



Monthly mean vertical gradients of precipitation, temperature and glacier mass balance adjusted to measured runoff from high alpine basins

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The present version of the OEZ hydro-meteorological model of the water balance of glacierized basins uses measured runoff as the prime variable to determine basin precipitation. Precipitation, evaporation, and storage in seasonal snow, glacier ice and liquid water are resolved in monthly values of 100 m elevation bands. Snowfall is redistributed towards the glacier surfaces.

This presentation concentrates on the vertical gradients of precipitation and temperature that are required in order to simulate the annual sum and the monthly values of measured runoff. Based on the seasonal course of precipitation in valley stations, the vertical gradient of precipitation forces annual and monthly basin precipitation. The vertical gradient of temperature decides over snow or rain and thus over the build-up of the snow cover in the accumulation season, and over the melt rate and runoff in spring and summer. Glacier mass balance and its vertical gradient simulated by the model are forced to agree with measured values.

While each of these three gradients by itself leaves a wide range of uncertainty in the simulation, their simultaneous constraint to the runoff simulation reached agreement with measured runoff of better than ± 20 mm per month. Model results are presented for forty basins in the Austrian and Italian Alps, 1961-1990 and 1985-2003.