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CRYONIVAL PHENOMENA AND KARST PHENOMENA IN THE PLATEAU OF THE SELLA GROUP

With 4 photos

DARIO CROCE

The Sella Group occupies the principal orographic knot of the Occidental Dolomites, from which diverge four important valleys: the Val di Fassa, the Val Gardena, the Val Badia, and the Val di Livinallongo.

One speaks of a grandiose Dolomitic bastion, roughly square in shape. It ranges from 2000 to 3000 meters in altitude, and a wide ledge between the altitudes 2500—2700 meters interrupts the continuity of the Dolomitic cliffs which, as a result of the compactness of the rock, turn out to be quite poor in spires and pinnacles. It terminates at the top with a vast plateau tortured by depressions, continually subjected to intense meteoric action, which has transformed this summital; plateau into a harsh strip of rocky desert over which dominates the characteristic pyramid of Piz Boè.

Geologically the basal terminus is represented by a block of unstratified dolomite (Dolomite of Sciliar) while the summital part is made up of a white compact dolomite, which presents an almost horizontal stratification that is very regular (Principal Dolomite).

Between these two dolomitic blocks there are some more easily erodible formations (Strata of Raibl) which have formed a characteristic ledge. This ledge constitutes one of the more salient morphological aspects of the whole group.

In this work I have taken into consideration some of the more particular surface forms of the plateau, i. e. those due almost exclusively to karst and cryonival modelling actions.

The plateau, in the form of a basin, ranges between 2750 and 2950 meters in altitude. The peripheral borders quite often turn into dolomitic terraces and thus the whole plateau is subdivided into numerous and steep depressions. The plateau represents an old relief, always morphologically speaking, in clear contrast with the young forms of the peripheral walls of the group, even though they developed from the same rocks.

During the last glaciation, in the various stages Bühl, Gschnitz, and Daun, the plateau was still covered, as NANGERONI affirms, by one continuous and enormous ice-cap with steep borders which was over-flowing in all directions.

The past existence of this ice-cap is confirmed by the abundant morainic sediment deposited both along the two principal valleys of Mesdì and Lasties, and inside and around the whole group. The successive conservation, understood in a broad sense, of this vast area is due above all to its position, summital in respect to the group, and to the almost horizontal position of the powerful dolomitic banks which make up its surface.

And precisely on this fundamentally uniform area were formed the preliminary elements necessary for a two fold erosive action: one slow, of a chemical character on the part of the carbonic anhydride contained mainly in the melting waters; the other of a mechanical nature, in the period when the freezing and thawing takes place and which works with thrusts of expansion, etc., an action naturally facilitated by the quality and by the position of the dolomitic rocks.

Once established the lack of a rapport between the variation of the chemical constitution of the rock and the genesis and the development of the forms (complessio-metrical analysis of about thirty samples taken from sections of the cavities), I tried to see what could be the determinating motives for such a characteristic morphology.

An element of fundamental interest for the comprehension of the forms is given by the climate, the study of which bears out from time to time a two-fold explanation: cryonival action and karst action. In this field of study I had notable diffi-

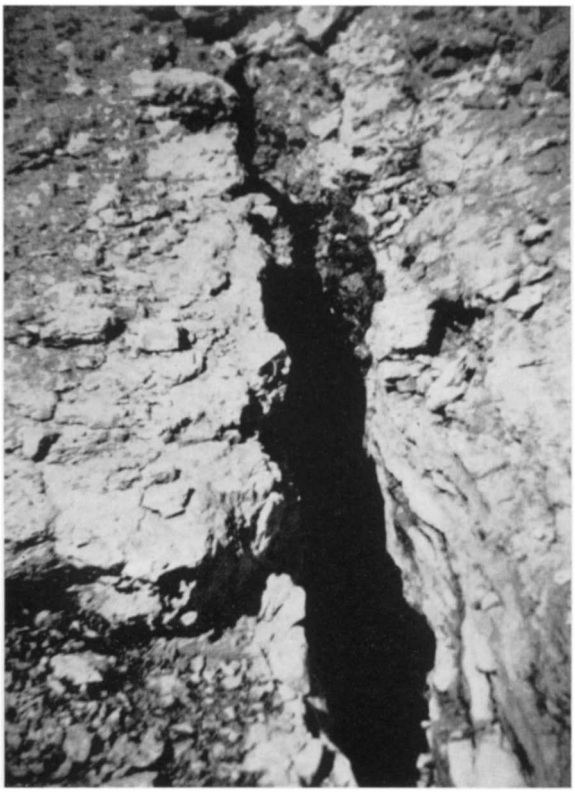

Photo 1: Narrow and lengthened cavities. Note in upper part a diaclasses with direction N 70° W — S 70° E.

Photo 2: Three aligned cavities, located on a cleft with direction N 50° W—S 50° E of which that cavity situated at SE is not shown in the photograph. On the right one notes another smaller cavity that seems to have had a development independent from the first.

Photo 3: Rectangular cavity with a snow-covered floor. Note the intense craeking of the rock and at the top one of the four diaclases that arrive at the corners.

Photo 4: Rock intensely split, near Rifugio Boè. Note the isolation of the various rocks due mainly to cryonival action.

culties since I was able to take into consideration only those facts relative to the stations situated at the valley bottom (Arabba, Corvara, Mazzin, and Ortisei) and at two situated at the Pordoi and Campolongo Passes, which for the most part functioned only occasionally. Thus, for the climatic considerations which exist now on the plateau, I had to turn to empirical considerations, for which I was able to obtain a simple valutation on the thermal-pluviometric state of this zone.

With the same facts, I considered above all the thermal differences which determine and accen-

tuate the causal characteristics of the modelling whether the object of the study be karst or cryonival modelling. The alternation of freezing and thawing favors, in fact, the evolution of the cryonival forms, and exercises its vigorous action in the plateau in the month May, June, September and perhaps even in the first half of October, that is, in that period in which the daily thermal average is above 0° centigrade but the night minimum is constantly below 0° C. In the months of July and August, however, even the minimum temperature remains generally above 0° C and thus the solvent action of the melting and falling waters is more important than cryonival action. The blanket of snow performs an important action; precipitations in solid form are particulary abundant in the plateau. These precipitations, besides often protecting the ground from freezing, constitute a potential water reserve, both because they contribute to maintain the constantly humid terrain and because in the summer months they are the source of relevant quantities of water which favor an intense action of chemical dissolution.

Undoubtedly the surface modelling action has had its preliminary causes in the lithologic make up of the zone and in the surrounding conditions. But we must not forget another element of fundamental importance, and that is the present state of rock-riving. In fact, both the solvent action of the melting waters and that due to freezing and thawing have been able to act with great intesity in the points of minor resistance of formations present. In fact, and in agreement, in most cases with faults, diaclases and leptoclases a whole series of characteristic phenomena of erosion has started and developed. These phenomena if in the general lines do not change the aspect of the plateau, do modify its surface with a nervous and accentuated texture of terraces, niches, furrows, and cavities. And it is precisely on these formations I focused my attention trying to determine ther genesis and the development.

In fact, one can note how the form of the cavity, that is a) the predominant direction of development and, b) the profundity, is fundamentally tied up with the presence of diaclases and leptoclases, which have rendered the water convoy easy and relatively more abundant. And thus, to the presence of one or two almost parallel diaclases are joined forms that are generally very lengthened in one direction, agreeing with the direction of the diaclases. In the case of two diaclases, however, the forms are notably deeper and wider. When instead one is in the presence of a more or less numerous group of diaclases, forms originate that are rounder and elliptical even if rather limited in dimensions.

Naturally if the karst and cryonival actions have contributed to the creation of these forms, each has marked them differently. In fact, while cryonival action has performed an intense dismantling of the surface, the karst action for the most part has effected the progressive deepening of the cavities and of the large fissures.

Thus we are watching on one hand a mountain landscape more uniform or anyway less incised in its lines, and on the other, the succession of forms in which the local erosion is very intense.

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BLATT 3 (NORD-PUERTO RICO) DES INTERNATIONALEN KARSTATLAS

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(siehe Beilage)

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