

**VERNAGTFERNER 1999,
AUSTRIA 1:10,000**

(Orthophoto map from semi-metric images)

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Orthophoto maps of glaciers are enjoying great popularity by glaciologists because of their ability to depict glaciological and geomorphological phenomena in a realistic way. The Commission of Glaciology of the Bavarian Academy of Science uses the semi-metric camera Metrika 45 from Linhof on board an aircraft which is normally used for hail prevention based at Rosenheim, Bavaria. This equipment provides a rather cheap and rapidly serviceable system for catching, as an example, the maximal extent of the ablation area in a given year.

The Vernagtferner in the Oetztal Alps, as one of the glaciers which is monitored permanently by the Commission of Glaciology, was depicted during an image flight on September 9, 1999 with a formation of 39 colour negative images within 7 strips. For further processing the original colour negatives as well as the scanned images were used. Exterior orientation was determined by stereo model orientation on an Analytical Plotter P1/Zeiss, based on an existing network of ground control points.

A digital elevation model (DEM) was generated to serve as input for the ortho-image computation as well as for the derivation of 20 m contour lines which were used later on for cartographic processing. As DEM primary data, a 30 m grid and breaklines were measured in the stereo models for the Vernagt- and Guslarferner including the near surroundings. The data were completed by a 20 m regular grid from the Austrian glacier inventory of 1997 in order to have full coverage of the map sheet. In a further step, the current glacier limits and the moraines were recorded and included as breaklines during DEM generation. On the basis of all these data, a homogenous 20 m DEM was computed with the DEM software package HIFI.

For the generation of the ortho-images the original negatives were scanned using a VEXEL Ultra Scan 5000 with a pixel size of 10 microns which corresponds to an average ground resolution of 0.2 metre. The digital images were rectified on the basis of the 20 m DEM, and the exterior orientation was imported from the Analytical Plotter into the ortho-photo software package PHODIS-OP/ ZI-imaging.

Since the image formation was rather inhomogeneous due to the special conditions of a non-metric image flight 27, ortho-image tiles had to be computed with special attention to the approx. 10% overlap and full coverage of the map sheet. These tiles were then

combined to an ortho-image mosaic with geometric and radiometric alignment using the software package OrthoVista/INPHO GmbH at the Wenger-Oehn Engineering Company, Salzburg.

The colour ortho-photo mosaic in TIFF format and the 20 m contour lines in DXF format together with the glacier border lines, the gauge marks, the mountain tops, the extent of the glacier tongue and the geodetic benchmarks served as input for the cartographic composition with the FREEHAND/Macromedia program. Finally the map sheet was completed using a Gauss-Krüger and geographical coordinate grid and a map legend. Areas with no ortho-image coverage were filled with panoramic photographs which gives a special appearance to the orthophoto map.