

Hazard due to eruptions and floods from Katla and Eyjafjallajökull, south Iceland



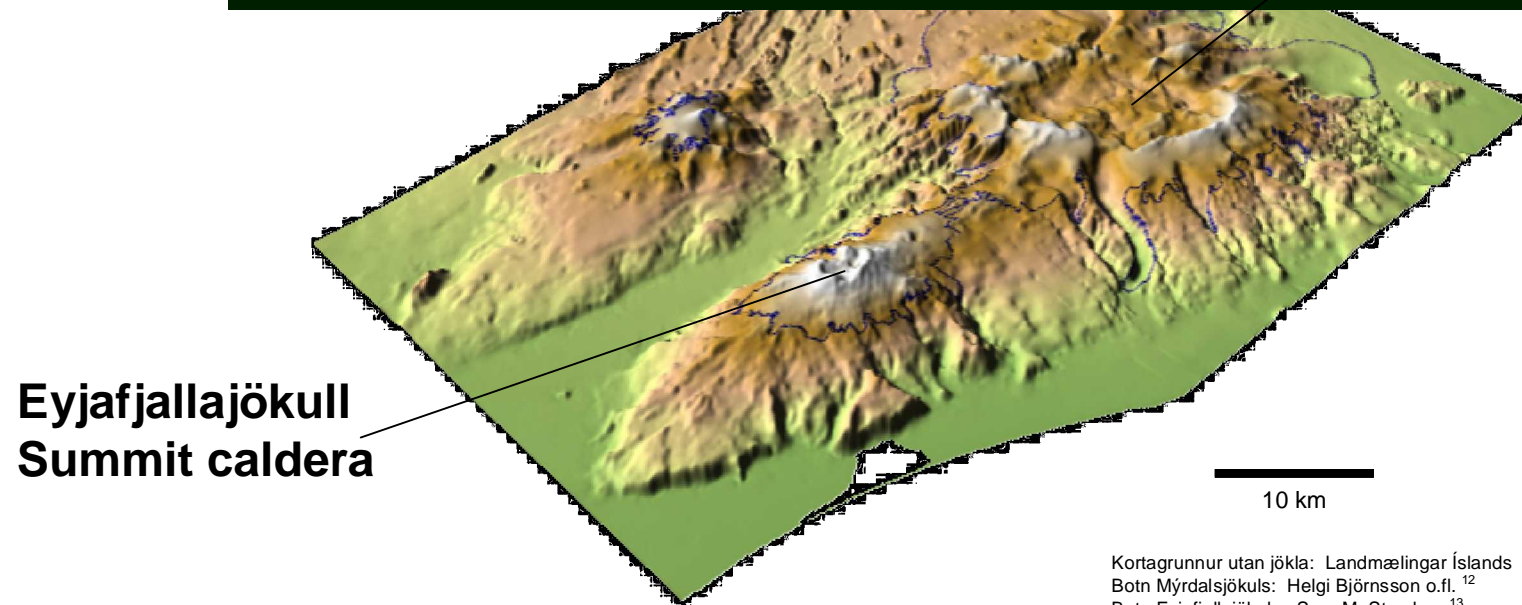
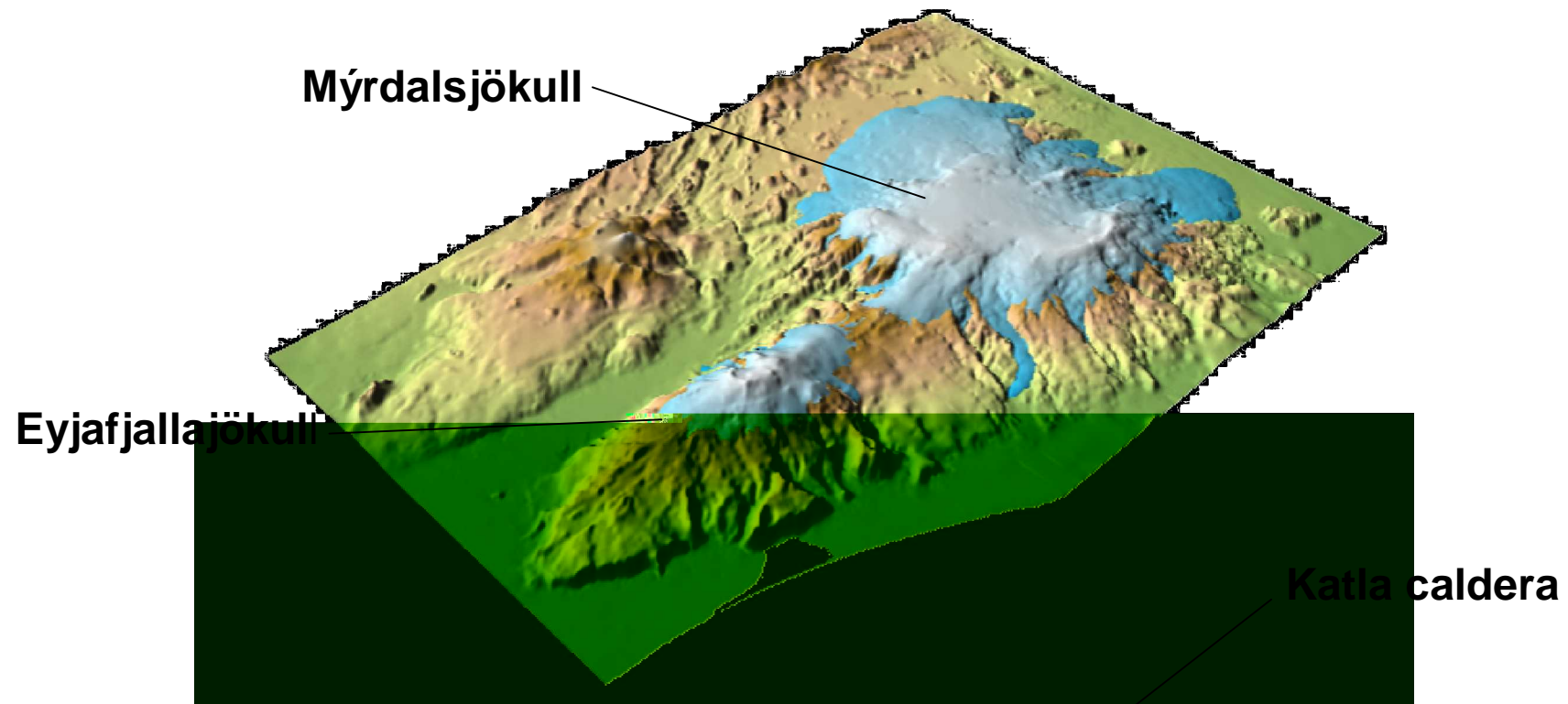
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4: Icelandic Meteorological Office 5: Institute of Natural History

This presentation is a summary of project funded by the Government of Iceland. The results are found in a special publication available on the web-page of the Civil Protection Department of the National Commissioner of the Icelandic Police – see end of presentation for details



Kortagrunnur utan jökla: Landmælingar Íslands
Botn Mýrdalsjökuls: Helgi Björnsson o.fl.¹²
Botn Eyjafjallajökuls: Sara M. Strachan¹³

Eruptions and associated floods caused by ice melting a major hazard



- Unrest (seismicity, inflation, geothermal activity)
- Catastrophic floods to the east well known
- New: floods to west more frequent than previously thought

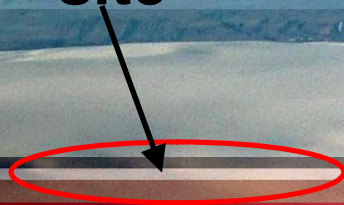
Tasks of hazard assessment for area to the west of the volcanoes:

- Estimate eruption frequency for sectors of the volcanoes
- Estimate likely flood magnitude
- Estimate which areas would be affected by floods

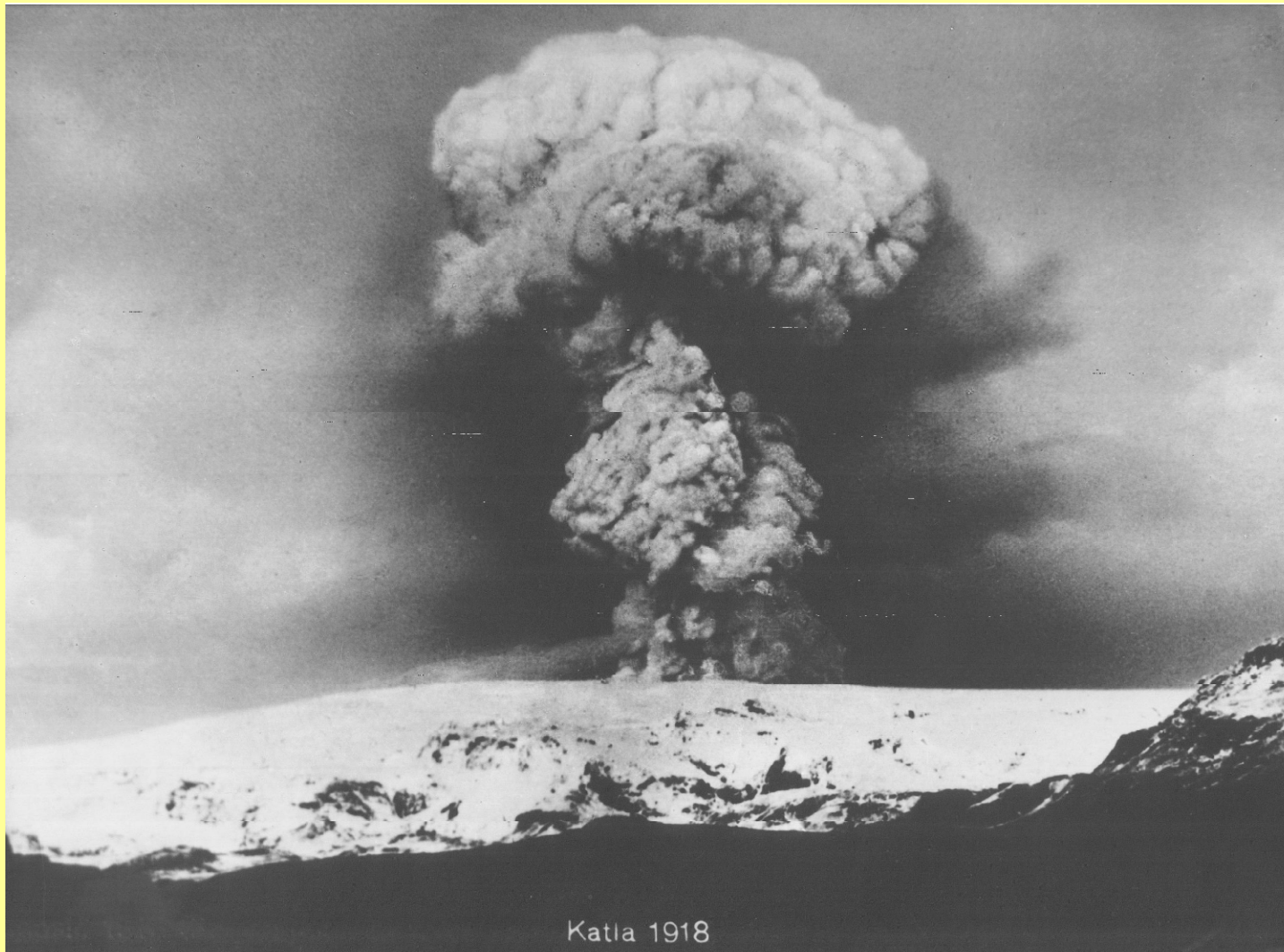
Katla caldera – 400-700 m thick ice

About two eruptions / century

1918
eruption
site



Katla - Large phreatomagmatic eruptions

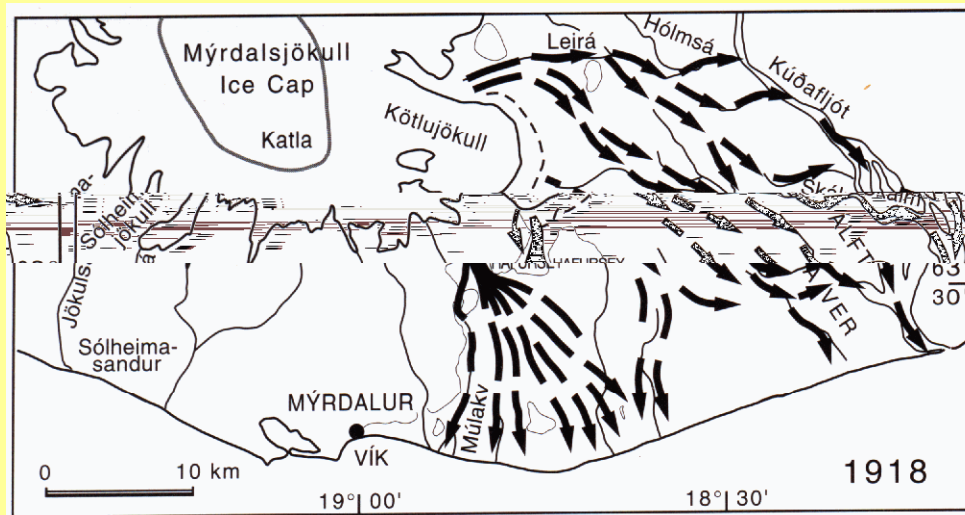


Katla eruption 1918

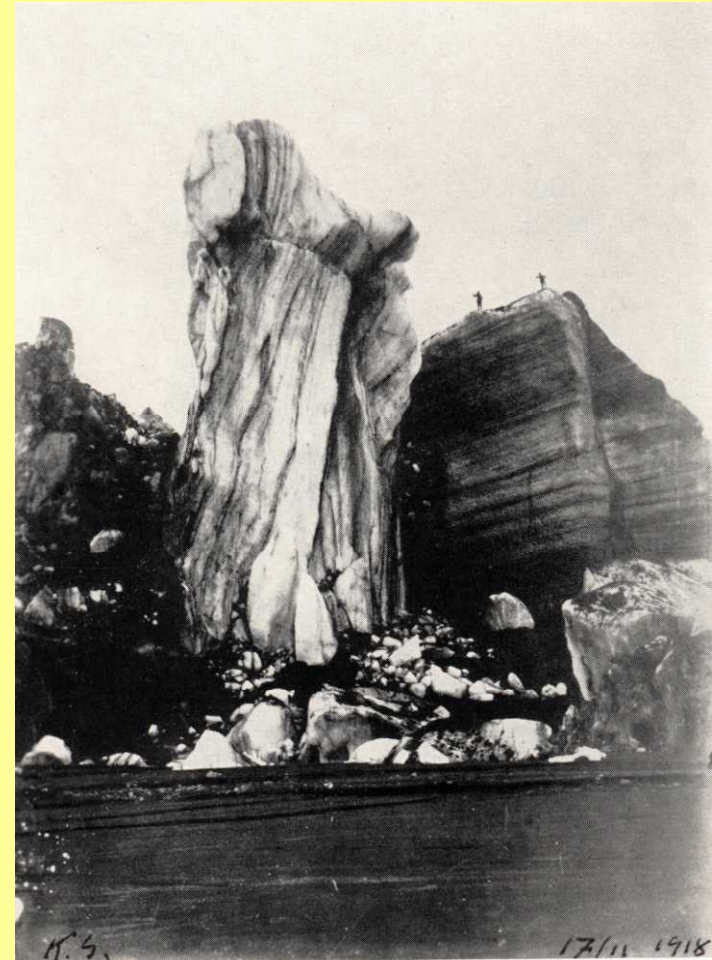
Katla eruptions cause catastrophic jökulhlaups - the 1918 event the largest of its kind in the 20th century

Peak discharge $100-300 \cdot 10^3 \text{ m}^3 \text{ s}^{-1}$

- ~1 km³ of sediments transported
- 3 km long peninsula formed at coast
- Katla jökulhlaups one of the largest volcanological hazards in Iceland



From Larsen (2000)



Kjartan Guðmundsson 1918

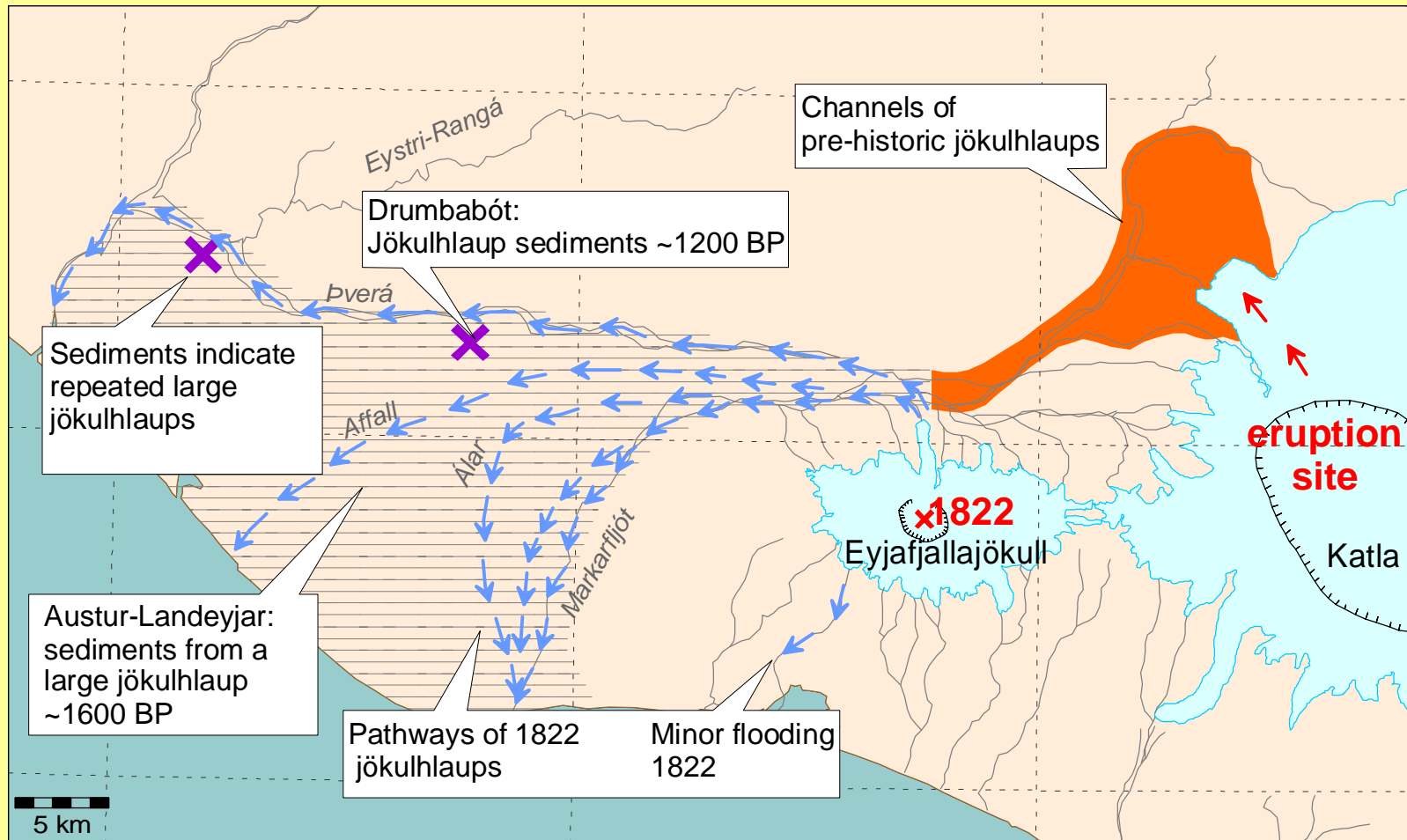
Eyjafjallajökull - ice covered stratovolcano

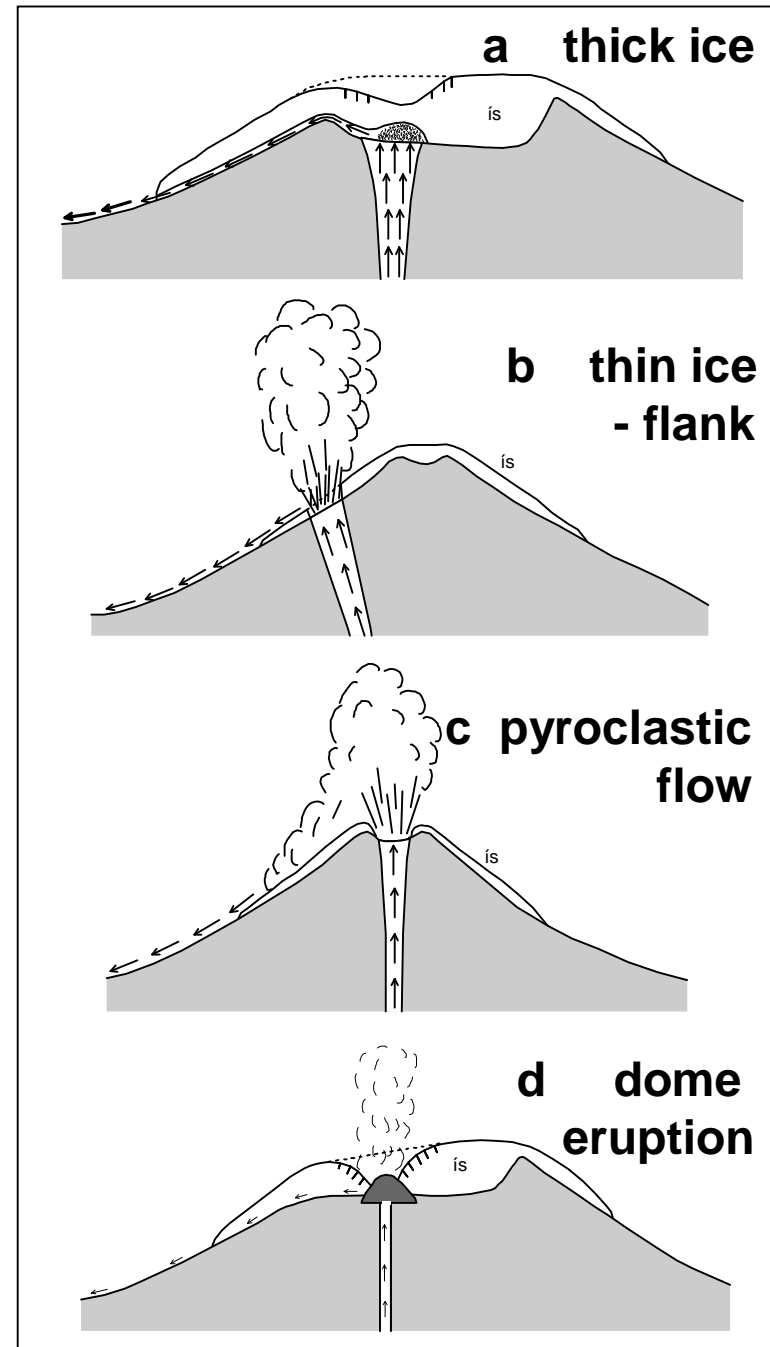
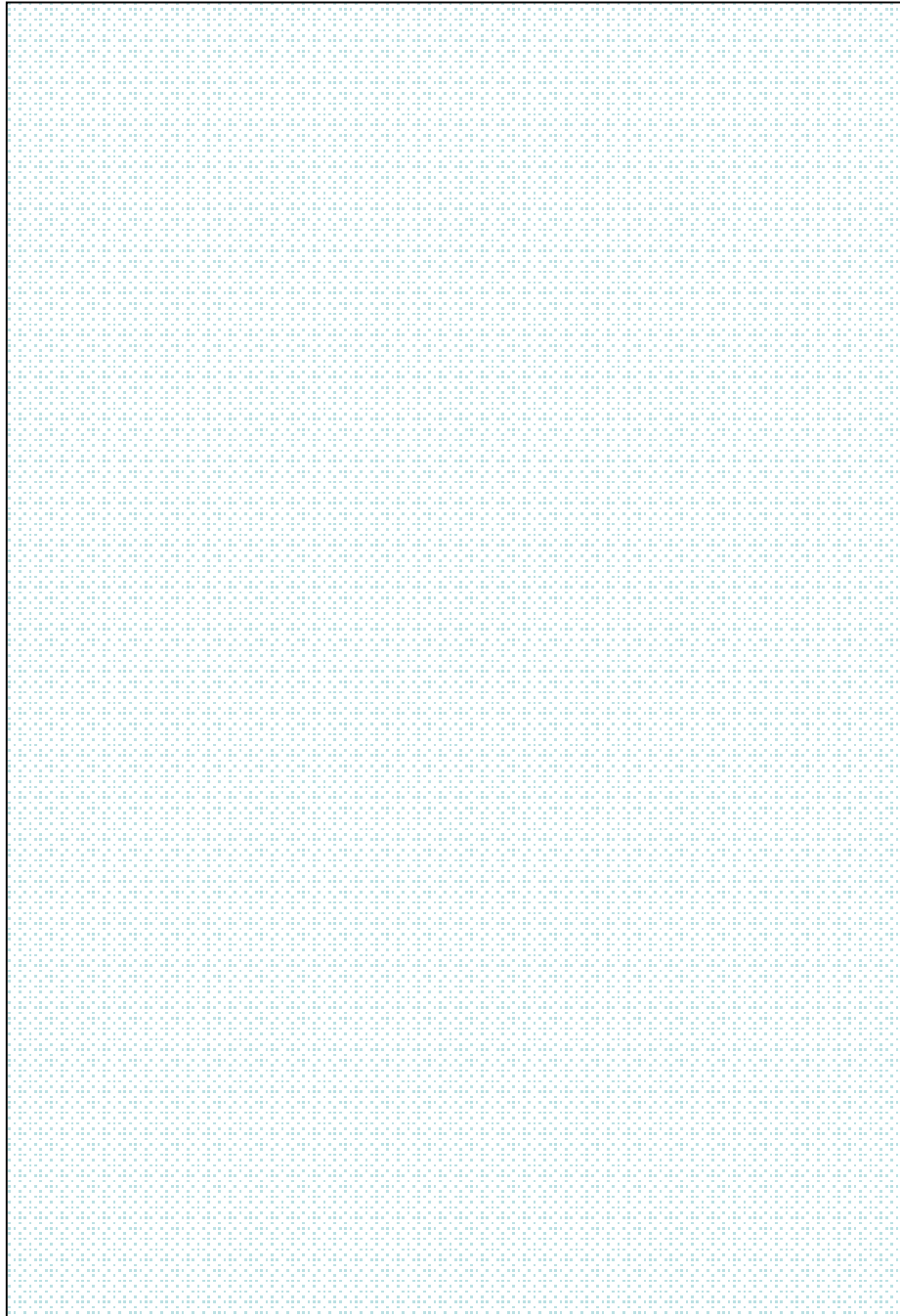
Eruptions once every few hundred years

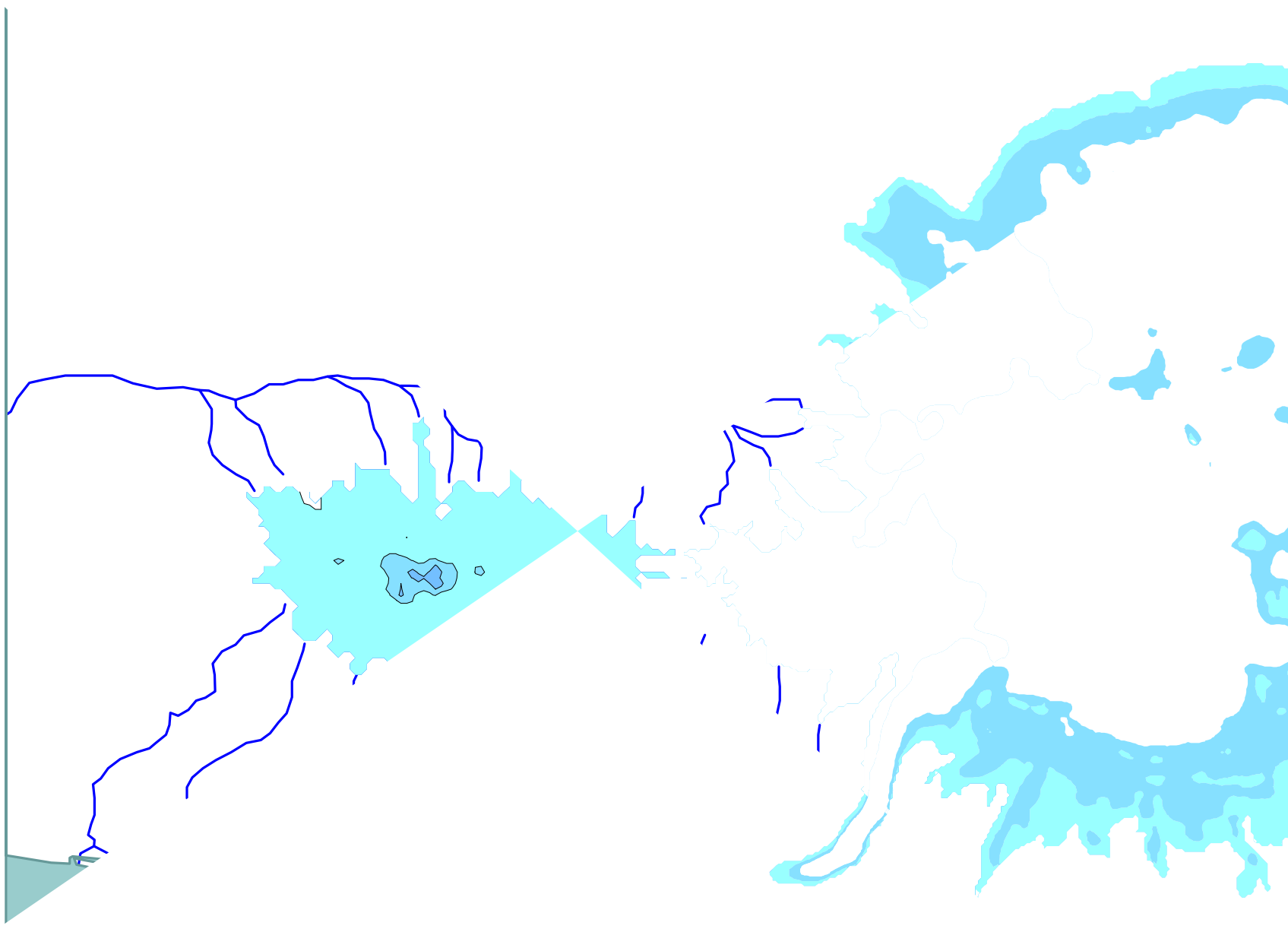
1821-1823
eruption



Evidence for hazardous floods towards west







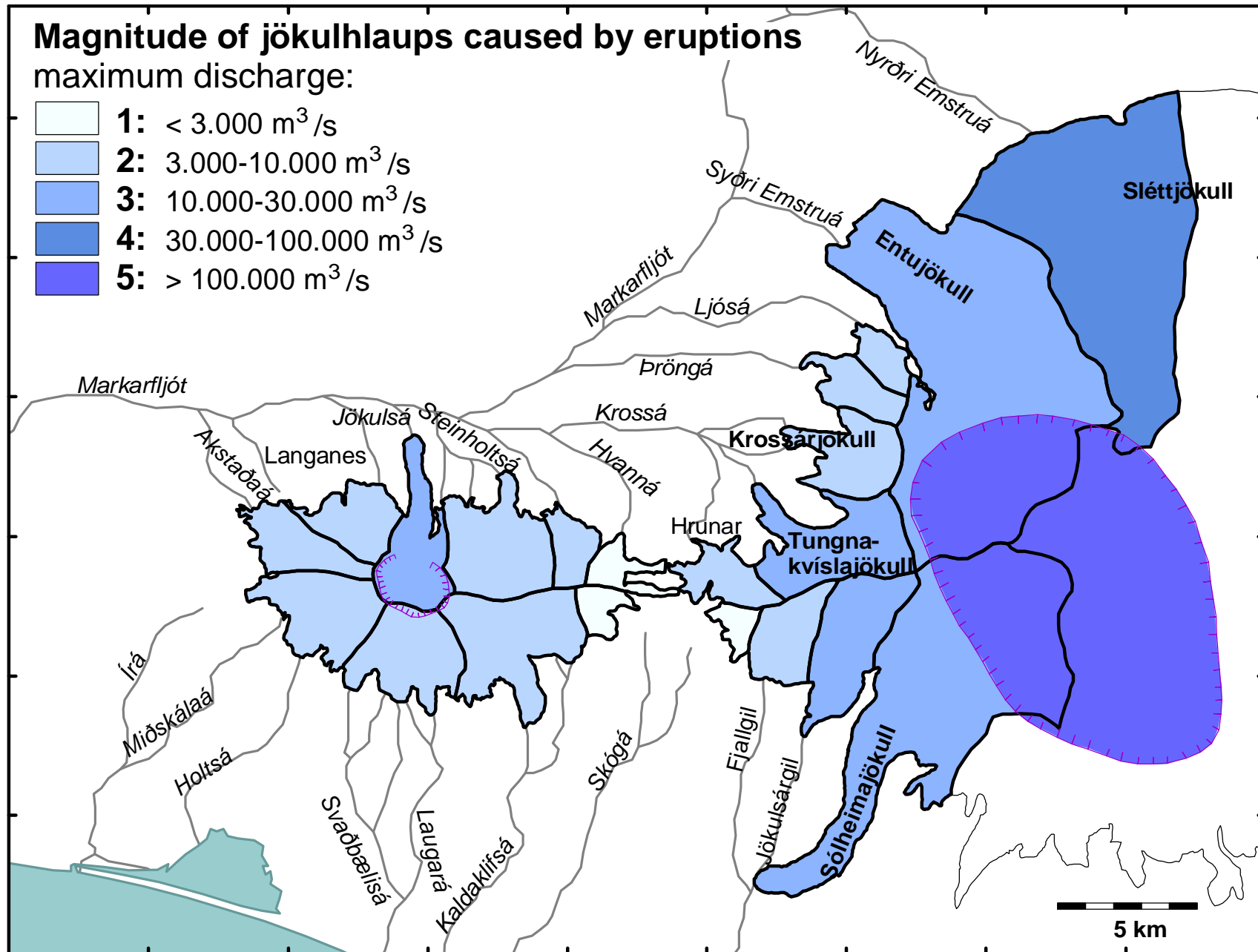


Evjafjallaiökull - north flank
Evjafjallaiökull - south flank
Mýrdalsiökull - west flank
Mýrdalsiökull - southwest flank

Magnitude of jökulhlaups caused by eruptions

maximum discharge:

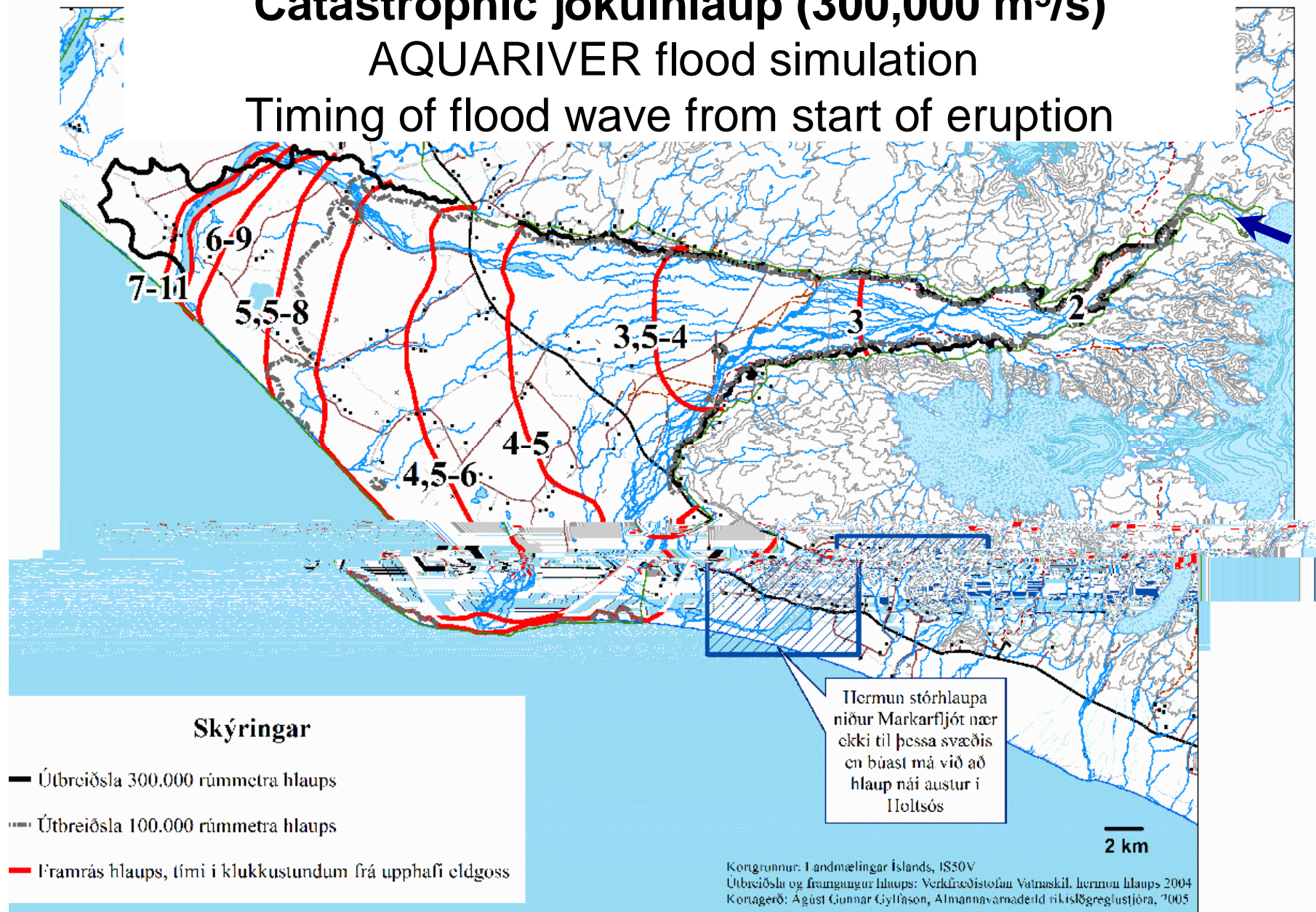
- 1: $< 3.000 \text{ m}^3/\text{s}$
- 2: $3.000\text{-}10.000 \text{ m}^3/\text{s}$
- 3: $10.000\text{-}30.000 \text{ m}^3/\text{s}$
- 4: $30.000\text{-}100.000 \text{ m}^3/\text{s}$
- 5: $> 100.000 \text{ m}^3/\text{s}$



Catastrophic jökulhlaup (300,000 m³/s)

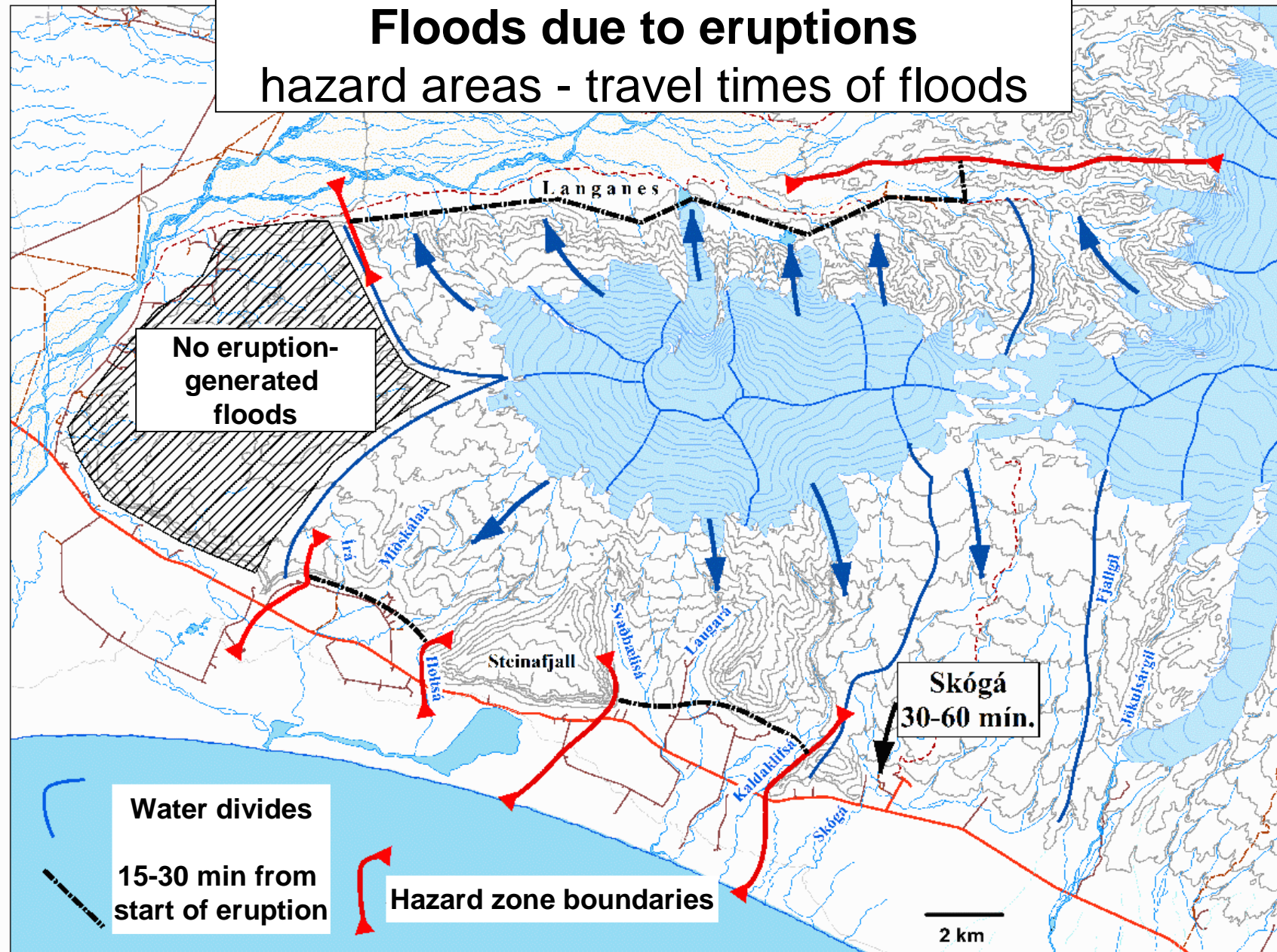
AQUARIVER flood simulation

Timing of flood wave from start of eruption



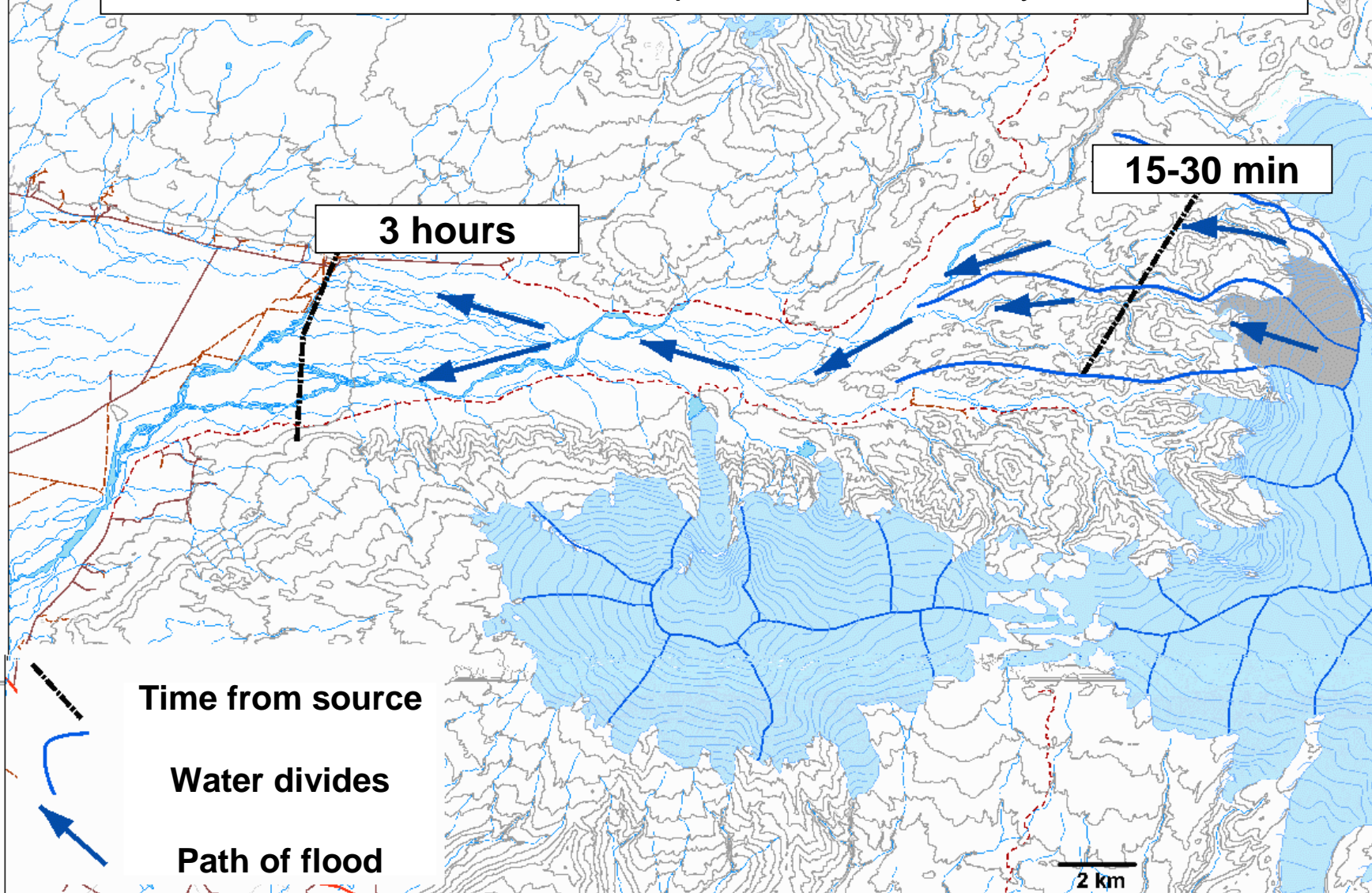
Floods due to eruptions

hazard areas - travel times of floods



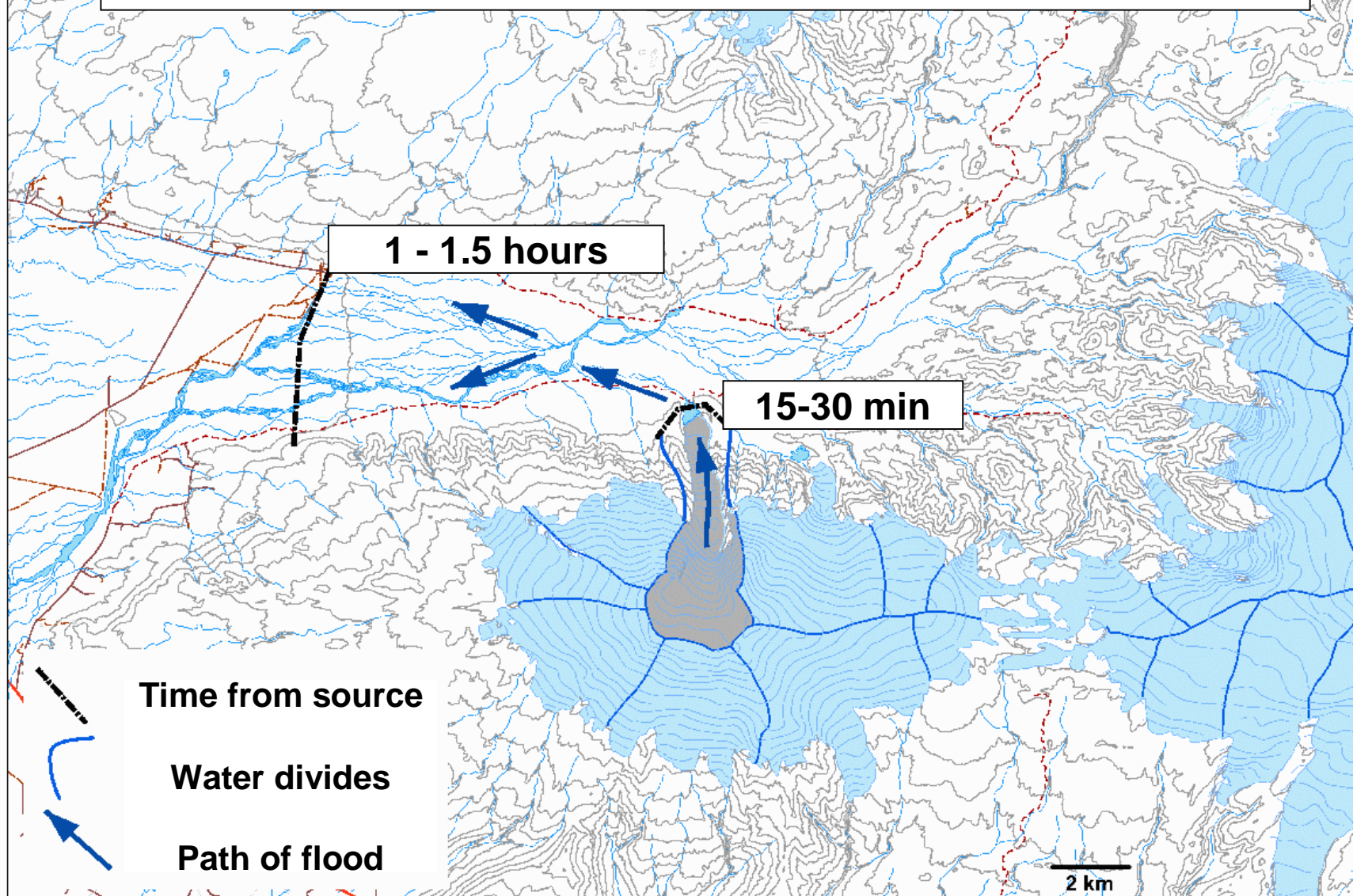
Floods from Ljósá and Þröngá – path and travel times

recurrence time of eruptions 1,000-10,000 years



Floods Eyjafjallajökull caldera – path and travel times

recurrence time of eruptions 100-1,000 years



Results - Hazard assessment

- Recurrence time of eruptions varies between areas - from 50 to 10,000 years
- Recurrence time of large floods to west 500-800 years
- Largest pre-historic floods from Katla caldera ~250,000 m³/s (2 x Amazon River)
- Magnitude of floods due to eruptions on flanks of volcanoes mostly 3,000-10,000 m³/s
- GIS presentation important to convey information to inhabitants and authorities

This presentation is a short summary of:

Magnús T. Guðmundsson, Jónas Elíasson, Guðrún Larsen, Ágúst Gunnar Gylfason, Páll Einarsson, Tómas Jóhannesson, Kristín Martha Hákonardóttir og Helgi Torfason. 2005: ***Yfirlit um hættumat vegna eldgosa og hlaupa frá vesturhluta Mýrdalsjökuls og Eyjafjallajökli.*** (in Icelandic), (*Overview of hazard due to volcanic eruptions and jökulhlaups from the western part of Mýrdalsjökull and Eyjafjallajökull*) In: Magnús T. Guðmundsson and Ágúst Gunnar Gylfason (editors): Hættumat vegna eldgosa og hlaupa frá vestanverðum Mýrdalsjökli og Eyjafjallajökli, 11-44. Ríkislögreglustjórn og Háskólaútgáfan.

In addition to the above overview, the publication on hazard assessment has 11 specialized papers on various aspects of hazard assessment for the area. All the papers are available on the web-page of the Civil Protection Department of the National Commissioner of the Icelandic police (Ríkislögreglustjóri, Almannavarnadeild):

<http://www.almannavarnir.is/>

or

http://www.almannavarnir.is/displayer.asp?cat_id=183