Geology of System 2

Marmolada

An organic island in the Ladinian archipelago crossed by lava and covered in volcanic material

This system tells of the first Dolomite sea and the establishment of an island in the Triassic archipelago until eventual its covering with Ladinian volcanic material, although some of this story is rather disjointed, it is nonetheless unique.

The Marmolada massif is an exceptional example of a pre-volcanic island built from organic matter in which the relationship between the organically constructed sections and the deep sea sediments is preserved in various places. In the Padòn, Auta and Monzoni subgroups, the area also contains some thick layers of volcanic material, such as tuff and ashes, deposited as a result of the eruptions of the mid-Triassic period.

This island was split in two by the river of rising magma travelling along conduits and it was covered by material from the eruptions, presenting us with vertical sections that provide much information about the relationship between the carbonate and the volcanic deposits. The volcanic material covering the fossil island contributed to the failure of this massif to become transformed into dolomite rock, hence the references to Marmolada limestone, and it also accounts for the excellent state of preservation of the fossil fauna.

Another exciting feature of the Marmolada is that it contains eloquent traces of the Triassic tectonic upheavals in addition to the more recent ones that lifted up the Alps.

Geomorphology

The Marmolada massif is at the centre of the UNESCO World Heritage Site and it is known as the Queen of the Dolomites in that it reaches a height of 3,343m at Punta Penia. The northern face is home to the largest glacier in the Dolomites, making it a very special place for observing the formations associated with both past and present glaciation and for further study of glaciology and climatology.

Here too there are some magnificent examples of morphology associated with the rock variations and the lines of the faults and fissures created by tectonic movements.

The Marmolada, Gran Vernel, Cime Ombretta peaks and Val Fredda present an overall picture of an isolated calcareous massif rising abruptly from the centre of the Dolomites with sheer faces and dizzying walls. They emerge from more gentle slopes carved out of the soft Ladinian volcanic rock and the Anisian marl. The silhouette of the massif is markedly asymmetrical with vertical walls to the south contrasting with a broad, slightly inclined plateau to the north. This geometry is the product of the thrusts suffered by the crust when the Alps were being raised, causing the northerly inclination of the layers of rock, forming a monoclinal structure. The orientation of the main walls, crests and little valleys inside the massif, Val di Contrin and Val Ombretta, also displays the reticular geometry of faults and fissures. Numerous fractures run across the imposing southern wall, some of these open, that developed along the vertical faults or ancient fractures across which travelled the Ladinian magma.

The Marmolada glacier has made a significant contribution to remodelling the northern face of the massif. It is a mountain glacier bounded upstream by the rocky crests culminating in Punta Rocca (3,310m) and Punta Penia (3,344m). At times it reaches these crests framing the dizzying south wall in spectacular fashion. The glacier is thawing rapidly. In the 1960s it covered a surface of 305 hectares and by 2006 this had shrunk to only 170 hectares. Today the leading edge of the glacier has retreated to above Sasso delle Undici and Sasso delle Dodici that up till only a few years ago formed the boundaries between the eastern, central and western sections of the glacier. Once enveloped in ice, these ridges resemble shark fins, also known as nunataks, narrow, elongated calcareous outcrops their sides abraded by the glacier, rendering them smooth and marked with deep striations. These rocky outcrops modelled by the glacier, also known as sheepbacks, which are smooth, rounded and marked by streaks and furrows, are quite common all over the area. Among the many other signs of glaciation, Valle Ombretta deserves a mention as a magnificent example of a hanging glacial valley.

The highly soluble grey Marmolada limestone is ideal for creating karst and glaciokarst formations that increase as you head downhill.

Text by Dolomiti Project Srl