

## The discovery of the upper margin of the paleolandslide

### The development of the M-shaped crack below Monte Toc



#### 21 - Discovery of the upper margin of the paleolandslide

Photo Edoardo Semenza, 29 July 1960  
from Le foto della frana del Vajont - S2\_2

The western branch of the Massalezza Stream; the lower part on the right; the upper part on the left. Also visible is a portion of the head of the paleolandslide just below 1000 m asl. Layers in bedrock at the left side of the photograph dip 40° to the north. Some meters of mylonite and cataclasite are exposed in the gully. A perimeter crack developed in this area months later. To the right of this zone are blocks belonging to the folded and heavily fractured Fonzaso Formation. The remarkable thickness of the mylonite and cataclasite highlights the importance of the movement plane of the paleolandslide. This surface controlled the movements of the Monte Toc slope from the spring of 1960 until October 9, 1963. The approximate location of photograph 22, taken downslope, is indicated.

The first measured movements, localized to the northern part of the Monte Toc slope, occurred in May 1960, when the reservoir reached about 595 m asl. In September 1960, movement began to accelerate and gradually expand towards the south. By the end of October, velocities reached and exceeded 3 cm/day, rates that would not be reached until the end of September or the beginning of October 1963.

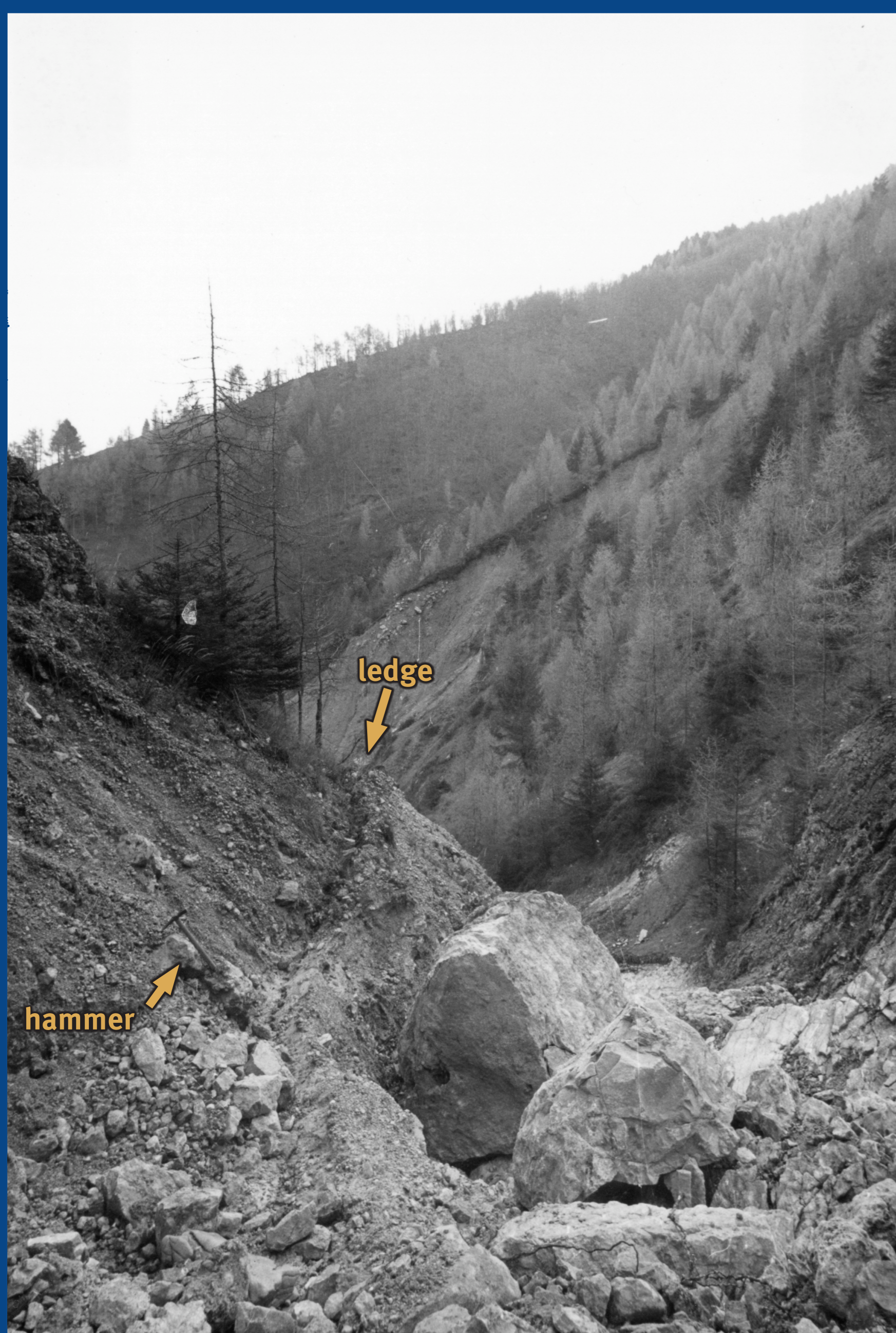
When the reservoir reached about 645 m asl, probably near the end of October 1960, a large, M-shaped crack more than 2 kilometers long (photo 3 of panel 2, shown here in small size in the center) began to open at the upper margin of the paleolandslide detected and outlined in summer.

The crack, which was 50 to 100 cm wide, delineated the margin of a large rock mass moving downslope, to the north, at an angle of 30-40°. To the west, the crack turned downslope, delineating the western margin of the moving rock mass (photograph 24).

Even though this large perimeter crack indicated dangerous movement of the entire slope, the evidence was not interpreted by everyone in the same way. F. Penta, a member of the National Superior Council of Public Works and of the Testing Commission, thought it was possible, even probable, that the movement was not happening along a deep failure surface, but rather at shallow depth.

S.A.D.E., however, had already called Professor Müller immediately after the November 1960 landslide and, acting on his recommendation, immediately lowered the level of the reservoir. The lowering was gradual and stepped – initially at a rate of five meters over two days, followed by no lowering for 4-5 days, then another lowering of five meters, another 4-5 days period of no lowering, and so on, until a water level of 600 m was reached at the end of December. This action immediately led to a marked reduction, and finally a near-cessation, in the movement.

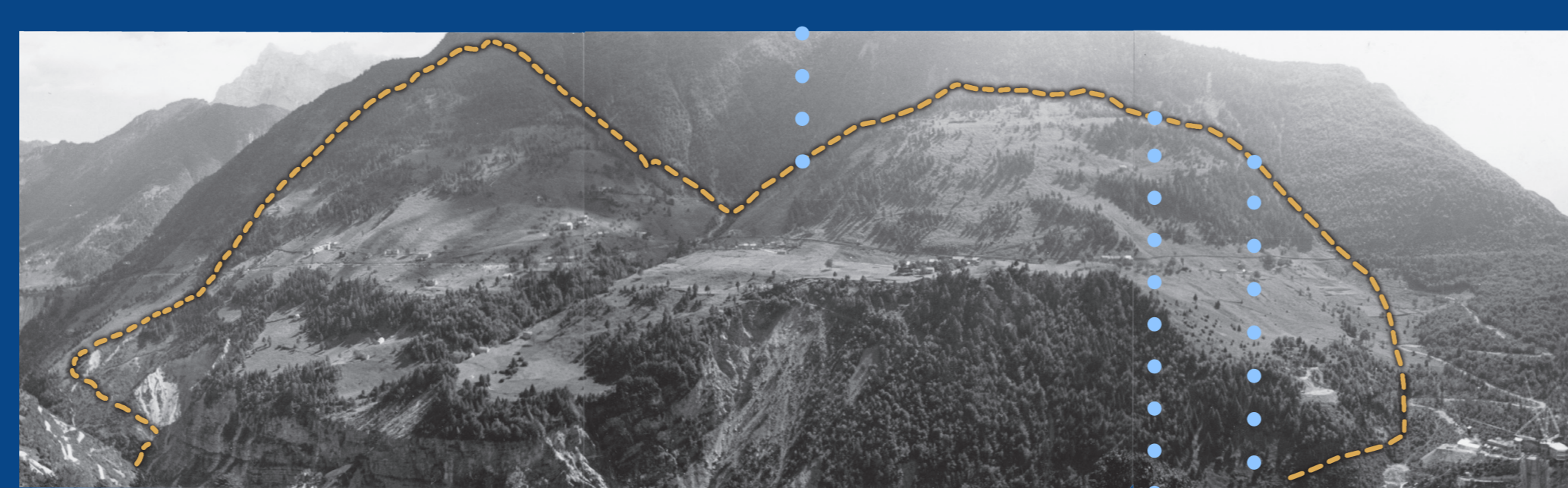
Professor Müller, however, did not accept the idea of the paleolandslide as described by Edoardo Semenza (rapid movement and obstruction of the valley). Rather, he concluded that the landslide had been slowly moving for centuries.



#### 22 - West branch of the Massalezza Stream, shortly after the first appearance of the M-shaped perimeter crack

Photo Edoardo Semenza, 9 November 1960  
from Le foto della frana del Vajont - S2\_15

Note the small ledge produced by sliding of the overlying rock mass towards the left. This ledge was not present in August 1960. The hammer on the left side of the ledge provides scale. The approximate point of view of the photo is indicated in photograph 21.



#### 23 - A section of the M-shaped perimeter crack

Photo Edoardo Semenza, 9 November 1960 | from Le foto della frana del Vajont - S2\_21



This photograph was taken at the south margin of the hollow at 1110 m asl (A in fig. 5 of panel 3), which is located along the western upper part of the perimeter crack.

#### 24 - Western part of the perimeter crack: movement parallel to the fracture

Photo Edoardo Semenza, 9 November 1960 | from Le foto della frana del Vajont - S2\_22

This photo shows a portion of the perimeter crack along the west margin of the paleolandslide. The view is downslope; the part of the slope that has moved is on the right. Note that the trees in this area have been tilted in a variety of directions by the movement.

Cracking of the grassy surface is the result of downslope movement of the rock mass.

