

GLACIAL FEATURES AND SNOW-LINE TREND DURING THE LAST GLACIAL AGE ON ALBANIAN AND GREEK MOUNTAINS

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ABSTRACT

In the region stretching from Albania as far as Crete, many traces of glacial modelling are preserved on reliefs higher than 2,200 m. These traces, like glacial cirques and morainic deposits, are all attributable to the last glacial age (Würm). The position of frontal moraines allows snow-line altitude (ELA) to be reconstructed.

ELA reached about 1,400 m a.s.l. on the northern side of the examined area, and was characterized by a regular increase from North to South. This increase was of about 100 m per degree of latitude from Albania to Crete.

INTRODUCTION

Knowledge of Würmian and Late-Glacial activity in the regions stretching from Albania to the island of Crete (Greece) allows the general Equilibrium Line Altitude (ELA) trend to be reconstructed. The area involved has a width of 6° in latitude (from about 36° N to about 42° N).

In this region glacial traces characterize only reliefs higher than 2,200 m. There we have used data either personally gathered or from bibliographic sources about the following mountains: Jezerce (2,693 m), Radohimës (2,570 m), Kunora e Lurës (2,121 m), Smolika (2,637 m), Timfi (2,480 m), Parnaso (2,457 m), Aroania (2,340 m), Taigheto (2,404 m), Leuka (2,452 m) and Idi (2,456 m).

ELA has been calculated by means of Kurowski's method, i.e. making the average between the maximum height of collector basin and the minimum height of each frontal moraine. This method, though not completely precise, is nevertheless the only one applicable without excessive subjectivity. Otherwise, no comparison of the ELA would be possible.

GLACIAL TRACES AND ELA FROM ALBANIA TO CRETE ISLAND

In the region from Albania to Crete (Greece), the northernmost data concern the Albanian Alps. Here, in the Scutari district, at about 42,30° latitude N, several cirques and morainic arcs have been recognized (Castiglioni, 1949). The most important of these are preserved in the "Përroi i That" basin which originates from Mt. Radohimës (2,570 m). Moraines were found down to 500 m of altitude, and allow the maximum Würmian expansion ELA to be calculated at about 1,400 m. Successive stages during glacial retreat indicate an ELA at about 1,600/1,700 m and finally at about 1,800 m.

At the same latitude, from Mt. Jezerce (2,693 m) showing wide glacial cirques, originates Valbona Valley where large morainic deposits are well

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Ψηφιακή Βιβλιοθήκη "Θεόφραστος" - Τμήμα Γεωλογίας. Α.Π.Θ.

preserved (Castiglioni, 1949). The lowest moraines are located at about 350 m of altitude (morainic arcs of Selimaj). In Valbona valley, ELA can be estimated, first at about 1,400/1,500m and then, during the glacial retreat, at 1,650, 1,800 and 2,100 m respectively.

Between 42° and 41° latitude N, the situation during the last glacial period is well shown on Mount Kunora e Lurës (2,121 m). On the slopes of this mount, several researchers (Nowack, 1929; Sestini, 1941; Castiglioni, 1949; etc.) recognized glacial cirques and morainic deposits. These allow ELA to be estimated lower than 1,800 m, probably about 1,650 m, during maximum Würmian expansion. One successive retreat stage is witnessed at about 1,900 m.

From 41° to 40° latitude N, Smolika Massif (2,637 m), in Northern Greece, has been recently studied (Boenzi and Alii, 1992). It shows large glacial cirques and, between 900 and 2380 m of altitude, well preserved morainic deposits (fig. 1). The latter allow the ELA to be calculated at about 1750 m during maximum Würm expansion, and at about 1,800, 1,870, 2,100, 2,350 and 2,450 m during following retreat stages.

From 40° to 39° N, near Smolika, is located Mt. Timfi (2,480 m). On this mount many glacial cirques and morainic deposits are well preserved (fig. 2). There, ELA, lowered at about 1,700 m of altitude, rose afterward at 1,800, 1,900, 2,000 and 2,200 m a.s.l. (Palmentola and Alii, 1992).

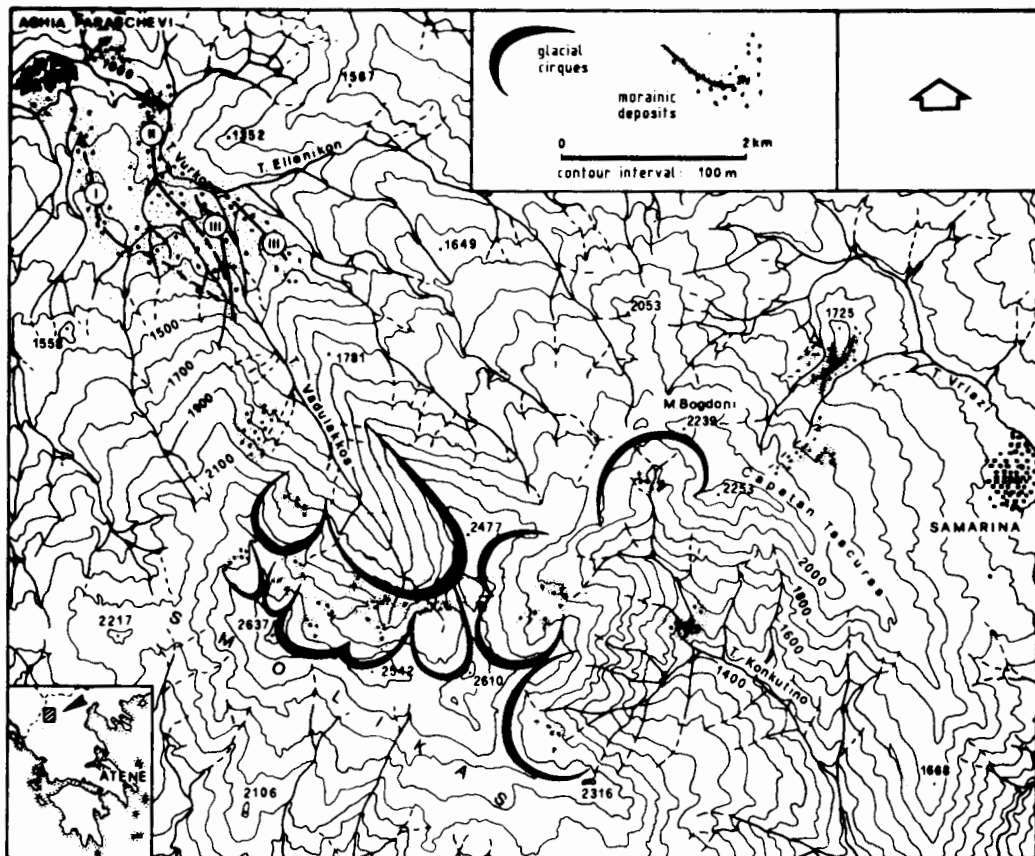


Fig.1: Geomorphological sketch of the Smolika Massif. I, II and III indicate the succession of the moraines of Aghia Paraschevi.

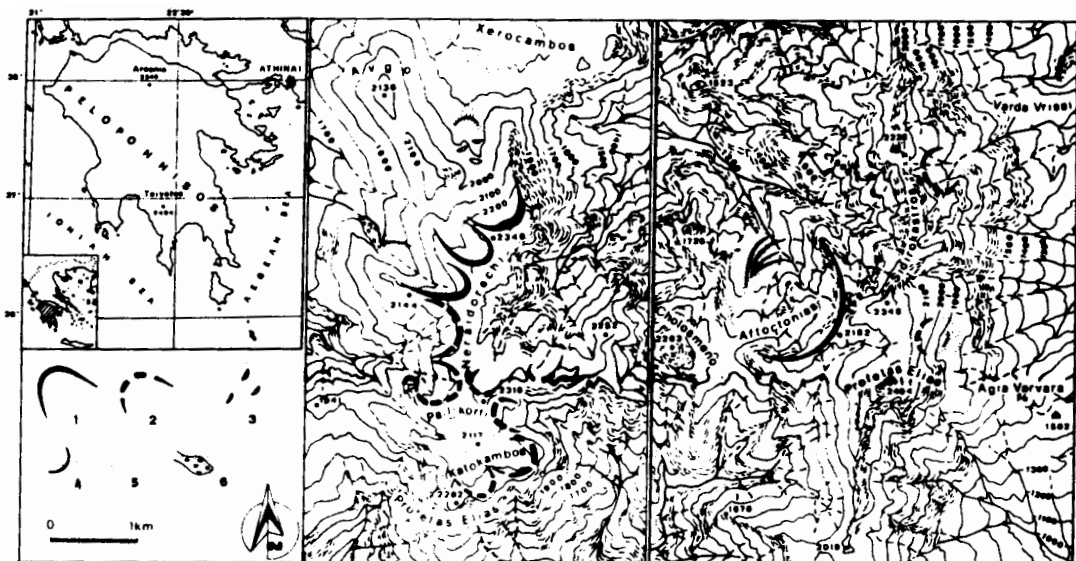


Fig. 3: Location of glacial landforms on the Mt. Aroania and on Mt. Taigheto. 1. Cirque; 2. Cirque-like form; 3. *Roches moutonnés*; 4. Moraine arc-shaped; 5. Shapeless morainic deposit; 6. Debris-flow tongue.

Table 1

	Latitude	Altitude meters a.s.l					
		Würm maximum	Late glacial				
Jezerce	42°28'	1500	1650	1800	2100	-	-
Përroi i That valley	42°25'	1400/1500	1600/1700	1800	-	-	-
Kunora e Lurës	41°47'	1650	?	1900	-	-	-
Smolika	40°06'	1750	1800	1870	2100	2350	2450
Timfi	39°58'	1700	1800	1900	2000	2200	-
Parnaso	38°32'	<1800?	1900	2100	2250	-	-
Aroania	37°59'	2000?	2200	-	-	-	-
Taigheto	36°56'	1950	2100	-	-	-	-
Leuka	35°20'	-	-	-	-	-	-
Idi	35°18'	2200?	-	-	-	-	-

DISCUSSION

Despite some differences due to erosion, to exposure of slopes, and to different sources of data, some features can be summarized about the region from Albania to Crete:

- On the whole, the region shows evidences of six stages of Würmian age. The first related to maximum glacial expansion; the rest, to successive Late-Glacial retreat. On the contrary traces of former glacial periods have still not been recognized. On this subject, new fresh outcroppings of the clastic deposit of Vournassa, that Brunn (1956) recognized near the village of Tourniki in Macedonia and referred to a Rissian morainic deposit, allow us to relate it with landslide deposit.

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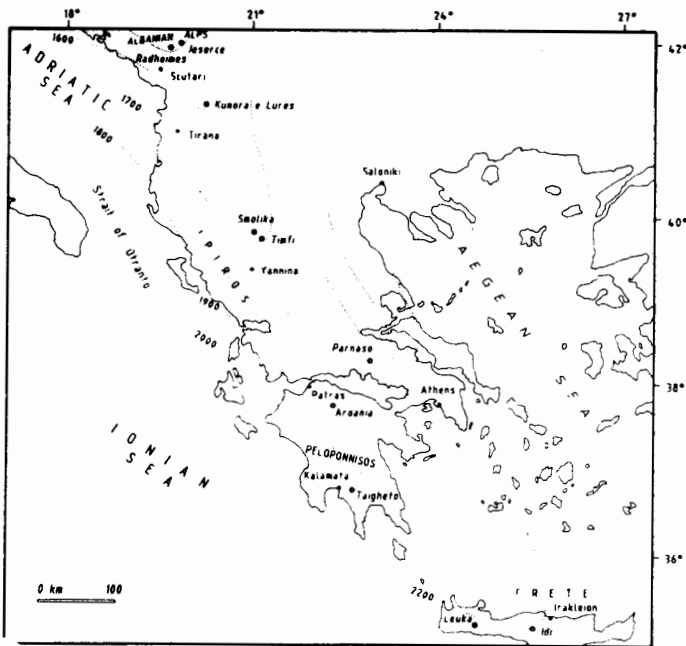


Fig. 4: The geographical position of the examined mountains; dotted lines approximate trend and values of ELA during glacial maximum expansion.

successive stages: in fact, glaciers survived only on the highest mountains, where orographic conditions were particularly favourable.

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Ψηφιακή Βιβλιοθήκη "Θεόφραστος" - Τμήμα Γεωλογίας, Α.Π.Θ.

ELA lowered at about 1,400 m a.s.l. on the northern side of the area, and at 2,200 m on the southern one (fig. 4).

- During Würm maximum expansion, ELA shows a regular increasing from North to South of about 100 m per degree of latitude; complexively, about 800 m in 7°10' of latitude. This value does not change even when excluding the uncertain situation of M.t Idi, Crete: in this case, in fact from Albania to Peloponnisos, ELA increases of about 500 m in 5°32' of latitude.

- During first successive retreat stage, ELA trend does not change sensibly.

- Trend of ELA became most irregular during

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