DISCUSSION OF PAPER "AN OBJECTIVE FORECAST OF THE SNOWMELT HYDROGRAPH IN THE PLAINS REGION"

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By

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The approach of converting temperatures (which can be forecast) to a volume of free water (snowmelt) is endorsed. It provides flexibility for accounting for watershed conditions of varying snow cover and retention capabilities - observed data available to the hydrologist forecasting runoff potential. Other approaches of indexing temperatures directly to runoff require numerous melt-rates-of-runoff related to different watersheds and conditions. Although it is recognized that temperature alone is a relatively poor index to melt, particularly for unforested areas, good results can be obtained empirically as demonstrated in this paper.

An interesting comparison can be made between the melt rates discussed in this paper and melt rates reported in the Corps of Engineers' report "Snow Hydrology." The Corps reports a melt rate of .085 inch per degree day defined as mean daily temperature above 32° F. They also report an average rate of .038 inch per degree day defined as maximum temperature minus 32° F. The ratio of these two rates is 2.24. A ratio of 2.5 is used in this paper to relate melt per degree day, maximum temperature minus 32° F to melt per degree day obtained by Snyder's curves.

The assumption that 10 percent of the water equivalent measurement can exist as free water in a snowpack recognizes its "ripening" process and waterholding characteristic. This value, 10 percent, is suggested by Corps' data for well drained watersheds with a caution that this value may be higher for plains areas. Two additional considerations might be investigated for use in evaluating the effect of the free water portion in the snowpack. First, the author assumes free water to accumulate until 10 percent of the original water equivalent is reached, after which daily pack release is equivalent to daily melt. It is suggested that in shallow plains snowpacks, free water which does not drain out, 2 to 5 percent, may refreeze during nights when temperatures fall below 32° F. If this occurs, free water will not accumulate in the pack from day to day unless night temperatures are 32° F. or above. Secondly, if the empirical melt rate truly evaluates melt of the snow crystals, then the free water held within the depth of snow structure which is melted is also released. In other words, release from a ripe pack would be the water equivalent of the computed melt plus the free water held = 10 percent of the melt water equivalent in this case. This could be significant amount on days of high temperature.

Computing the runoff hydrograph by a unitgraph type approach is logical. However, derivation of a snowmelt unitgraph is graught with as many frustrations as encountered in rainflood unitgraph development. It is believed that development of a basin routing technique would not be more difficult and would provide more flexibility to runoff computations, particularly for large watersheds.

This paper stimulates interest in analyzing snowmelt floods in the plains region. The method appears to be particularly applicable to forecasting snowmelt runoff resulting from a rapid transition from subfreezing weather to successive days of unusually high temperatures.

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