and Cretaceous periods found in the Vette Feltrine, Brendol, Monti del Sole, Schiara and Talvena peaks.

Another striking morphological feature is the Gusela del Vescovà, the famous pinnacle that owes its geometry to the network of vertical fractures cutting into the Schiara strata.
Extremely deep gorges, such as Val Vescovà, Val di Piero, Val Ru de Mulin, Val del Grisol and Val Maè, have been formed on the site of the most pronounced faults and/or in areas where the strata have been lifted vertically by the forces that raised the Alps. Finally, mention must be made of the imposing western face of Monte Burel which reaches a height of 1,000m.
The calcareous Jurassic and Cretaceous rock formations give rise to some fascinating karst phenomena that leave evident traces both above and underground and attract a large number of potholers. These features include the Altopiano dei Piani Eterni plateau and the Busa delle Vette valley.
There are also plenty of climatic morphological features associated with ancient glaciation, such as the banks of moraine in Val Pramper, glacial deposits in Val Canzoi, and the cirques Circo di Cimia and the Buse cirques in the Vette Feltrine. Those due to freezing and thawing processes include the cones and debris layers of Val Pramper and the Vette Feltrine rock glaciers.

Given the high-energy forces at work, there are a great many rock slides in this area. Val Pramper has been hit by some major collapses and falls of debris and in the late glacial era there was a massive landslide on Monte Peron whose debris field, Masiere di Vedana, blocked the flow of the Cordevole mountain stream.

Text by Dolomiti Project Srl