

LANGTALER FERNER 1971 (OETZALER ALPEN), 1 : 7,500

(Orthophoto map)

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To prepare orthophoto maps is an economical alternative as regards the expensive and time-consuming construction of conventional topographical maps (so-called line maps). Orthophoto maps are widely used for glaciological studies because glaciologists are experienced in the interpretation of aerial photographs.

Aerial photographs and differential rectification

A photo flight in August 1971 took normal angle photographs of high quality and covered the area of the Langtaler Ferner (Oetzaler Alps, Tyrol/Austria) with three photo strips. Orthophotos could be prepared using three photogrammetric models. For the differential rectification, an Orthoprojector GZ 1 of Carl Zeiss Co. (West Germany) was used according to the principle of central-perspective correlation by optical projection. The orthophotos were obtained using a strip width of 4 mm and a special slit aperture with a slit width of 0.3 mm at a scale of 1:8,000; the orthophotos did not show any distortion.

Screening and sheet assembly

Reproduction of orthophotos necessarily involves some loss in image quality. For the offset lithography, the photos were enlarged and then screened by a halftone screen with 60 lines per cm. (A larger screen density would have flattened the image.)

The screened orthophotos were assembled along the 2km-grid lines of the Austrian national grid, which was shifted 100 metres to the north and which is marked with heavy black lines. There is no other way of obtaining perfect agreement along the edges of adjacent photos if this method of differential rectification is used and if there are no elements of cultural landscape in the photo.

## Cartography

The cartographic representation is achieved by the use of three colours:

- 1) Grey: orthophoto image
  - 2) Black: framework including grid intersection and graticule ticks, survey points, ablation stakes, lettering and contour lines (vertical interval 20m)
  - 3) Blue tint: glacierized area (active glacier and dead ice).
- Stereoplotting gave the glacierized area and the contour lines.

## Glaciological results

Due to the high quality of the images from the photo flight in 1971, it is possible to identify the structural characteristics of the glacier surface very well. In particular, it is possible to discriminate between the areas of old snow, firn and ice. This leads to the following results: the area of the Langtaler Ferner in 1971 was  $3.478\text{km}^2$ ; the mean altitude of the firn line - a close approximation to the equilibrium line - was 2895m a.s.l.; the ratio of accumulation area to ablation area ( $S_c/S_a$ ) was 1.29, which corresponds to an accumulation area ratio (AAR) of 0.56.

## LITERATURE

- Brunner, K., 1976: Orthophotokarten vergletscherter Gebiete. Zeitschrift für Gletscherkunde und Glazialgeologie, Bd. 12, H. 1, p. 63-67.
- Brunner, K. and Rentsch R., 1977: Orthophoto Gepatschferner, 1:7,500, in Müller F., 1977 : Fluctuations of Glaciers 1970-1975. ICSI/IAHS and UNESCO, Paris, Vol. III, 262 p.
- Brunner, K., 1979: Begleitworte zur Orthophotokarte "Langtaler Ferner 1971" im Massstab 1:7,500. Zeitschrift für Gletscherkunde und Glazialgeologie, Bd. 15, H. 2, p. 195-199.

Pillewizer, W., 1977a: Orthophoto Glacier Map of the Grossvenediger, in Müller F., 1977, Fluctuations of Glaciers 1970-75. ICSI/IAHS and UNESCO, Paris, Vol.III, 262 p.

Pillewizer, W., 1977b: Hochgebirgskartographie und Orthophototechnik. Festschrift für Erik Arnberger, Verlag Franz Deuticke, Wien, p. 107-124.