

Further comments on hydrological
information from the Jökulsá á Dal and
Jökulsá í Fljótssdal basins, Iceland

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1. Introduction

The following questions have been forwarded to the Hydrological Service of NEA regarding the hydrology of the Jökulsá á Dal and Jökulsá í Fljótssdal.

2. Glaciology

1. The mass balance measurements started in the nineties.

- What do you know about the stability of the two outlet glaciers Brúarjökull and Eyjabakkajökull from these studies and the water discharge measurements?
- Is it possible that the hydrological regime after a surge can change according to movement of watershed in the glacier and therefore changing drainage area?

2. What is the size of the surges at Brúarjökull and what is the movement during a surge?

3. If the front of Brúarjökull will float into a magazine - is it possible that it can affect the dynamics of the glacier in order to change drainage pattern?

The mass balance measurements have only been carried out 6 years on Eyjabakkajökull and 4 years on Brúarjökull, and therefore, they can not tell us very much about the stability of the glaciers. However, we have the variation of specific winter balance on Eyjabakkajökull between 176 cm in 1994/95 and 238 cm in 1995/96 and the specific summer balance between 133 cm in 1993 and 323 cm in 1996. This means that the run-off from the glacier was 2.4 times greater in the summer of 1996 than in 1993. (Measurements of the Hydrological Service of the National Energy Authority in 1991-1995 and the Science Institute of the University of Iceland in 1996).

For Brúarjökull the maximum specific winter balance was in 1993/94 175 cm and the minimum in 1992/93 163 cm. The minimum specific summer balance was 54 cm in 1993 and maximum in 1996 188 cm indicating more than 3 times greater run-off from the glacier during the summer of 1996 than 1993. (Measurements of the Science Institute of the University of Iceland.)

Measurements of the surface velocity of both Eyjabakkajökull and Brúarjökull indicate that the flux is not sufficient to deliver the accumulation down to the ablation zone, which concurs to the historical information of surges in both glaciers.

The surges in Brúarjökull and Eyjabakkajökull can affect the watershed of the glaciers but the extent of the shift in water divide is not well known.

The total area affected by the surges in Brúarjökull is on the order of 1500 km². The maximum advance of the glacier terminus during surge is 8-10 km.

Drainage pattern of Brúarjökull will be affected to some extent if the glacier becomes afloat and calving will occur into the magazine. The calving will speed up the glacier and increase ablation until it reaches new equilibrium.

3. Hydrology

1. The summary-report about available hydrological information in this area mentions that there are inaccuracies in the discharge data:

- a) Discharge ratings done by suspended meters overestimate the discharge.
- b) Rating curves are unstable because of the extreme sediment transport.
- c) Water level gauges are perturbed by sediments and ice.

Is the order of these problems of general character, or is it necessary to reduce the expected runoff due to considerable inaccuracies/overestimates?

The problems of 1.b., and 1.c., are of a general character and in the analysis and processing of the data these problems have been addressed in the way of reducing any systematic errors in the data. Therefore, it is not necessary to exercise any systematic correction to the data when used. These problems, however, point to the fact that there are uncertainties in the data associated with the above problems.

The problem referred to in 1.a. is a more difficult one, since there are great difficulties in any attempts at addressing the uncertainties in standard measurements of discharge from cableways. In general all discharge measurements using propellers, are based on the assumption that calibrations of the propellers using moveable carriers to drag the propeller through stagnant water at different speeds are actually valid at field circumstances. Until the advent of ADCP (Acoustic Doppler Current Profiler) there were no alternatives to the propeller method, therefore, there were no ways to verify the results.

Experience with ADCPs shows that the results correspond in general very well to the results of classical methods. Our experience points to the same conclusion, except where suspended meters are used from boats or cableways in extreme circumstances. We do not, at this point, have but a few cases in which the discharge seems to have been overestimated by 2-4%. Comparable studies at Jökulsá á Dal have not been carried out, but are planned in the near future.

2. Has there been done some homogeneity tests between the stations in the Jökulsá í Fljótsdal/Jökulsá á Dal river basins and stations in other basins?

No, these tests have not been systematically carried out.