JÖKULHLAUPS

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What are Jökulhlaups?

- Jökull (=glacier) hlaup (=floodburst)
- 3 different sources:
  - Subglacial lakes at geothermal areas
  - Meltwater drained during volcanic eruptions
  - Marginal ice-dammed lakes

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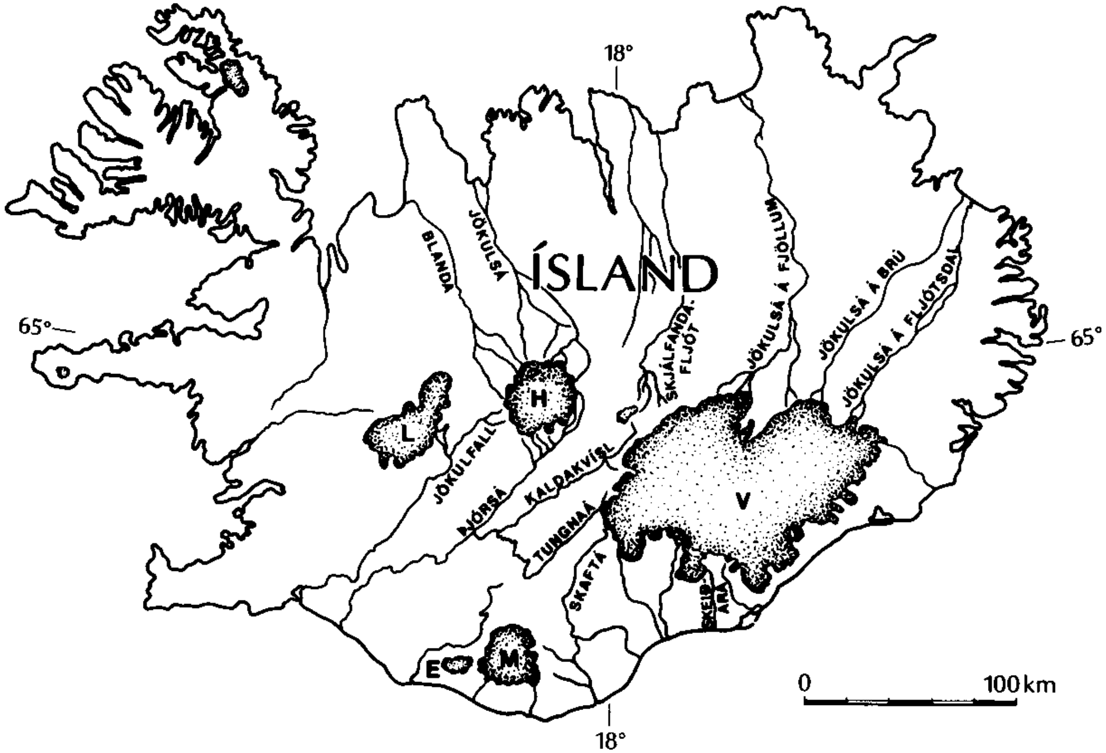
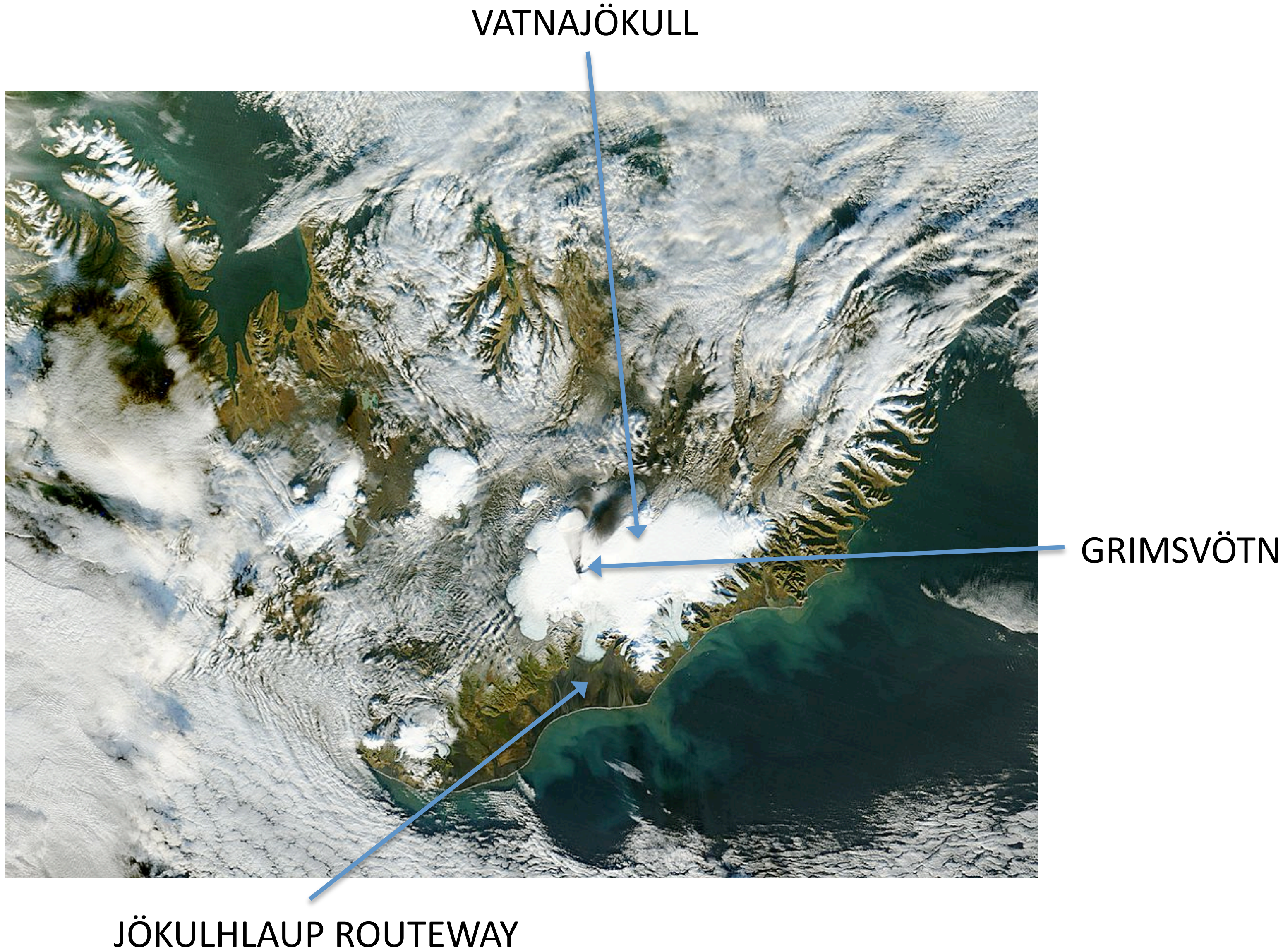


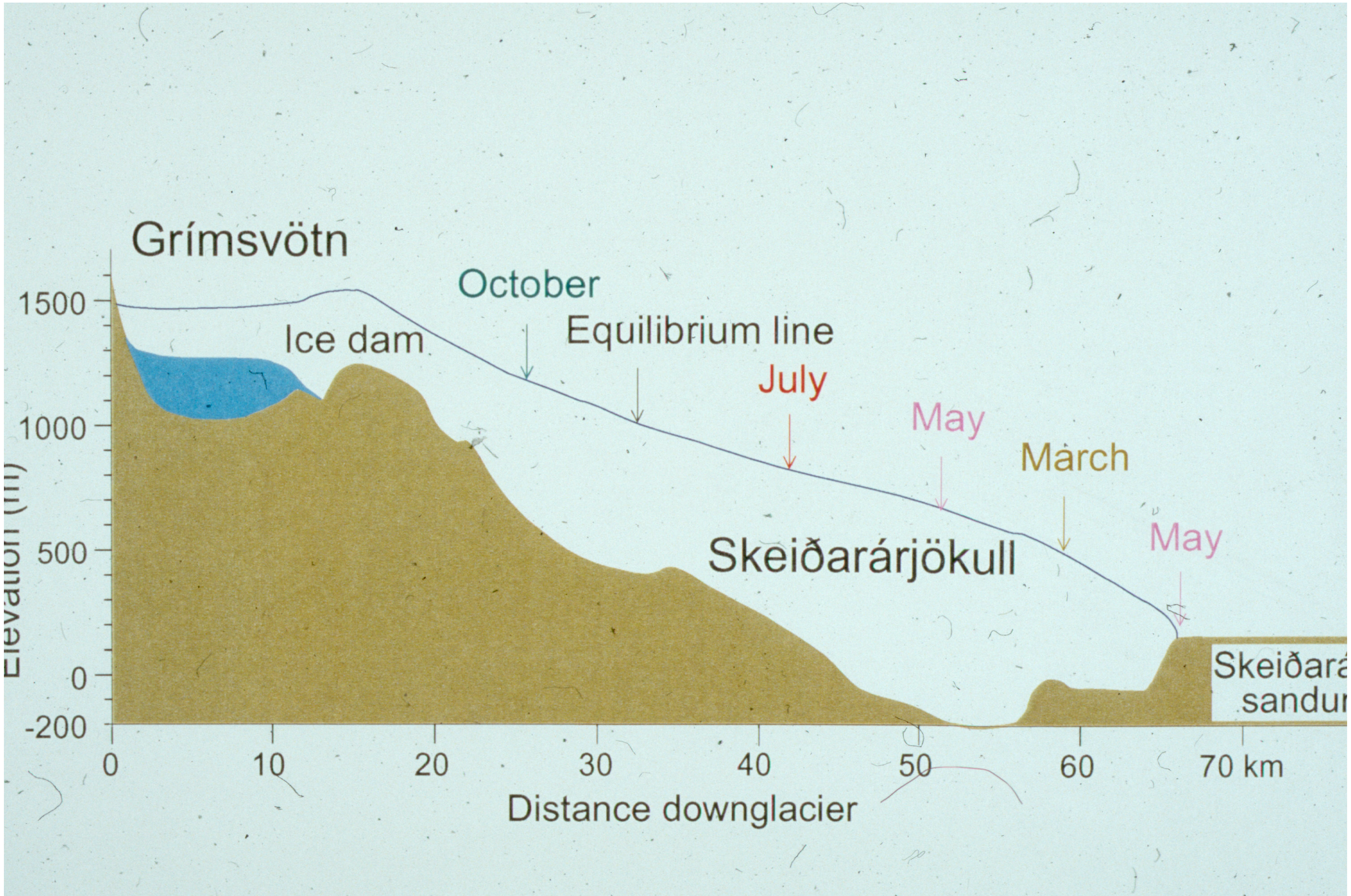
Jökulhlaups originating from Grimsvötn/ Vatnajökull (since 1940):

* interval: 4 – 6 years
* peak discharge: 600 – 10.000 m^3/s
* duration: 2 – 3 weeks


VATNAJÖKULL
GRIMSVÖTN
JÖKULHLAUP ROUTEWAY

Jökulhlaups have dramatic impact on inhabited areas and landform

Schematic demonstration of a subglacial lake triggering Jökulhlaups



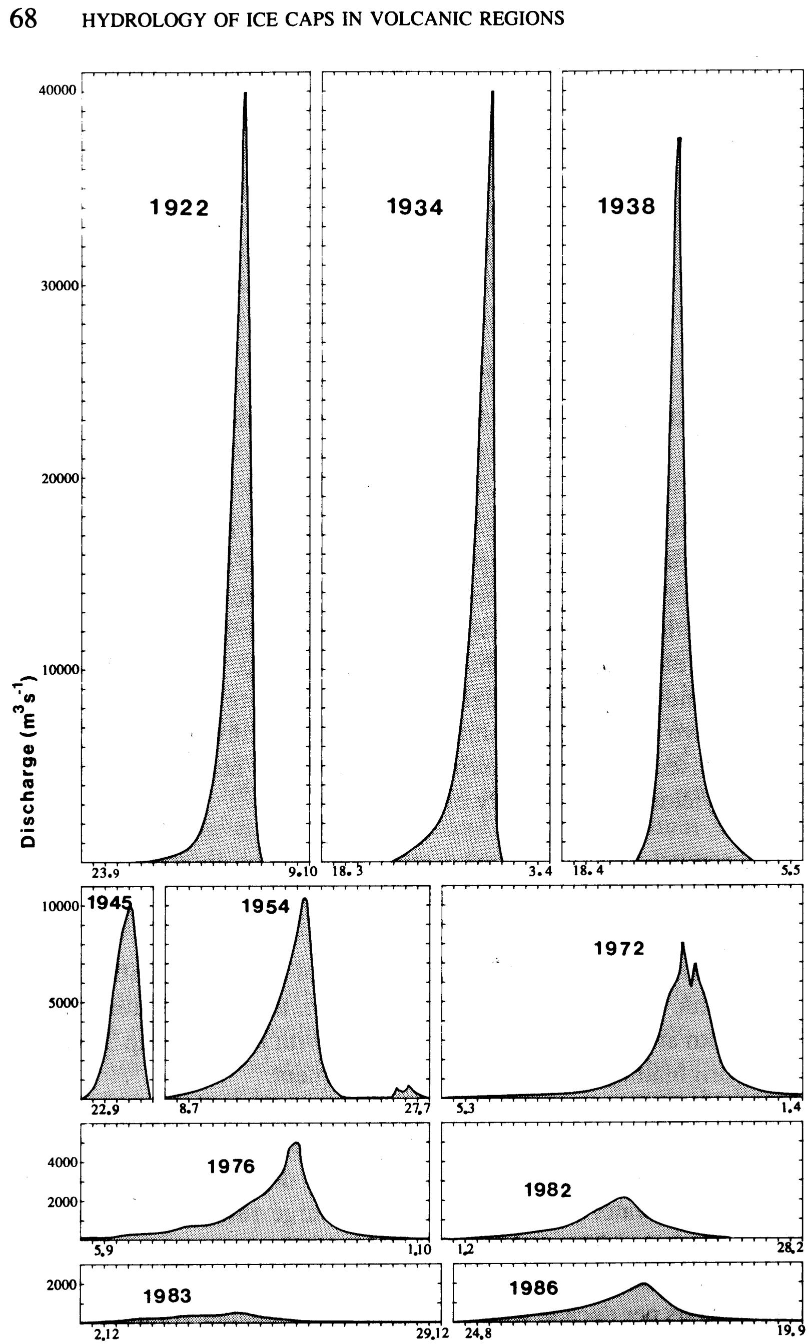
Helgi Bjornsson

NYE MODEL

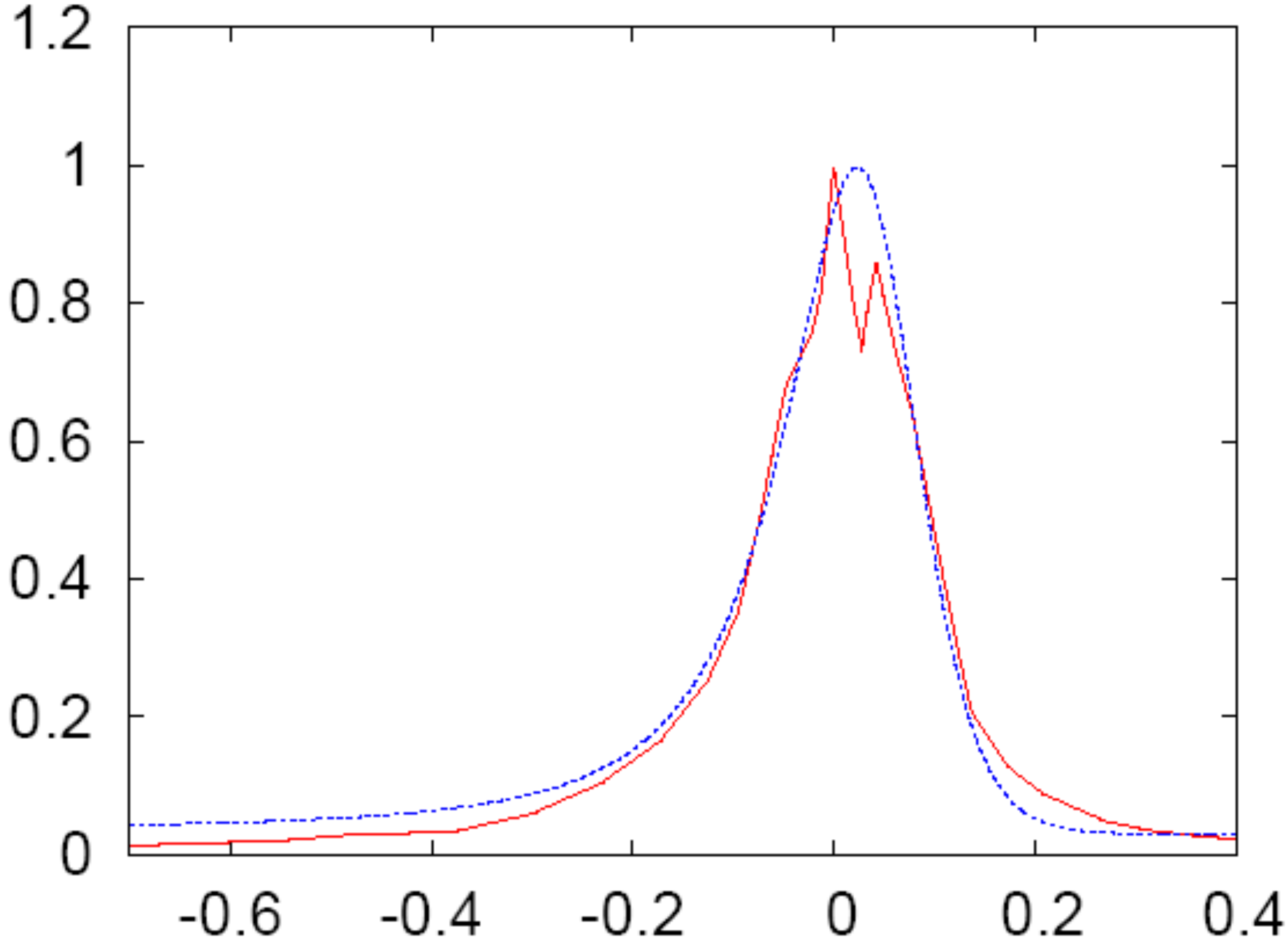
- Consists of 5 equations for each variable
- Q (volume flux)
- S (cross section area)
- p (channel water pressure)
- m (interfacial melt rate)
- T (water temperature)

Aim

- Reproduce hydrographs of Jökulhlaups of Grimsvötn



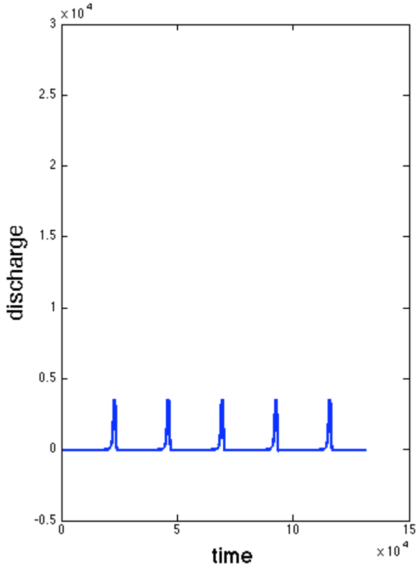
Andrew Fowler's results:
Journal of Glaciology 1999, Breaking the seal at Grimsvötn, Iceland



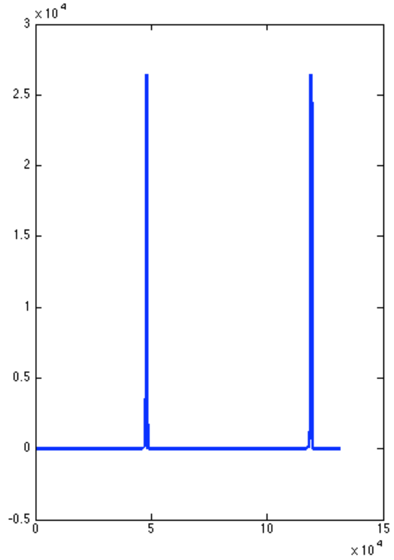
Parameters significantly changing the discharge

Omega: change of discharge with distance from lake

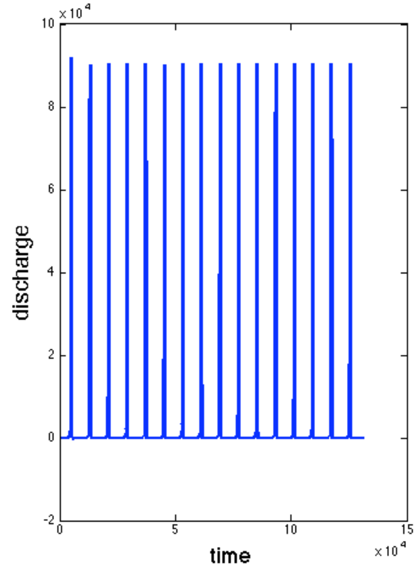
Nu: melt rate/reference discharge



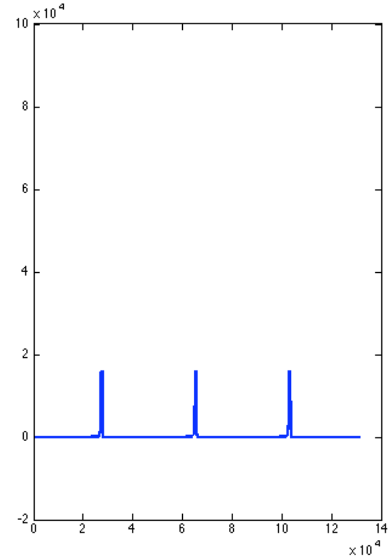
High value



Low value



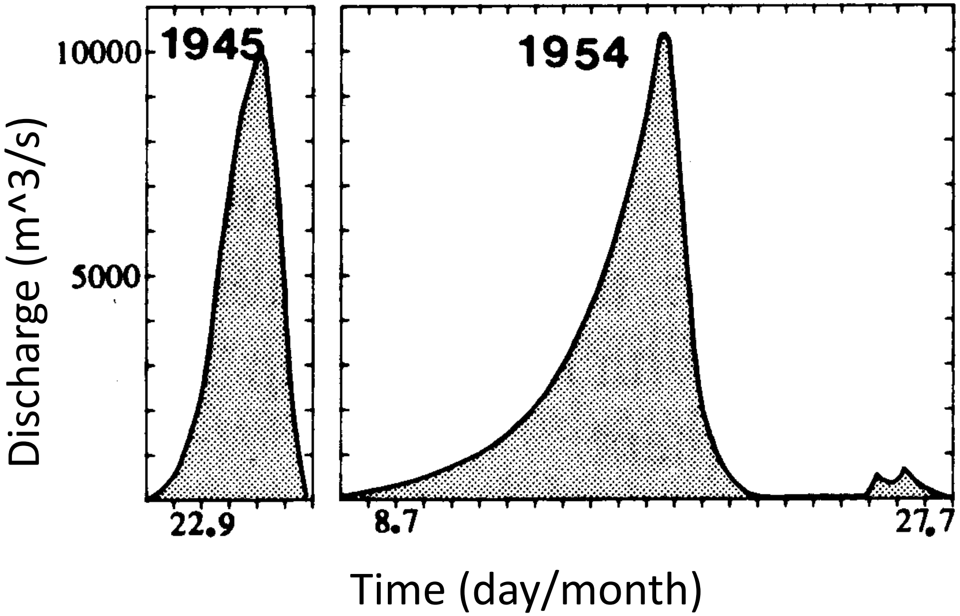
High value



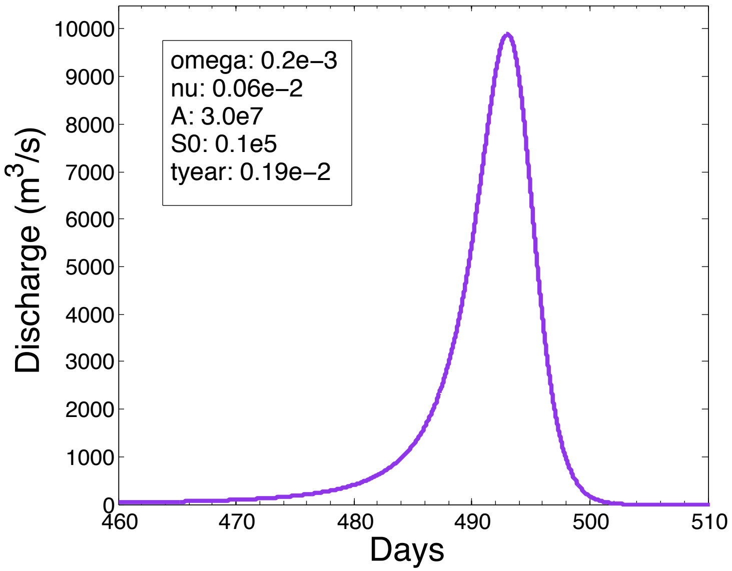
Low value

RESULTS

Observed hydrographs



1954 modelled hydrograph



Water level of the sub-glacial lake

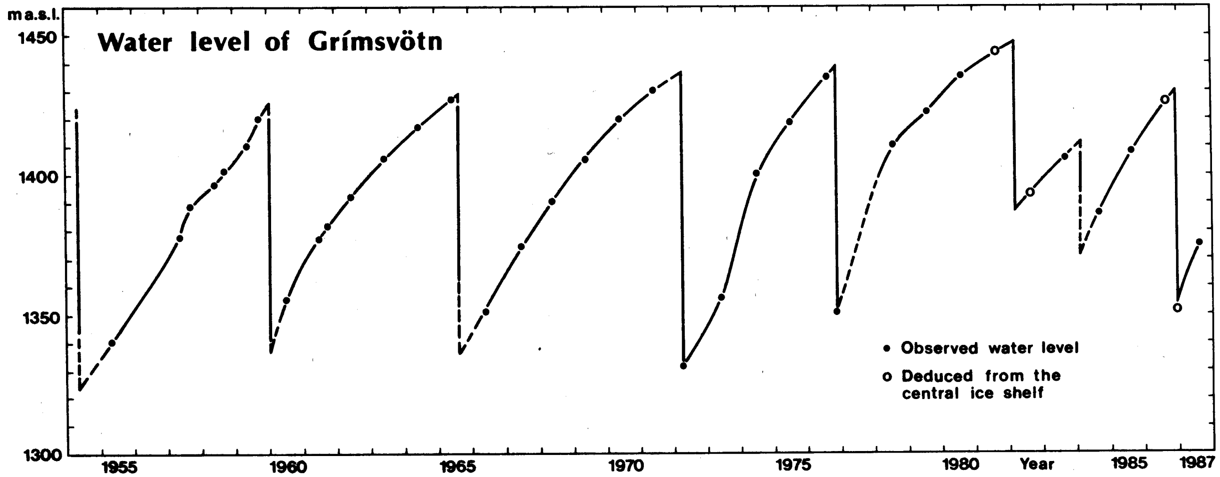
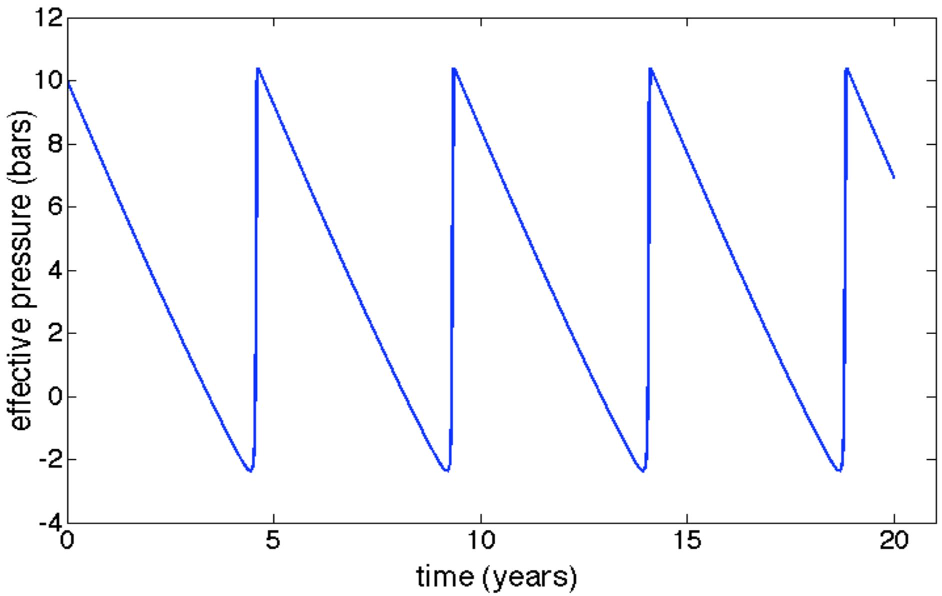


Fig. 5.2. Variations of water level in Grímsvötn since 1954.



Nu: 0.12e-3

Maximum discharge: 4000 m^3/s

CONCLUSIONS

The model provides a suitable explanation of the flood scenarios:

a. Flotation
b. Positive effective pressure

By fixing parameters the model provides a comparable output to the observed hydrographs of the 1954 flooding and the 1972 hydrograph (Fowler, 1999)

Suitable outcomes were determined for (i) frequency, (ii) discharge and duration of the event, but not simultaneously.