TOPOGRAPHICAL EFFECTS OF SNOW DEPOSITION ON RESTRUCTURED LAND

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Abstract. The measurement of snow accumulation and distribution is one of the primary objectives of a study on the melt of snow-drifts and erosion in the phosphate mining region of south-eastern Idaho. The study area is located in an active phosphate mine and is limited to the sites of waste dumps, a product of the surface mining technique used in this area. Four sites are included in the overall study with one dump selected for intensive snow measurement. Snow deposition data have been collected for one winter season (November 1977–June 1978) on a grid pattern over this dump. The area of the study site has been expanded and similar measurements are planned for the coming snow season.

The snow measurements were made monthly on a pre-established 23 m (75 ft) square grid overlaid on the dump. The analysis of the snow data consists of contour mapping of any one or all the snow properties measured—snow depth, density, or water equivalent. In addition, since the measurements are made on the same grid each month, mathematical manipulation of grid data allows contour maps of the residual of the monthly snow properties to be plotted. A similar analysis of terrain properties collected on the same grid results in contour maps displaying ground slope, concavity–convexity of the surface, aspect, or distance from snow-deposition obstacles.

The aim of the analysis using these types of data is to arrive at a model which will compute patterns of snow accumulation and distribution on the ground surface given a description of terrain type and probable meteorological properties of the region. A preliminary comparison of the maps shows a similar pattern of snow deposition occurring each month with the exposed areas of the dump swept clean and the greatest snow depth occurring in the sheltered concavities.

SWISS AVALANCHE HAZARD MAPS

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Abstract. This paper describes the various maps concerned with avalanche hazards in Switzerland and gives examples of parts of specimen maps. These include the *Wald- und Lawinenkarte der Schweiz* (1907) at 1 : 250 000 which marks actual avalanche paths, the *Karte der lawinengefährdeten Gebiete* (1972) at 1 : 300 000 which gives a summary view of avalanche hazard, the *Gefahrenkarte der Schweiz* (1975) at 1 : 100 000 which is intended to give an over-all view of all natural hazards that will influence land use, the *Lawinenatlas/Lawinenkarte Uri* (1978) at 1 : 25 000 which contains all identifiable avalanche paths in the Canton, the *Kombinierte geomorphologische Gefahrenkarte 1 : 10 000 von Grindelwald* (1977), a pilot study of mapping natural hazards in a mountain area, and the *Lawinengefahrenkarten des Eidg. Institutes*

für Schnee- und Lawinenforschung at 1 : 10 000 included in 26 advisory reports on 561 individual avalanche paths, and which can act as pilot studies to assist cantons in preparing their own maps.

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CONSTANT STRAIN-RATE TENSILE TESTING OF NATURAL SNOW

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Abstract. In conducting tension and compression tests on snow samples, strains and strain-rates are usually determined from the displacements of the ends of the samples. In this work, a strain-gage which mounts directly onto the snow sample during testing, was developed and was found to give accurate and direct measurements of strain and strain-rates.

A commercially available 0–28 pF variable capacitor was modified to perform the required strain measurements. It is a polished metallic plunger sliding inside a metal-coated glass tube. The plunger and tube were each soldered to the end of a spring-steel wire arm. To the other end of these arms were soldered 10 mm square pads made of thin brass shim stock. The whole device weighs 2.5 g and the low coefficient of friction in the capacitor resulted in a very low actuation force. To mount the strain gage, the pads are wetted and frozen onto the snow sample.

A high degree of sensitivity was achieved through the use of "phase-lock-loop" electronic circuitry. The capacitance change caused by the strain in the sample, changes the frequency of output signal from an oscillator and thus causes the change in output from the system. In the locked state, to which the system is constantly driven by a feed-back loop, the system output is almost ripple free.

The strain gages were calibrated in the field in order to take into account the effects of very low field temperatures. The calibration curves were almost linear over the travel of 15 mm, the maximum limit. The sensitivity of the system is 4 mV per strain unit, but this could be increased by an order of magnitude by minor adjustments in the circuit.

Constant strain-rate tensile tests were performed on natural snow at Berthoud Pass, Colorado, U.S.A., in the density range of 140–290 kg m^{-3}. Four strain gages were mounted onto the samples to sense any non-uniform deformation which otherwise would have gone unnoticed or caused scatter in the data. The average indication of these gages was used to construct stress–strain curves for various types of snow at different strain-rates. The effect of strain-rate on the behavior of snow was studied.

"Ratcheting" in the stress–strain curve in the region where the snow becomes plastic was observed first by Kinosita in his compression tests. A similar phenomenon was observed in these tension tests. It was found that directly measured strain is quite different from that which would be calculated from sample end movement. Strain softening was not observed in these tests up to total strains of 8%. The strain-rate effects found were comparable to the results of other investigators.