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Nota breve

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PERIGLACIAL DEPOSITS IN SARDINIA: THE BLOCKSTREAMS NEAR PRANU MANNU

Abstract: GINESU S., *Periglacial deposits in Sardinia: the block-stream near Pranu Mannu* (IT ISSN 0391-9838, 1990).

Periglacial deposits known as blockstreams, attributable to the cold climatic phases of the Pleistocene, are described for the first time in Sardinia along the border of the Pranu Mannu (Logudoro) basaltic plateau. (KEY WORDS: Periglacial deposits, Block-stream, Pleistocene, Sardinia).

Riassunto: GINESU S., *Depositi periglaciali in Sardegna: i block stream di Pranu Mannu* (IT ISSN 0391-9838, 1990).

Depositi periglaciali conosciuti come *block-stream* sono segnalati per la prima volta in Sardegna, nei pressi del rilievo basaltico di Pranu Mannu (Lugudoro). Essi vengono attribuiti alle fasi fredde del Pleistocene. (TERMINI CHIAVE: Depositi periglaciali, Block stream, Pleistocene, Sardegna).

Recent events and deposits in Sardinia attributed to the Pleistocene have often been reported in literature. But the main interest has been in shoreline variations associated with glacial-eustatic phenomena and terraced deposits more closely related to these fluctuations. On the other hand, studies on deposits and phenomena associated with periglacial processes in continental environment are quite scarce. Few authors have studied such phenomena (PELLETIER, 1960; OZER & ULZEGA, 1981; FEDERICI, GINESU & OGGIANO, 1987) and mainly with reference to the stratified slope deposits, known as «éboulis ordonnés». In 1971 DIENI & MASSARI gave a possible reconstruction of the gravitational movements of Mt. Albo, and attributed some of them to cold phases of the Pleistocene.

In the present study continental detrital deposits referrable to *blockstreams* have been identified and reported for the first time in Sardinia. Their distribution along the reliefs of the island is at present being studied but it has been considered useful to anticipate the first results. Blockstreams have been identified for the first time along the perimeter of one of the most extended plateaux of the Logudoro region in Central-Northern Sardinia (fig. 1).

The area, characterized by modest elevations (600 m on average), is situated at latitude 40° North. The landscape is mainly made up of plateau-like forms (commonly known as «*giare*» in Sardinia) determined by the presence of relics of Plio-Pleistocene basaltic volcanic flow, sharply emerging from a landscape moulded by river erosion. The remarkable difference between the volcanic rocks and the marl ash rocks of the substrate, which are usually very fragile, caused strong erosion in the valley floor and along the slopes, which is unusual for small streams such as those flowing in this territory. The evolutionary model of the landscape here in mainly due to relief inversion, which is associated with the difference in resistance to erosion agents.

THE BLOCKSTREAMS

The blockstreams observed along the border of the Pranu Mannu plateau (maximum height 796 m) show an identical lithological constitution. They are made up of blocks of remarkable size (diameter at times greater than 1.5 m) all basaltic. Petrographically they are basaltic andesites, the same as in the flow of the Pranu Mannu relief. They do not appear cemented, but the transport and the successive leaching have been so intense as to cause severe general compaction. The lithological nature is

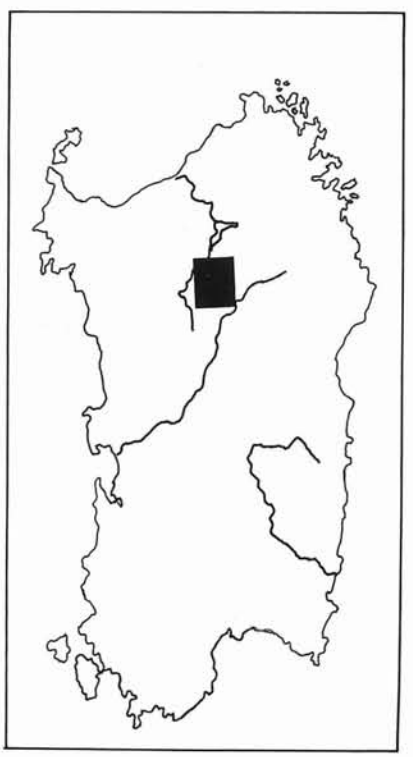

FIG. 1 - Sardinia island: localization area.

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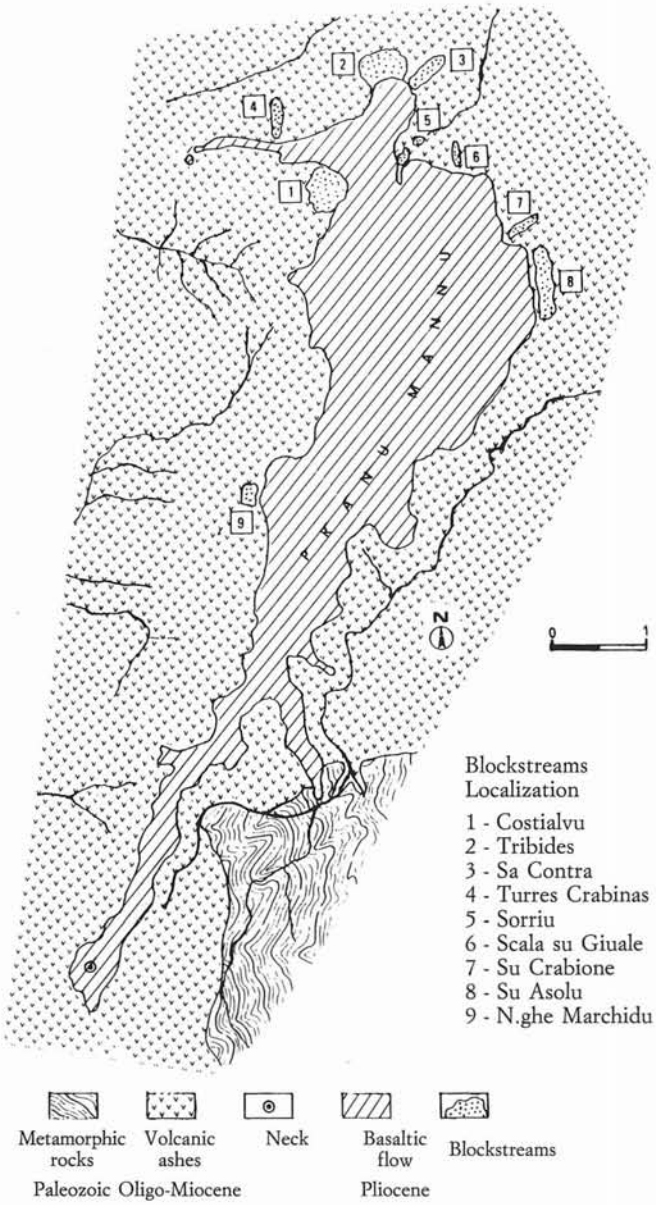

FIG. 2 - Localization of the block-streams of Pranu Mannu.

FIG. 3 - A view from the top of the Costialvu blockstream.

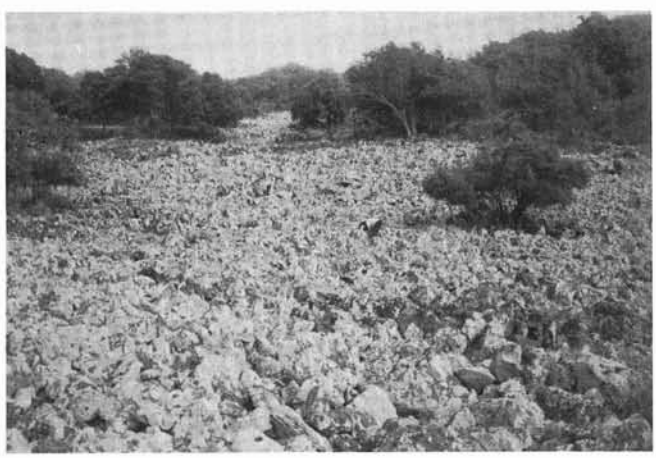

FIG. 4 - A view from the edge of the Tribides deposit. The blocks are angular and unaltered indicating they hare moved little from their source.

petrographically defined by the same basaltic andesites making up the flow of the Pranu Mannu plateau. The single elements are always underdeveloped, almost splintery, and sharp-cornered, whatever their size. Strangely shaped cavities or niches and split-types shapes are not rare in some of the larger boulders. The deposit is simular to those described in literature (i.e. Czudek, 1964; Dahl, 1966; Caine, 1968; Clark, 1969; Minty, 1989).

Since these deposits are to be considered fossils because of the present climatic conditions of the island, it is likely that, during wet temperate phases, also fine-grained materials could have percolated into the core of the deposits; the soil nappe overgrown with vegetation that can be seen on top of some of the blockstreams, can be due to subsequent alluviation during warmer climatic phases. On the other hand, fine-grained material such as sand or gravel is totally absent on the surface of the deposits (fig. 3).

Nine different blockstreams were observed on the sides of the Pranu Mannu relief. The blockstreams are different in extent, thickness and shape, and some present remarkably different slope values.

Site	Exposure	Shape	Extent	Altitude	Dip
Costialvu	N-W	versant	14.4	670/580	20%
Tribides	N	versant	10	620/500	30%
Sa Contra	N	linear	2.1	625/525	
Turres Crabinas	N	linear	4.8	675/545	30%
Sorriu	N-E		4.1	620/550	30%
Scala Su Giuale	N	linear	0.8	650/550	50%
Su Crabione	N-E	linear	2.0	655/525	30%
Su Asolu	E	versant		650/600	20%
N.ghe Marchidu	W		2.7	675/640	60%

Extent is expressed in hectares.

Altitude: It can be seen from the table that all the blockstreams considered are on a mean altitude ranging from a maximum of 648 m to a minimum of 557 m. The highest was found at an altitude of 675 m near the N.ghe Marchidu, while the lowest was near Tribides at 500 m. These values are a useful datum when trying to identify a well-defined climatic belt along the slopes of this part of the territory (fig. 4).
Exposure: Also in this case the locations where the deposits were found are prevalently exposed to North; «Su Asolu» and «N.ghe Marchidu» are the only exceptions, but they are at a higher altitude (above 600 m) than all the other blockstreams of the Pranu Mannu.
Extent: The deposits are not always easily identified. In some cases, as in Castialvu and Tribides, where the blockstreams are remarkable in extent, they are quite easy to identify even though locally overgrown with vegetation. In other places, however, especially in areas of smaller extension, the vegetation and the soil horizon must the examined with greater care. It is evident, however, that no precise relations are to be observed between the extent of the deposit and other parameters.
Shape: Some are visibly elongated and linear, giving evidence of a preferential flow along pre-existent incisions. The fact that some of these incisions, such as Crabione and Sorriu, are still supplied by elements falling by gravity, could suggest a mixed origin of periglacial processes and talus. Other blockstreams, especially the more extended ones, do not present any definite shape, but tend to cover the whole slope uniformly, irrespective of whether there is an incision or not.
Dip: The dip of these deposits, calculated as a percentage, shows a prevalence of blockstreams at a gradient of about 20-30% with some exceptions at Scala Su Giuale and N.ghe Marchidu. The latter, however, seems to be due to a process where leaching prevailed on the action of frost, thus mixing blockstreams with talus. Immediately upstream from the deposit there is an escarpment coinciding with the basaltic flow. This is extremely fractured and represents the necessary element supplying both the blockstreams and the abundant talus which can be found almost all around the Pranu Mannu plateau. Near Scala Su Giuale, where an elongated form can be seen, the steep slope suggests an origin associated only with gravity and leaching. Another phenomenon worth mentioning in connection with this relief, even though not related to the blockstreams but perhaps induced only by frost, is a small landslide causing a slump in the slope near Seari, in the south-western part of the plateau.

CONCLUSIONS

It has already been said that the territory where the Pranu Mannu plateau is situated is characterized by plateau-like forms in flat relief, whose evolutionary genesis is associated with marked relief inversion. Since the Upper Pleistocene, basaltic volcanic activity has occurred in this area causing subsequent episodes of discharge of magma up to about 140,000 years ago. All the visible plateaux in the area coincide with the volcanic flows of the different periods. The latter at times followed pre-existent incisions and formed very elongated plateaux, while at others the volcanic flows extended in morphologically more depressed areas and formed more regular extensions with very small differences in height at the surface. Therefore thanks to the basaltic flows, forms and deposits, referable to an age between the Upper Pliocene and the Upper Pleistocene have been preserved. The Pranu Mannu flow emerged from an emission centre located near Pranu Sa Sea (797 m) more than 10 km South. Between the highest and lowest points of the plateau there is an altitude difference of more than 100 metres. According to the K/Ar method, the plateau dates back to almost 2.9 million years ago. It shows an elongation towards North and a bifurcation in the South where the highest altitudes are found. This suggests that the basalt flow has run inside the incision.

The substrate underlying the plateau is almost entirely made up of volcanites of Oligomiocenic age, which are here represented by large banks of the «ash flow» type of white ash rocks connected to a rhyodacitic magmatic type. Undifferentiated and very weathered phyllite metamorphic rocks can only be seen in the south-eastern sector next to a fossilized tributary near Foresta Burgos. The fact that both the volcanic and metamorphic substrates are easily erosible has favoured a relief inversion evolution.

From the objective data in my possession, it is inferred that in Central Sardinia the formation process of the blockstreams started at altitude slightly above the present 500 m and far from the sea in periglacial conditions. Even though we do not dispose of radiometric datations we think these conditions occurred during cold periglacial periods that could not produce periglacial morphogenesis in view of the modest altitude of the sardinian reliefs and in contrast with what occurred in nearby Corsica (FEDERICI, 1986), where glacial evidence is documented.

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