

WATER BALANCE IN A GLACIERIZED BASIN

Water balance: Relationship between precipitation, evaporation, runoff, and storage for a given catchment.

Glacierized basin: catchment where part of the surface is covered with glaciers

Water run-off data are the only measurable parameters which are a true integration over the whole area of the drainage basin. Thus these data have a special significance; they can serve as a standard for the evaluation of the other area-sampled ice, water and heat balance results. Every effort should be made to obtain accurate run-off data, continuous in time over periods at least equal to the whole ablation season and preferably for the whole year. Run-off data should be obtained at a gauging station that has a relatively stable water level/discharge rating curve. Frequent calibrations (by current meter, salt dilution, or other technique) are necessary even after the rating curve has been established, to verify that no shifting of the rating has occurred. The measuring procedure should be sufficiently accurate so that daily totals of run-off are measured with a standard error of less than 8 per cent under normal (ice-free) conditions, and monthly or twice monthly totals accurate to 5 per cent. At the beginning of the ablation season when ice and snow may cover the stream every effort should be made, by frequent flow velocity measurement, to reduce the error in daily totals to 10 per cent or less.

Daily values should be reported for as long a period during the year as measurements can be made, and should be given as millimetres averaged over the drainage basin area. In addition, twice monthly and monthly values (also in millimetres) should be tabulated. In addition to run-off, a water balance computation requires knowledge of evaporation, sublimation, condensation, resublimation, evapotranspiration, rainfall, and the change of mass from ice to water (or vice versa). A large number of precipitation gauges, properly located and carefully utilized, together with accurate measurements of ice balance, may permit the estimation of evaporation/condensation.

Alternatively, evaporation/condensation might be estimated from heat balance data obtained at the main site. Only by comparing all three balances, with careful attention to error magnitudes, can one obtain a valid and demonstrable description of how the ice mass in a glacier drainage basin changes in response to its external environment.