



# The Physical and Societal Impacts of Volcanic Eruptions: The Case of the 1783 Laki Eruption

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**Geoscience Information for Teachers (GIFT) Workshop**

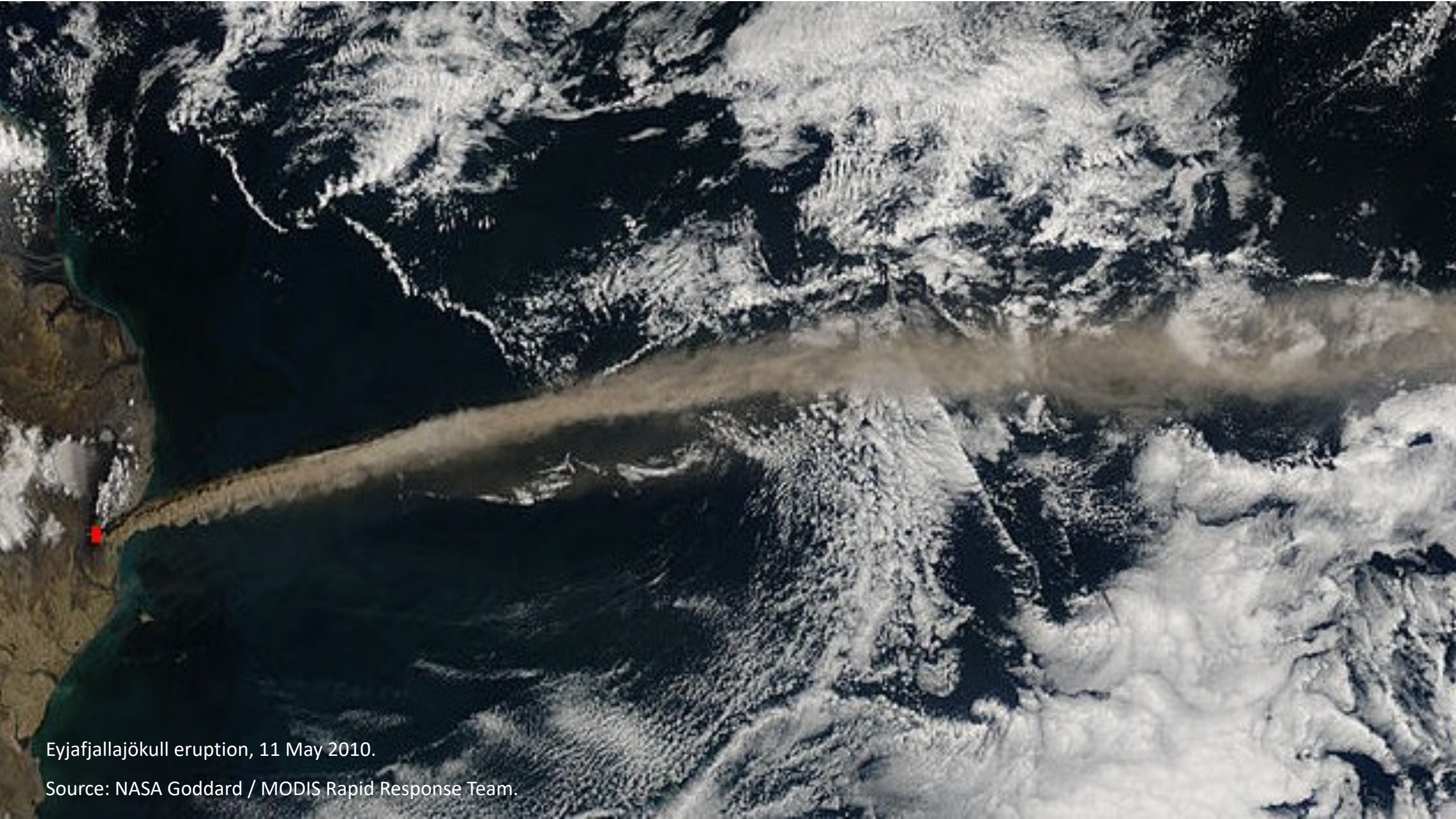
“How the Planet Shapes History. Geosciences, Human Society and Civilisations“

**7 April 2022**

# What is Environmental History?

Environmental historians “write history as if nature existed. And they recognize that the natural world is not merely the backdrop to human events but evolves in its own right, both of its own accord and in response to human action.”

—John R. McNeill: *The State of the Field of Environmental History*. In: *Annual Review of Environment and Resources* 35, no. 1 (2010), 345–374.



Eyjafjallajökull eruption, 11 May 2010.

Source: NASA Goddard / MODIS Rapid Response Team.



Interdisciplinarity

# Climate History

## Archives of Society

Logbooks, chronicles, weather diaries, letters, flood markers, newspapers, etc.



## Archives of Nature

Proxy data from tree rings, ice cores, lake sediments, stalagmites, etc.



Tephra layers in Iceland, photo: Dentren, GNU free documentation license.



1783  
 Nov 23 Sunday Clear & cold went to Church  
 Fair. Mr. Moberg's Sermon in the Morning  
 was Chap: 1 & Verse 12 to the Colossians

24 Monday Clear & Cold. Attended the  
 Workmen in 7<sup>th</sup> Street Employed by the  
 Street Commissioners

25 Tues. Clear & Pleasant. Attended again  
 as above / my Team fetched the 2<sup>nd</sup> Load  
 of hay from W. Moberg's barn, My son  
 & Sonny Took a new bald horse to the Meadows

26 Wed. Very Pleasant, in the evening  
 Met the Vestry at the Schoolhouse  
 concerning Mr. Lamberts Letter  
 attended the Workmen

27 Thurs. Cloudy & Rain  
 attended the  
 of the same

28 Frid. Rain and Snow last  
 day went with son Tho<sup>s</sup> to the  
 but home our Chair horse - Moberg  
 attended in 7<sup>th</sup> Street about  
 in the evening met the Comings  
 the Cott house

29 Sat. Clear Mr. Philips  
 spent the evening at my home  
 about 10 minutes after 10 o'clock  
 an Earthquake a Walking Through  
 up stairs by the Rattling of the  
 lasted about a half a Minute

30 Sund Cloudy, went to Church  
 in the morning was Chap. 2 & Verse the 10<sup>th</sup>

  
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A handwritten weather diary from 1783.



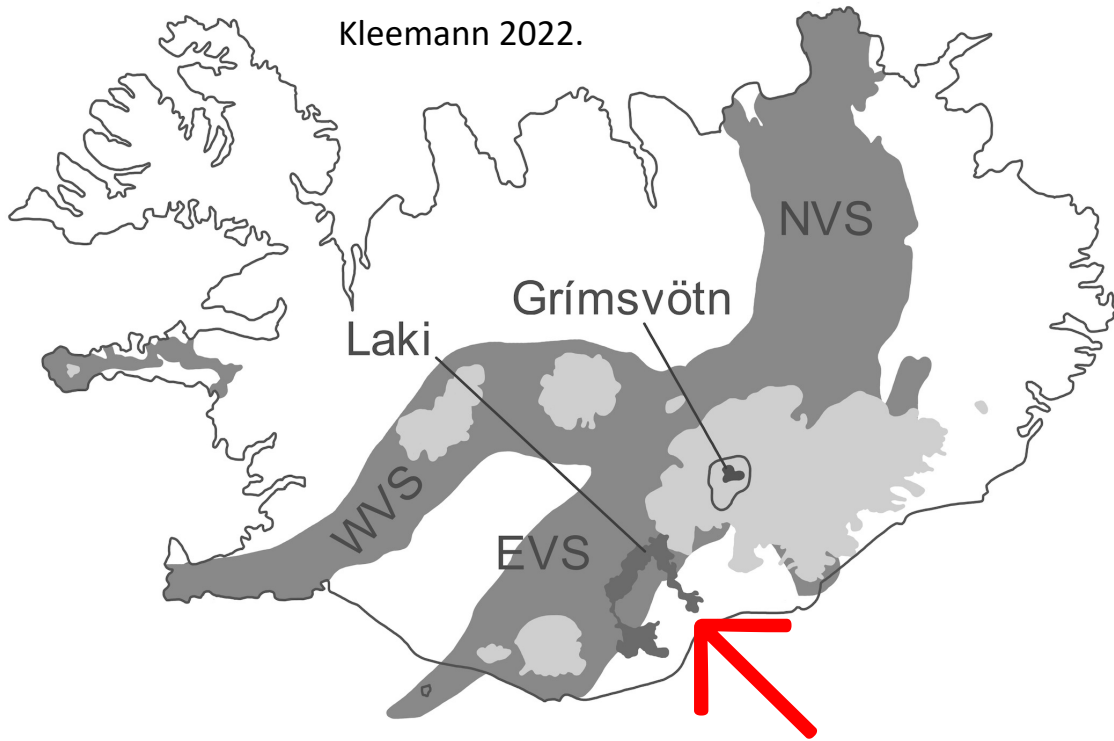
# The Laki Eruption



Map: Uwe Dederling, CC BY-SA 3.0.



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# The Laki Eruption

- 8 June 1783 – 7 February 1784
- The fissure reached a length of 27 kilometers
- It released 14.7 km<sup>3</sup> of lava  
→ equals 5,880,000 Olympic-sized swimming pools
- The lava covered an area of 599 km<sup>2</sup> (2 x Munich)



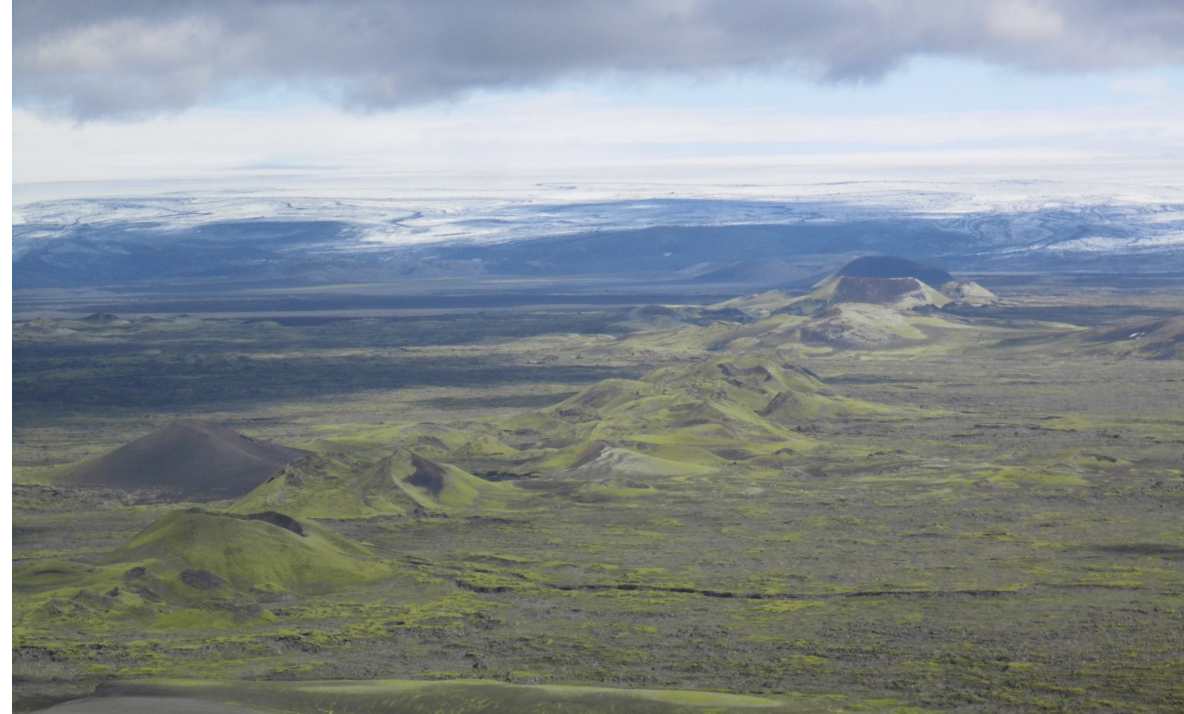
Photo: peterhartree, CC BY-SA 2.0.

# The Laki Eruption

*Lakagígar*

*Skaftáreldar*

*Móðuharðindin*



The Laki Fissure

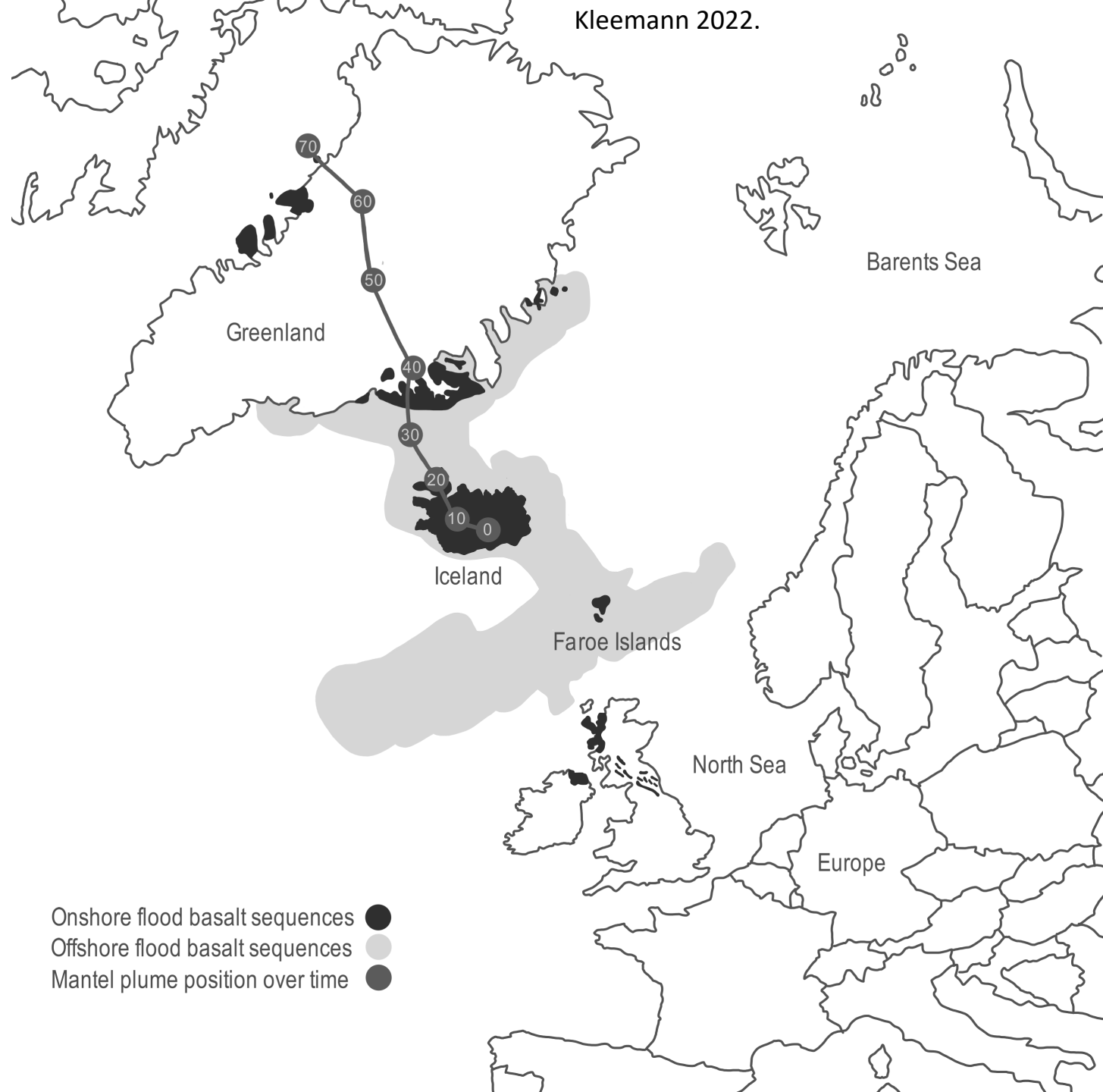
# Iceland's Geology

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- |                      |                       |                  |                    |
|----------------------|-----------------------|------------------|--------------------|
| 1. Reykjanes         | 9. Hveravellir        | 17. Torfajökull  | 25. Öræfajökull    |
| 2. Krýsuvík          | 10. Hofsjökull        | 18. Veiðivötn    | 26. Esjufjöll      |
| 3. Brennisteinsfjöll | 11. Tungnafellsjökull | 19. Grímsvötn    | 27. Snæfell        |
| 4. Hengill           | 12. Vestmannaeyjar    | 20. Kverkfjöll   | 28. Ljósufjöll     |
| 5. Hróðmundartindur  | 13. Eyjafjallajökull  | 21. Askja        | 29. Helgrindur     |
| 6. Grímsnes          | 14. Katla             | 22. Fremrinámur  | 30. Snæfellsjökull |
| 7. Geysir            | 15. Tindfjöll         | 23. Krafla       |                    |
| 8. Prestahnjúkur     | 16. Hekla             | 24. Peystareykir |                    |

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- Onshore flood basalt sequences ●
- Offshore flood basalt sequences ●
- Mantel plume position over time ●

# Volcanic Eruptions in Iceland

- Iceland's volcanoes have produced 2,400 volcanic eruptions since the end of the last ice age.
- Reconstructions based on ice core records from nearby Greenland, tephra layers in Iceland and historical records (for the past ~1150 years)
- Iceland was first settled in 871 AD



Kirkjubæjarklaustur Today



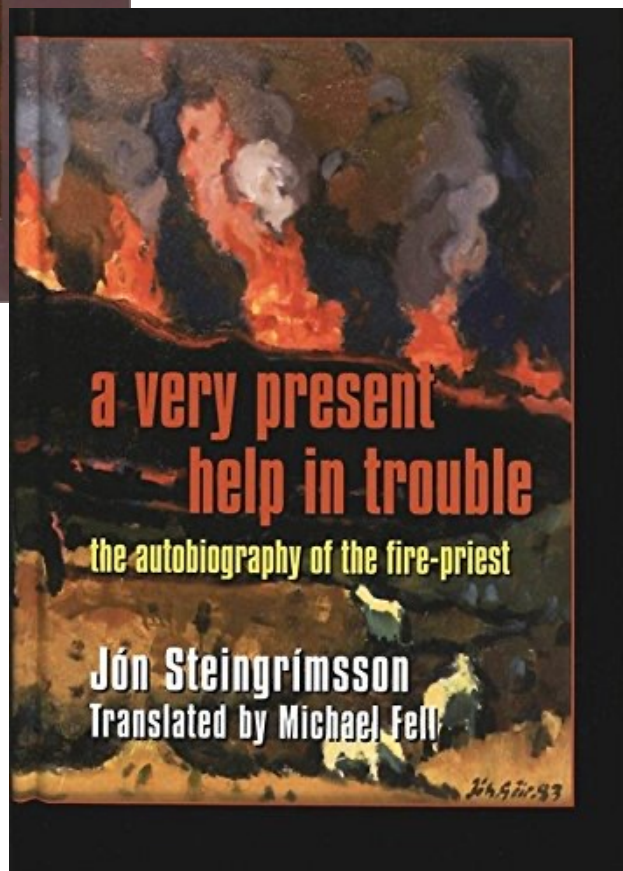
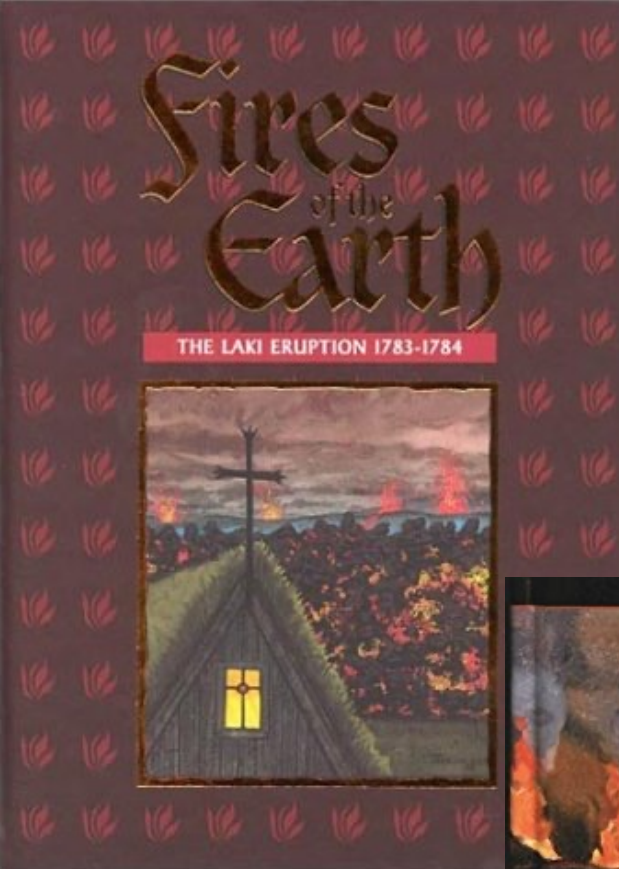
Reykjavík

Laki Fissure

Kirkjubæjarklaustur



Ashfall can create darkness by blocking out sunlight, as seen here during the 1997 Soufriere Hills eruption on Montserrat. Photo: M. Mangan, USGS.



# Eye-Witness Accounts by Jón Steingrímsson

- Steingrímsson, Jón. *Fires of the Earth: The Laki Eruption, 1783-1784*, translated by Keneva Kunz. Reykjavík: Nordic Volcanological Institute, University of Iceland Press, 1998.
- Steingrímsson, Jón. *A Very Present Help in Trouble: The Autobiography of the Fire-Priest*, edited and translated by Michael Fell. New York, NY: Lang, 2002.



# The Skaftá River



# The Hverfisfljót River





Skaftá river

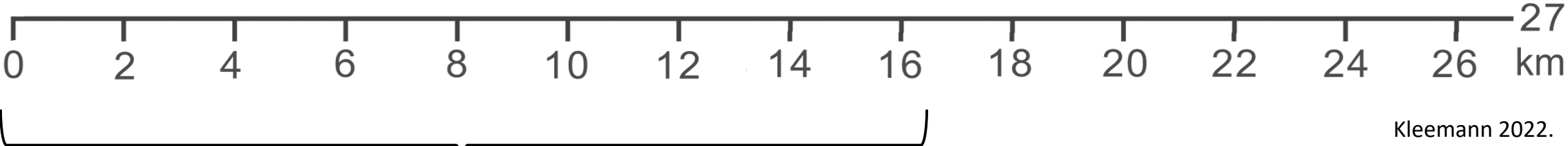
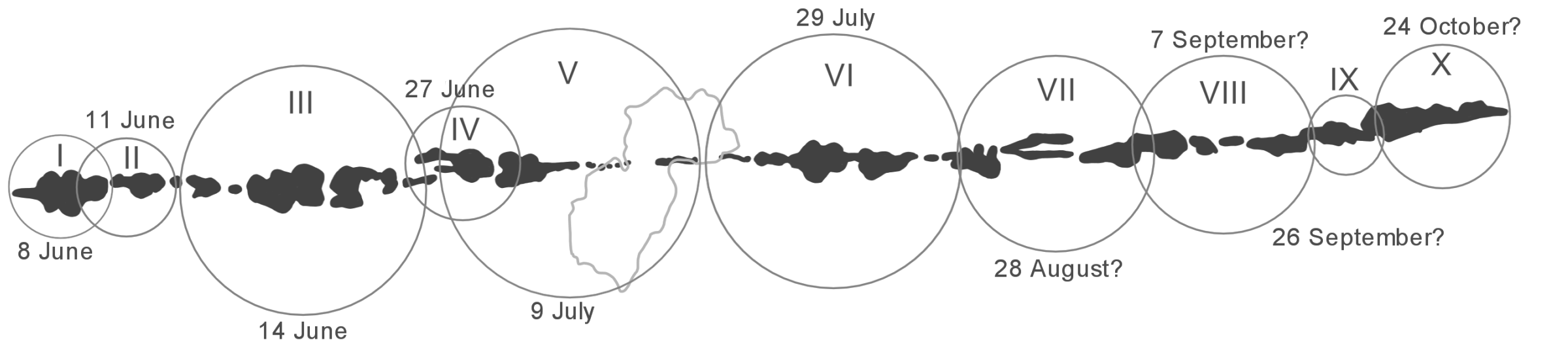
Hverfisfljót river

Kirkjubæjarklaustur

Map: Open Street Map, edited by Katrin Kleemann.

# The Laki lava fields today





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60 % of the magma was erupted

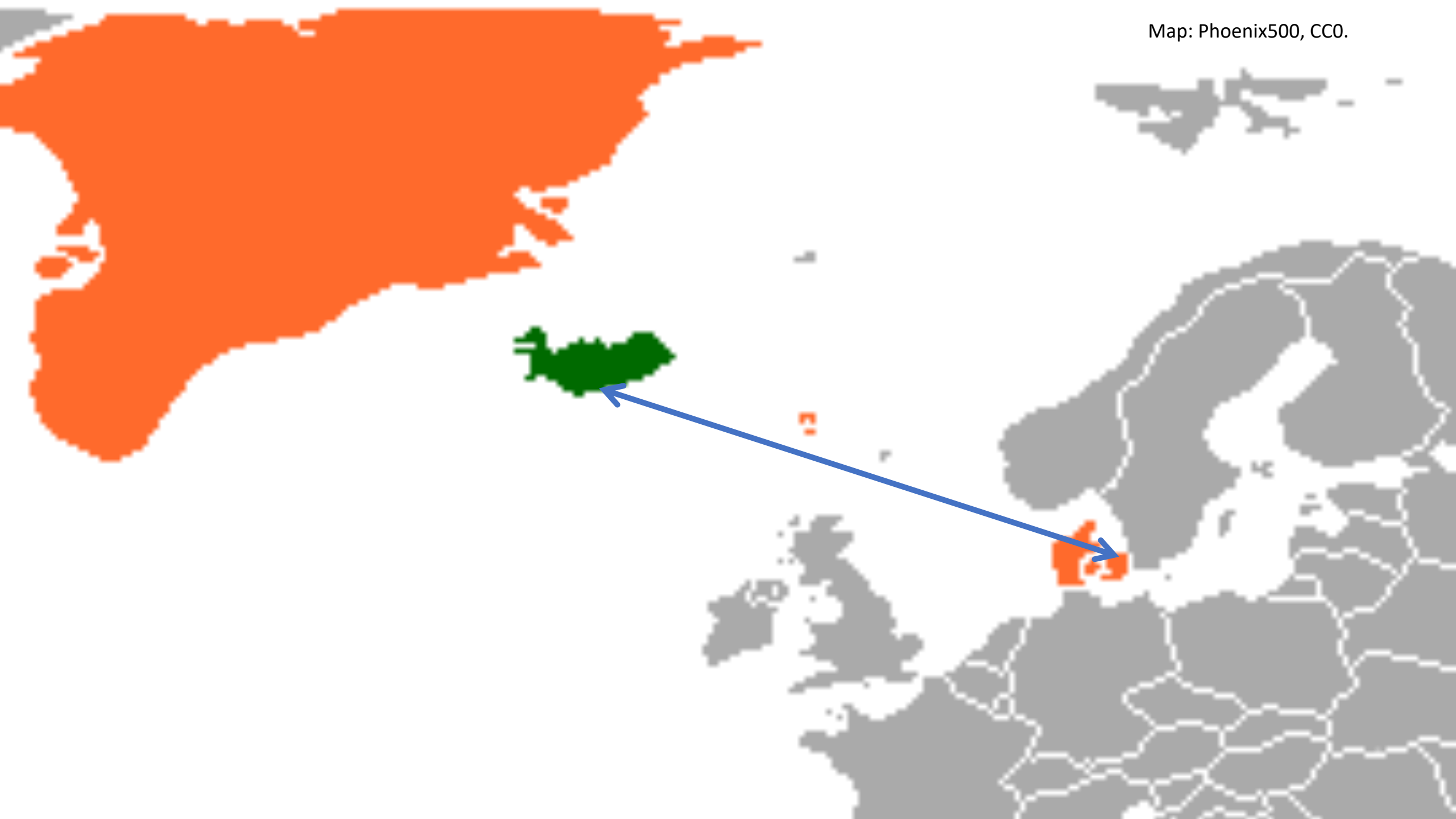
93% of the magma was erupted

Ashfall in the aftermath of the Eyjafjallajökull eruption in 2010.  
Kevin Hadley, CC BY-SA 3.0.





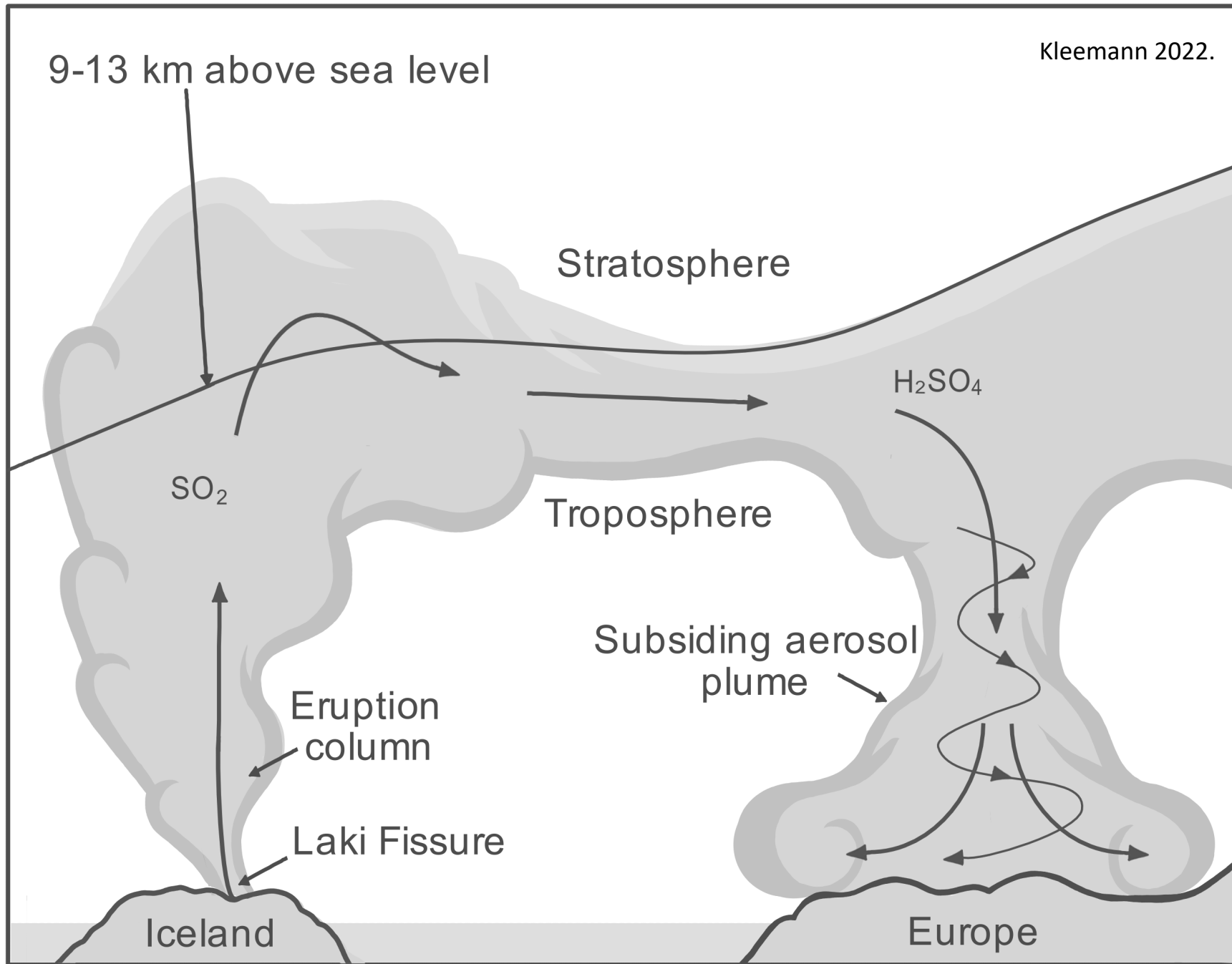
Between 1783 and 1785, 76% of the horses, 79% of the sheep, and half the cattle perished in Iceland.







# Beyond Iceland







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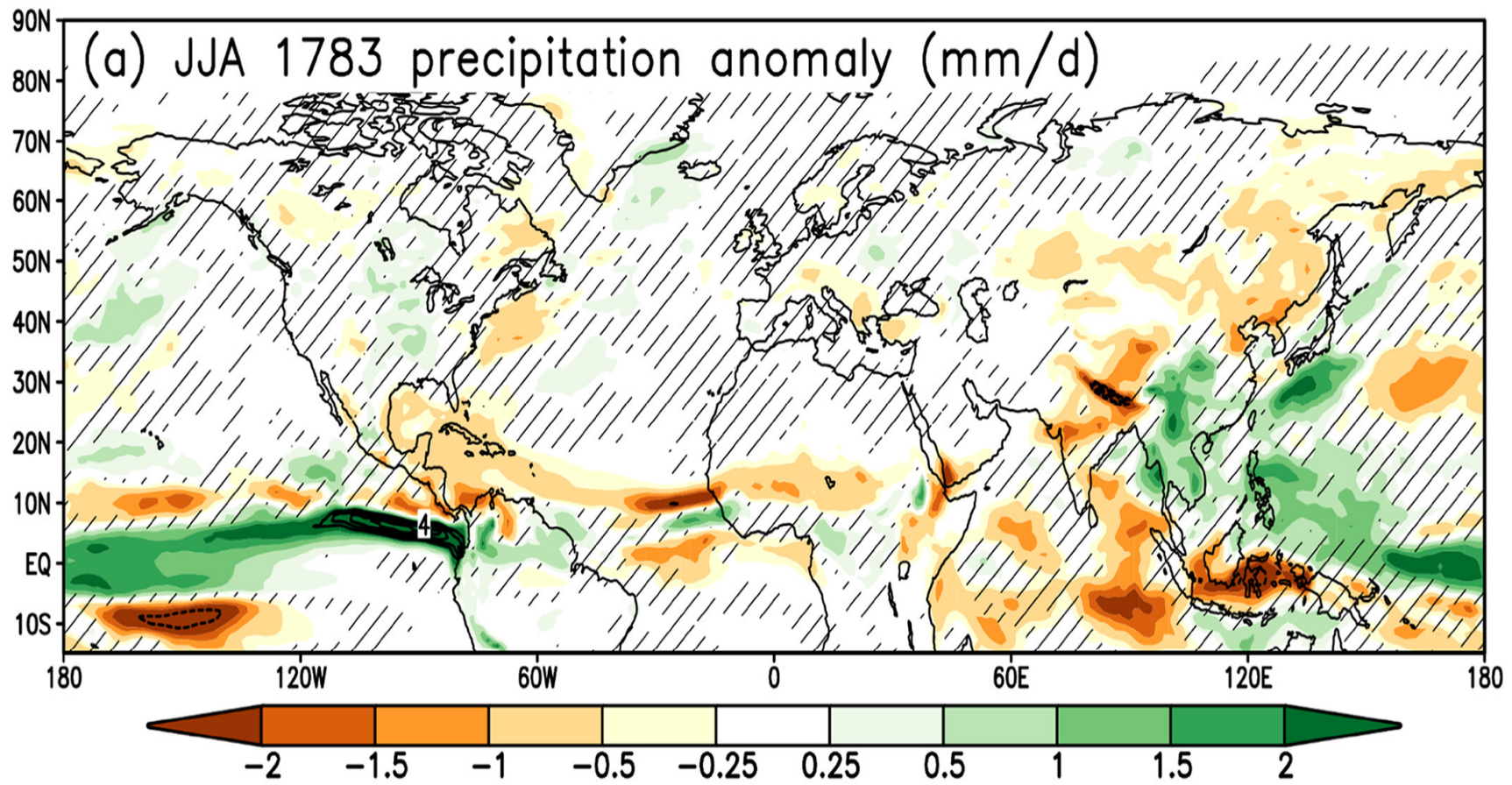
# The Fog in North Africa

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“[...] the sun was often invisible the whole afternoon [...] I was frequently so enveloped in a white, humid, warm, and opaque [sic] mist, as not to be able to see four paces before me.”

“On my return from Suez, [...] between the 24<sup>th</sup> and 26<sup>th</sup> of July, we had no fog during the two nights we passed in the desert.”

—Constantin François Volney: Travels through Syria and Egypt, in the Years 1783, 1784, and 1785, [...], translated from French. Vol. 1. London 1788, p. 345-347.



### Zonal-mean precipitation anomalies

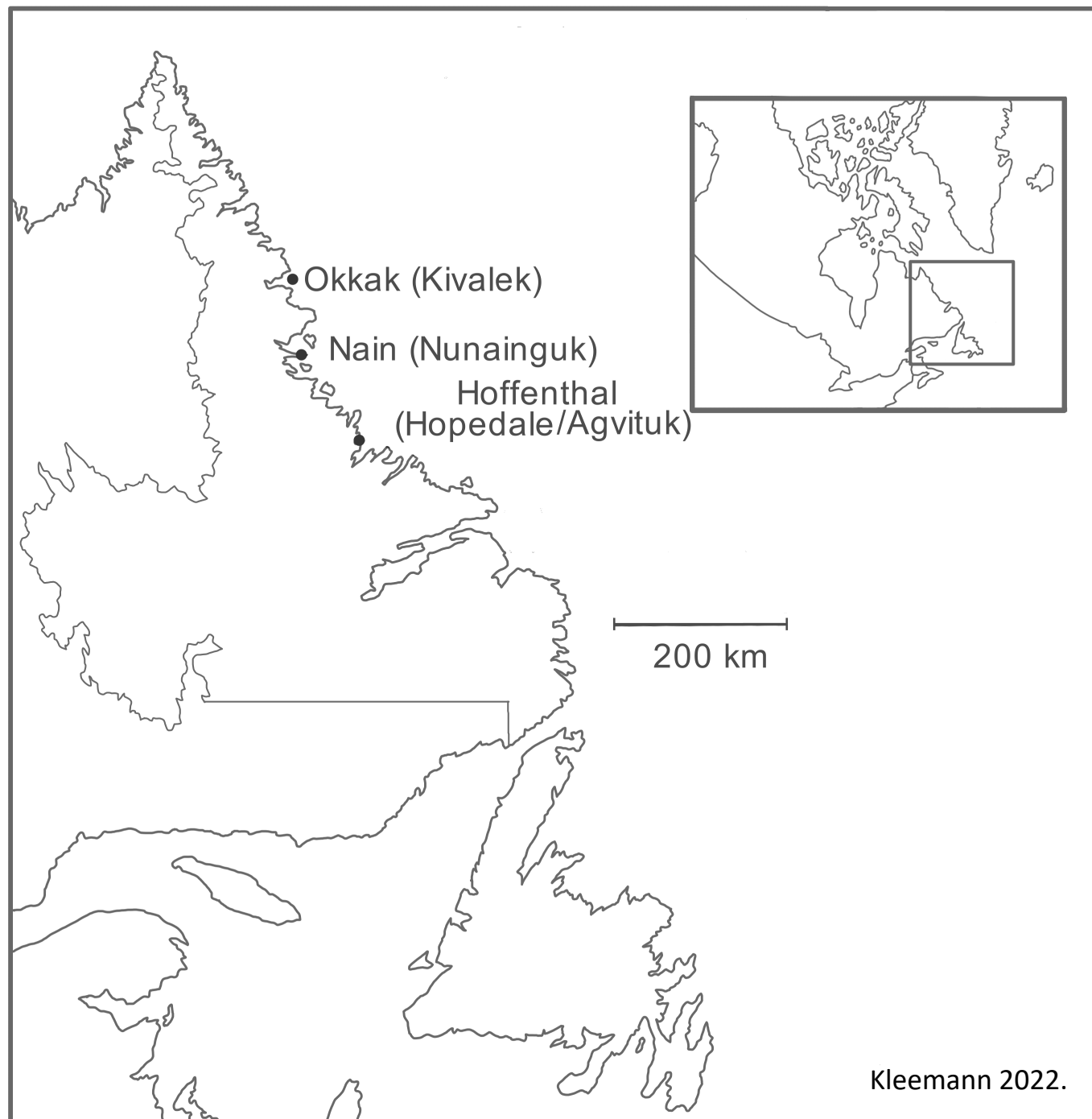
June–August (JJA) 1783 precipitation anomalies (mm/d) for the Laki ensemble average. Anomalies are calculated with respect to the 5 years before the eruption.

Brian Zambri, Alan Robock, Michael J. Mills, and Anja Schmidt: Modeling the 1783–1784 Laki Eruption in Iceland: 2. Climate Impacts. In: *Journal of Geophysical Research: Atmospheres* 124, no. 13 (2019), 6770-6790.

# Laki Haze in Labrador

- 20 June 1783: “heazey [sic] and sun shine.”
- 3 July 1783: “Heazey sun shine and rain. For several days thick smoke fog throw the Air as from a great fire so we pose the Ykas [?] let some great woods on fire, they do so sometimes.”
- 29 July 1783: “Cloudy and sunshine. The Air full of Smoke for 5 weeks past.”

—MA/144, Archives of the Royal Society, Meteorological observations at Okkak, Hudson’s Bay Company, Labrador, Newfoundland.



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The first  
appearance of  
the dry fog in  
June 1783





Calabrian earthquakes



Great Meteor,  
August 1783



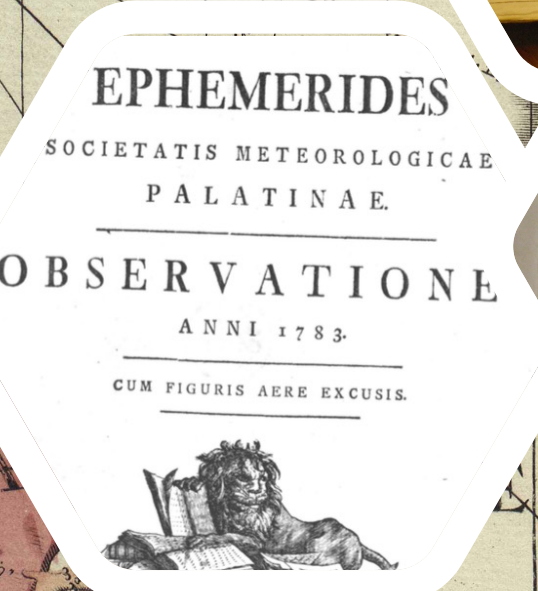
Thunderstorms



"blood red" sun



German  
eruptions



A wide-angle landscape photograph showing a volcanic region. The foreground is a rocky, moss-covered ridge. The middle ground features rolling green hills and a dark, winding river valley. In the distance, there are more hills and a body of water under a cloudy sky. The text "Different Theories on the Fog's Origin" is overlaid in white.

# Different Theories on the Fog's Origin

Peat or Forest Fire?



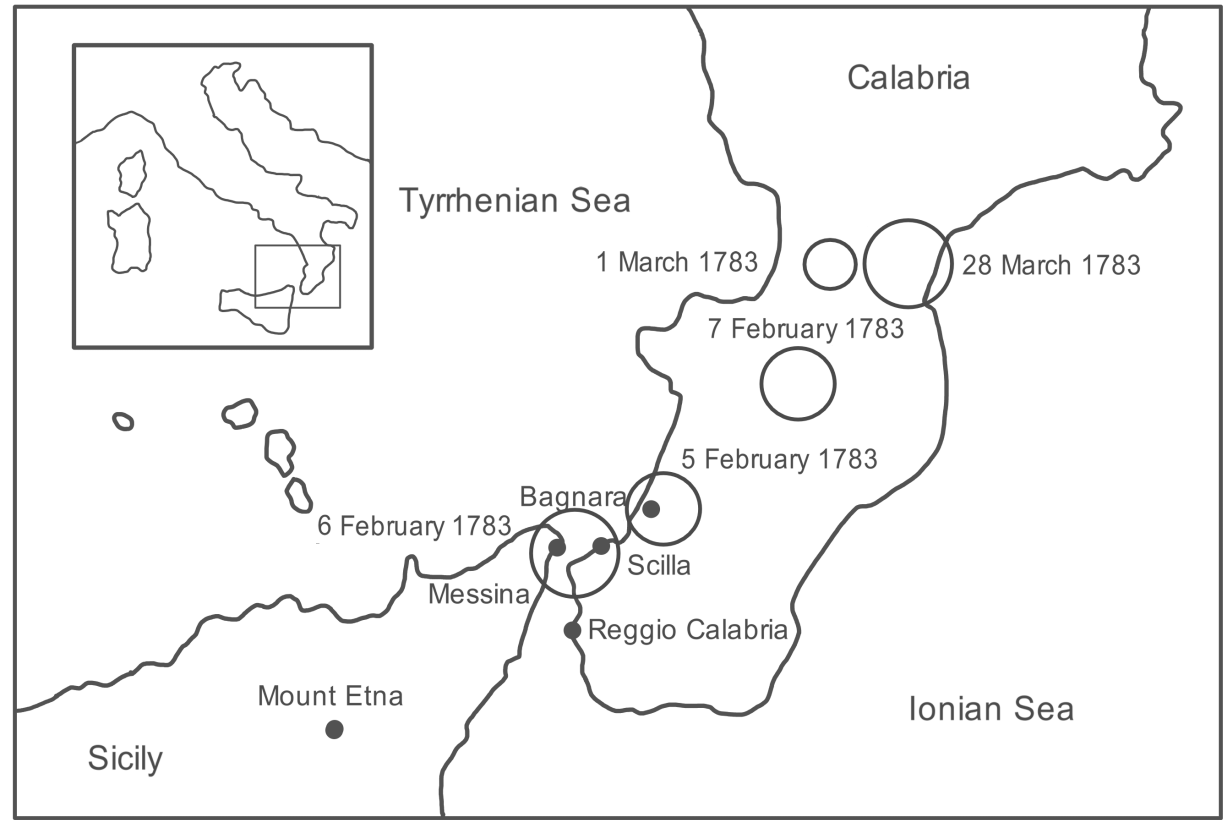
# Calabrian Earthquakes



VUE DE LA VILLE DE REGIO DIU MESSINÆ ET CES ALENTOUR DETRUIE

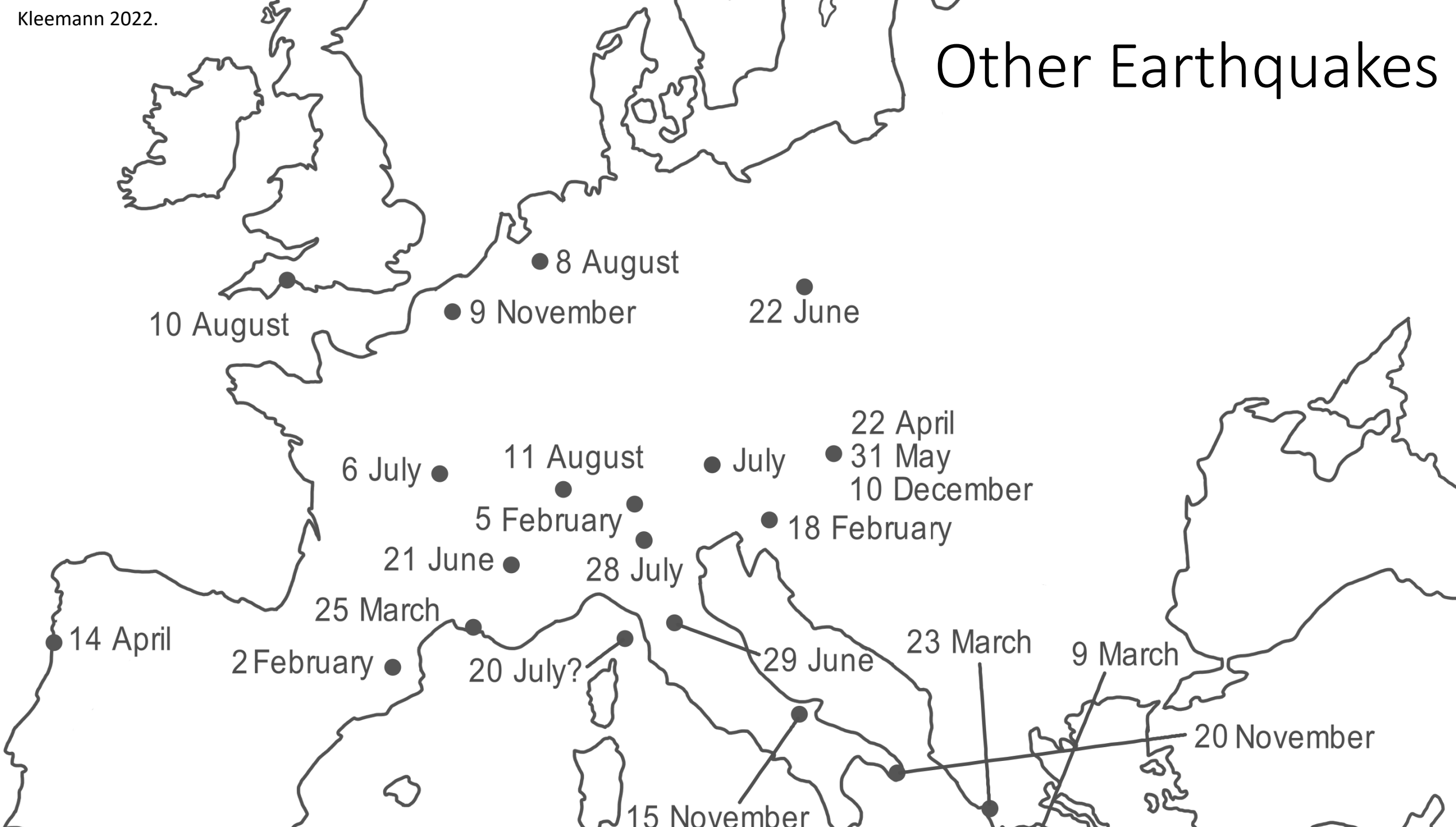
In the public domain. le terrible tremblement de Terre arrivé le Cinq Février de l'année 1783.

A Paris chez J. Choussier au Salon de la Fontaine St. Jacques au dessous de la Fontaine St. Ferron au 2 Colonne 111 257



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# Other Earthquakes



# Other Earthquakes

1783

Paris, vom 4. September.

Briefe aus Portugall melden, daß man in verschiedenen Gegenden dieses Königreichs, am 6. Julius ziemlich heftige Erdbeben empfunden habe; eben dergleichen wird auch aus England und selbst aus Island

berichtet; also ist das ganze Europa von diesem Schrecken heimgejucht worden. Außer dem Luftball den der König auf seine Kosten und zu seinem Vergnügen bauen läßt, werden dergleichen noch zwey andre, für den Herzog von Chartres und den Herzog von Rochefoucault gebauet; der spanische Ambassadeur Graf d'Aranda, läßt dem Vernehmen nach vier Stück auffertigen, die nach Madrid geschickt werden sollen, und auch in Lyon wird einer angefertiget, der von beträchtlicher Größe seyn soll. Wie haben schon Kopfzeuge und Hüfäße zu Damenkleidern à la Mongolier und au ballon volant. —

“Letters from Portugal report that several areas of this kingdom experienced quite strong earthquakes on July 6<sup>th</sup>, the same is being reported from England and Iceland; the whole of Europe seems to have been plagued by this horror.”

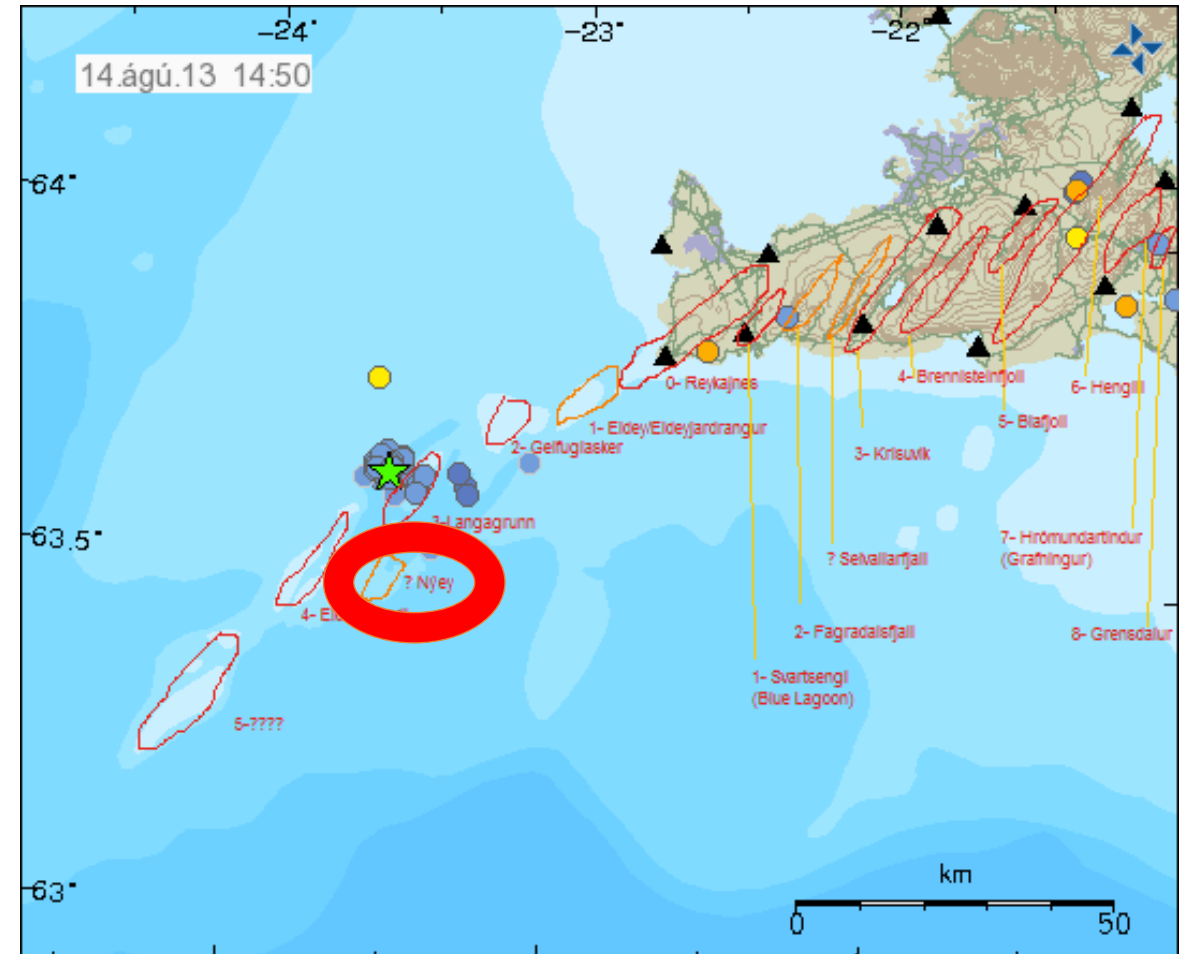
—*Berlinische Nachrichten*, 18. Sept. 1783, no. 112, p. 868-869. Report from Paris on 4 Sept. 1783.

# Nyey – Burning Island off the Coast of Iceland

- Nyey was discovered by fishermen in March 1783 and made the news during the summer
- Today it is a submarine crater

“[...] it is very odd that this natural event occurred at the same time when Messina and Calabria have been devastated by the most terrible earthquakes.”

—*Hamburgischer Unpartheyischer Correspondent*, 28 June 1783, no. 103, n.p.  
Report from Copenhagen on June 24, 1783.



Map: Vedur, Icelandic Weather Service.





# Suspecting a Volcano ...

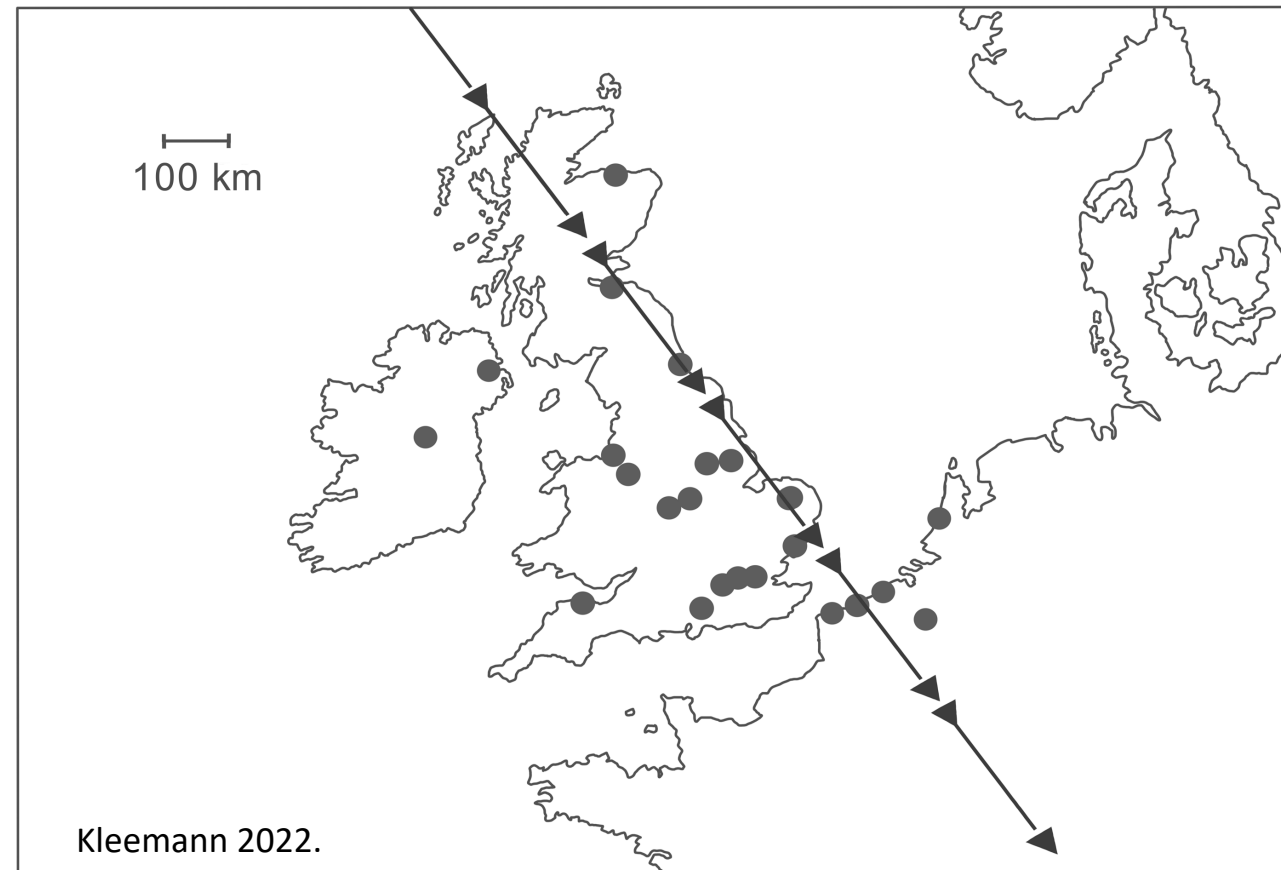
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- Summer 1783: Johann Rudolf Salis-Marschlins (Switzerland)
- Summer 1783: Christian Gottlieb Kratzenstein (Copenhagen)
- August 1783 (1784): Jacque Antoine Mourage de Montredon (Montpellier)
- After August 1783 (1785): Benjamin Franklin (Paris)



Henry Robinson, "An accurate representation of the meteor, as seen at Winthorpe, England, on 18 August 1783." Bildquelle: British Museum, Online Collection, CC BY-NC-SA.

## .. Or a Fireball (18 August 1783)





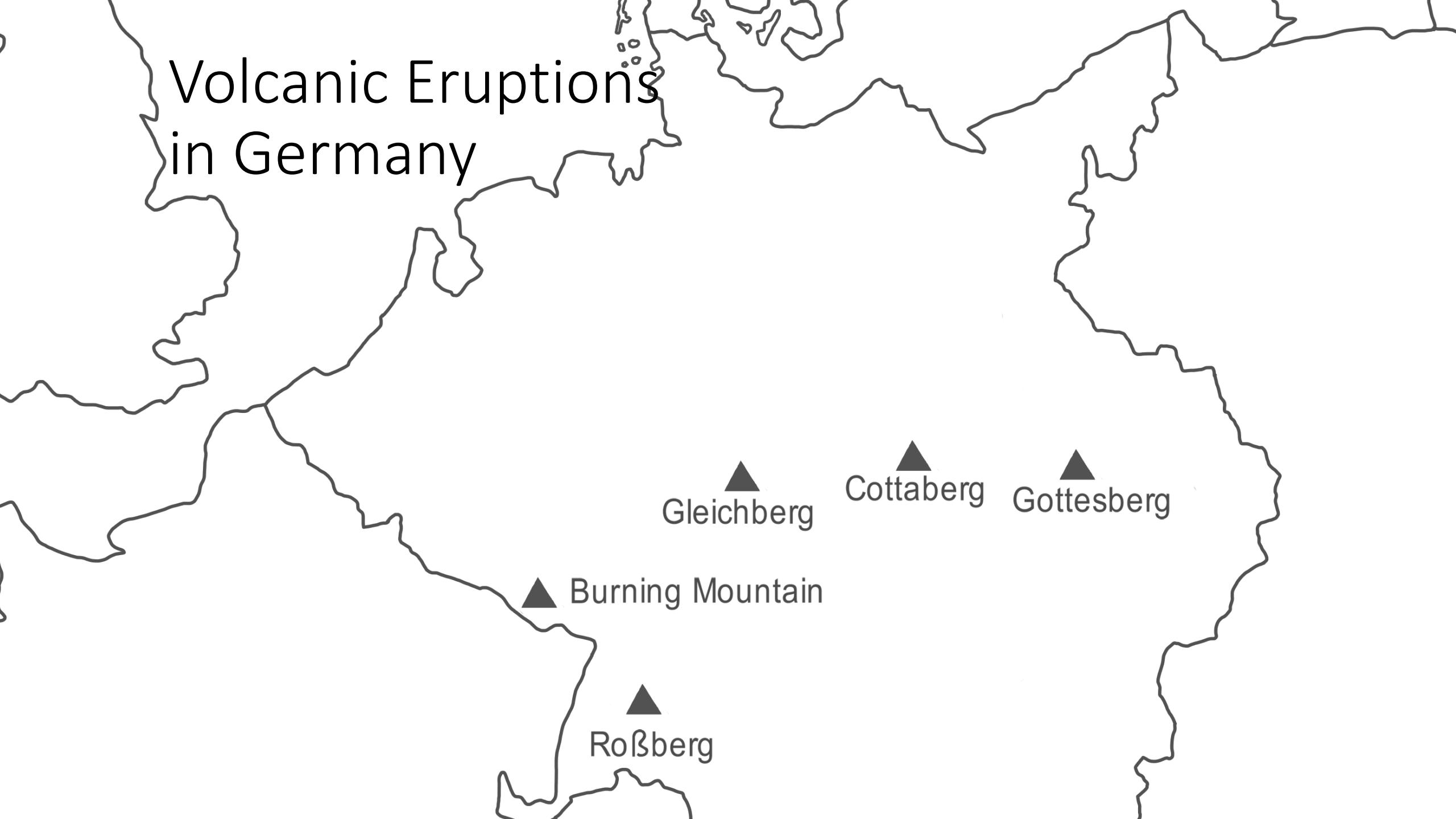
The Kleiner and the Großer Gleichberg, photo: Elop, CC BY-SA 2.5.

## The Gleichberg “Eruption”

„The Gleichberg, which is 2 hours away from here, [...] began steaming around Easter; the vapor increased daily until the whole area from Römhild to Hildburghausen, which are eight hours apart [by foot], was covered in permanent thick fog. The forests in this area are all white rather than green. The fog is true natural sulfur, which spoils everything it touches. Sun and moon rise and set in a blood red color. For eight days now inside the mountain there was horrendous and frightening bashing, as if cannons were fired; then the whole mountain opened up under the plumes of thick sulfuric smoke; and in the whole area you can hear a constant terrible roaring and rushing [‘Sausen and Brausen’] from the opening. There are praying services held in all churches; the people in the surrounding villages have fled as they are afraid the whole mountain may collapse.”

—*Königlich privilegirte Zeitung*, 22 July 1783, no. 87, p. 714. Report from Hildburghausen on June 24, 1783.

# Volcanic Eruptions in Germany



▲  
Gleichberg

▲  
Cottaberg

▲  
Gottesberg

▲ Burning Mountain

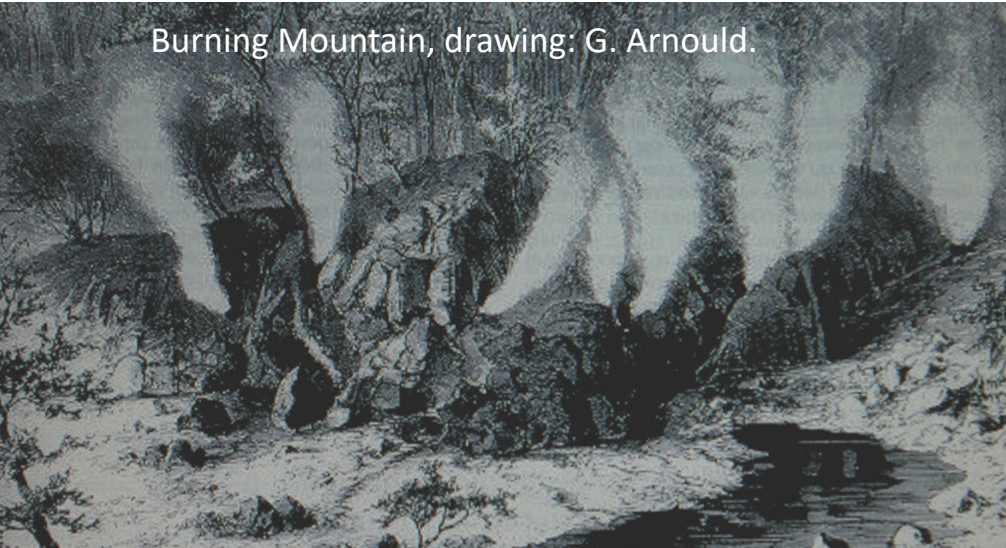
▲  
Roßberg

# Volcanic Eruptions within the German Territories in 1783

Roßberg, photo: Björn Appel.



Burning Mountain, drawing: G. Arnould.



Gleichberg mountains, photo: Winfried Gaenssler.

Cottaer Spitzberg, photo: Norbert Kaiser.



# Aftermath

- The winters following the eruption were very cold in Europe and North America
- The Laki Fissure eruption occurred during the Little Ice Age (1250-1850)

Würzburg



Bamberg



Heidelberg



Portrait of Sveinn Pálsson by Sæmundur Magnússon Hólm, 1798.



# Connecting the Dots

- 1794: The Icelandic naturalist Sveinn Pálsson discovers the Laki fissure. His findings are not published due to financial difficulties.
- 1880s: The Norwegian geologists Amund Helland re-discovers Pálsson's findings and visits the Laki fissure.
- 1883: Krakatau erupts and the scientific community realizes the impacts of volcanic eruptions can be visible on the other side of the world.
- 1945: Pálsson's findings are published in full.

Lithograph of the 1883 Krakatau eruption, 1888.



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*Katrin Kleemann*

# A MIST CONNECTION

AN ENVIRONMENTAL HISTORY OF THE LAKI ERUPTION  
OF 1783 AND ITS LEGACY



HISTORICAL CATASTROPHE STUDIES /  
HISTORISCHE KATASTROPHENFORSCHUNG

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# Coming soon!



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## A Mist Connection

An Environmental History of the Laki Eruption of 1783 and Its  
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# Thank you!

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