A HISTORY OF SNOW RESEARCH AT THE UNIVERSITY OF IDAHO 721-82

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INTRODUCTION

The importance of the water stored in the snow reservoir to the economy of Idaho cannot be overemphasized. Irrigation, power production, recreation and fisheries are only a few of the many uses to which this water can be put but wise use of this vast resource requires a knowledge of its variability, both in time and space. This requires proper instrumentation and a knowledge of snow characteristics and hydrology.

Research on snow measurement equipment and snow hydrology has been a large part of the program of the Colleges of Agriculture and Engineering, University of Idaho, for many years. The Engineering Experiment Station began studies on precipitation gages in 1948. These studies continued until 1959. At that time, it became apparent that only through sensing the hydrologic variables in the mountains and telemetering them to a base station, could adequate management of complex reservoir systems be done. Projects were started then to develop reliable radio transmitting and receiving equipment that could function in the hostile winter mountain climate. While the development of the radio equipment was being done, parallel development of hydrologic sensors was being carried out. These sensors, for precipitation, temperature, snow water equivalent, etc., had to not only be rugged but had to accurately measure the variable in question.

One of the best of these sensors, the snow pillow, was first installed in 1961. This was the first pillow installed anywhere.

Snow hydrology studies have concentrated on snowmelt modelling for agricultural lands, frozen ground simulation and infiltration and uses of snow data in building design.

PRECIPITATION GAGE STUDIES

Numerous studies involving precipitation storage gages were reported by Warnick in 1949, 1951, 1953, 1956 and 1957. These included experiments on determination of the influence and proper use of windshields on high-altitude storage gages. This resulted in recommendations as to the proper installation of the modified Alter shield on storage gages. Model tests were run in a slow speed wind tunnel using specially selected sawdust as the snow.

While engaged in this project, it was observed that riming and capping occurred on gages installed in some areas but only under certain conditions. Whenever there were snowfalls with very little wind and the temperature was between -6 and 1°C, capping was likely to occur. This was solved by use of a battery powered heated orifice that could operate all winter unattended.

TELEMETERING AND EQUIPMENT DEVELOPMENT

The objective of this series of projects, which lasted from 1958 to 1964, was to develop a system which could sense and report, unattended, hydrologic data to a base station. The overall project was described by Maxwell and others (1960).

The variables that were selected for study were:

precipitation
snow water equivalent
air temperature
snow quality
soil moisture
snow depth.

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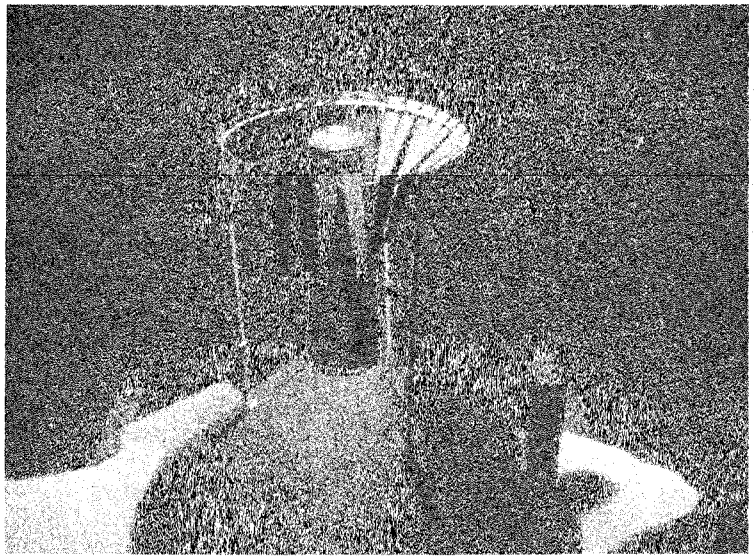

Figure 1. Model storage gage and windshield with sawdust "snow"

The precipitation was measured in a storage gage and sensed with a surface follower. Soil moisture was sensed with moisture blocks while newly developed thermisters were used for both air temperature and an anemometer (Duncan and Warnick, 1963).

In the area of snow water equivalent sensing, several methods were tried. The snow pillow was being developed in cooperation with the Soil Conservation Service and Agricultural Research Service as a separate project but it dovetailed into the telemetering project very well. In addition to the snow pillow, infrared radiation, two types of radio isotope gages (a Geiger-Muller counter and scintillation system), a capacitance gage and a flexible diaphram were all tested (Warnick and Penton, 1971).

The first snow pillow was built as a result of ideas put forth by R.T. Beaumont and R.A. Work to V.E. Penton and C.C. Warnick (Beaumont, 1965). That pillow was installed on Moscow Mountain in 1961. Pillows of various sizes and shapes were tested both on Moscow Mountain and Mt. Hood.

SNOW HYDROLOGY

The use of a catchment snow pillow for examining the relation between snowmelt and flow in a small stream was reported by Molnau (1971). The flow from the bottom of the pack, the remaining snow water equivalent and the stream flow could all be correlated. King and Molnau (1976) developed a snowmelt model for agricultural lands in the Palouse. This is currently being used in the CREAMS effort. This model accounts for the basins orientation and slope as well as using simulated hourly temperatures to account for diurnal cycles of melt so important in shallow packs.

Sack and others (1976) used snow loads normalized by elevation to develop snow load maps for each county in Idaho. These have since been adopted as part of the building process in many parts of the state.

CONCLUSION

This very brief summary has been given as a contribution to the 50th anniversary of the Western Snow Conference. This organization has been very important in the development and wise use of our snow resources. The University of Idaho is proud to have been a part of this.

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