

How climate change triggered a landslide tsunami in a Greenland fjord, vibrating Earth for 9 days



A rockslide-generated tsunami in a Greenland fjord rang Earth for 9 days

<https://www.youtube.com/watch?v=60T9TKuuujs&t=14s>

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by Svennevig et al., 2024

Soundtrack: 'Seiche'
by Isabelle Ryder

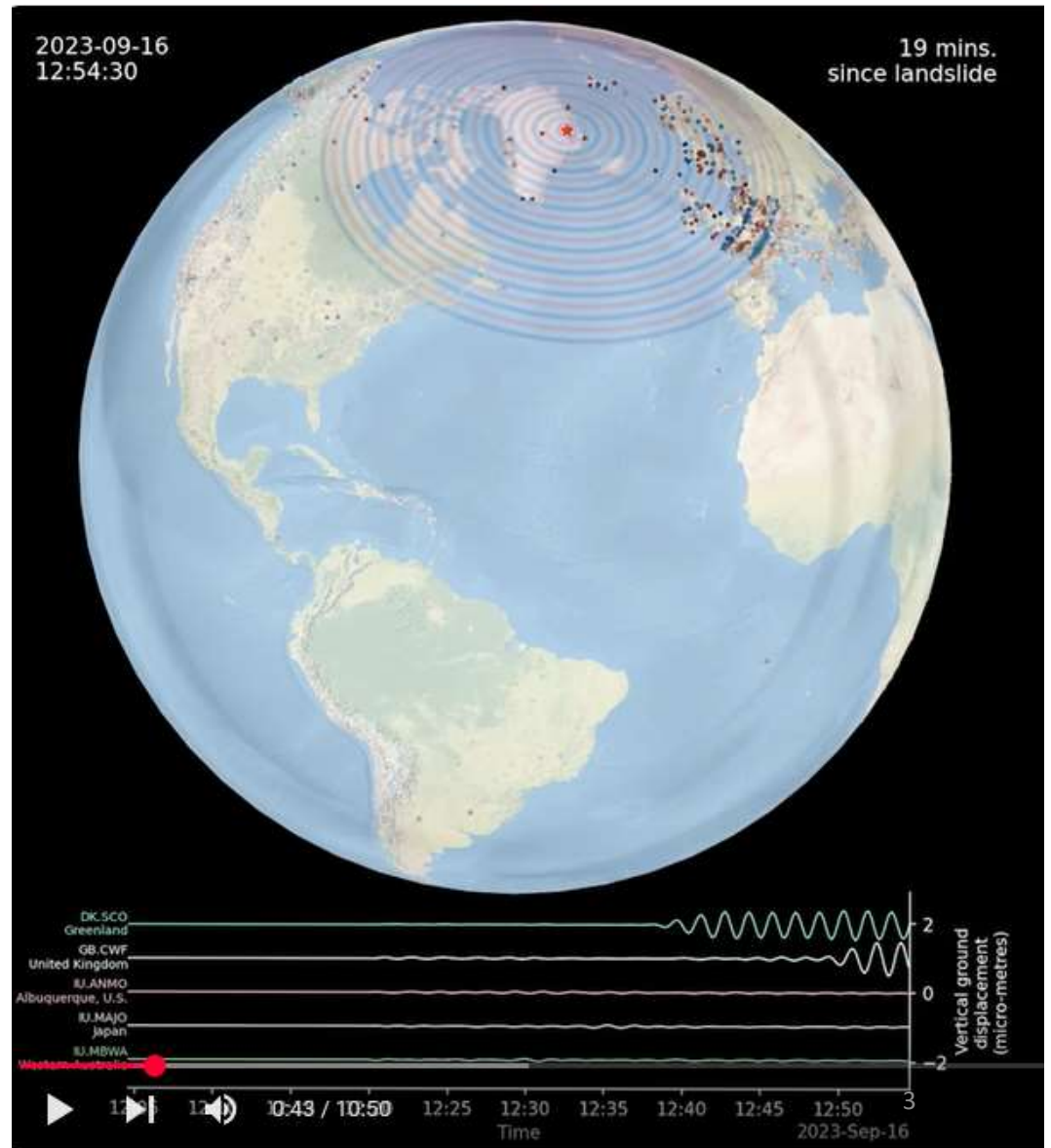
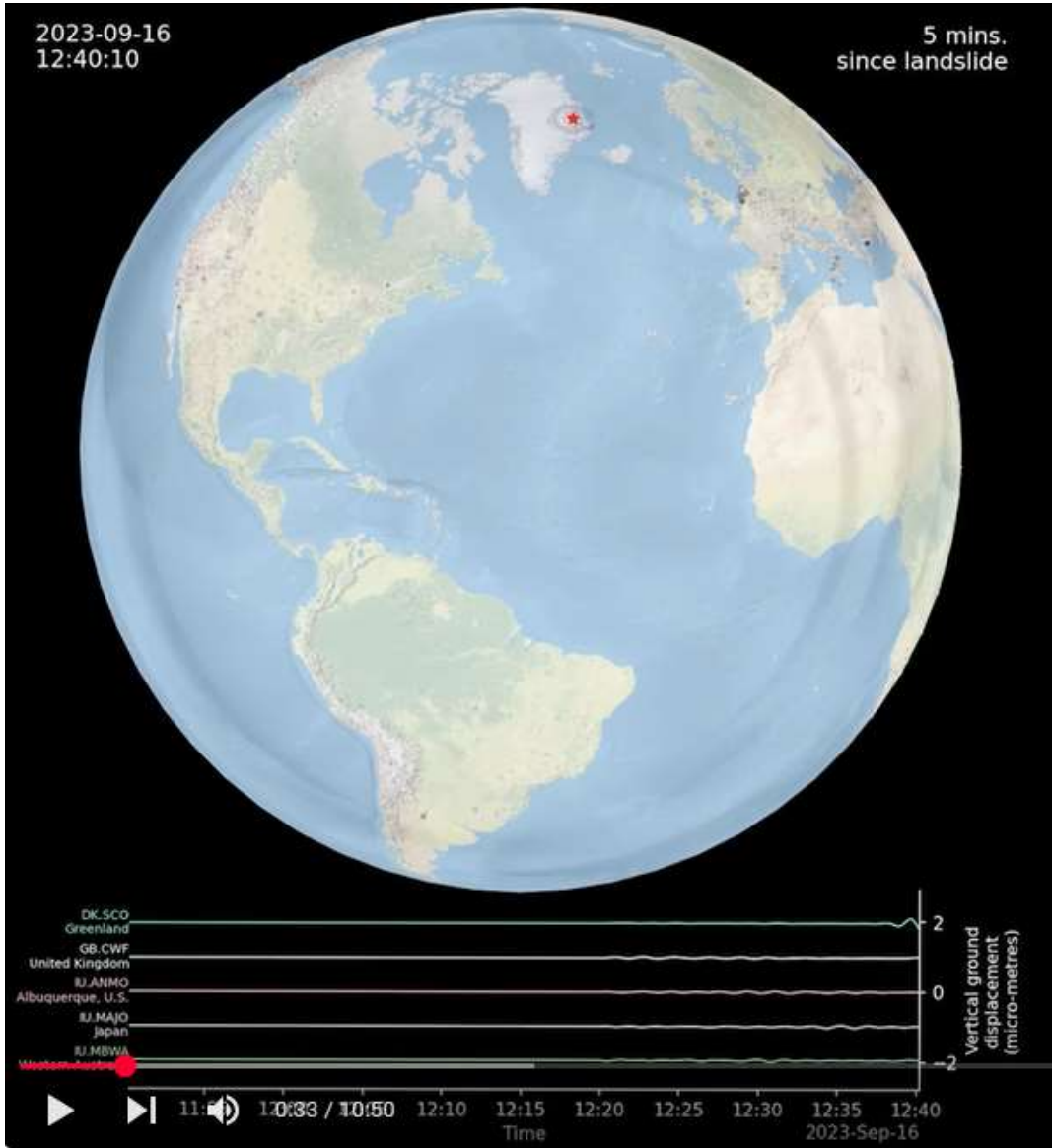
Big Mystery

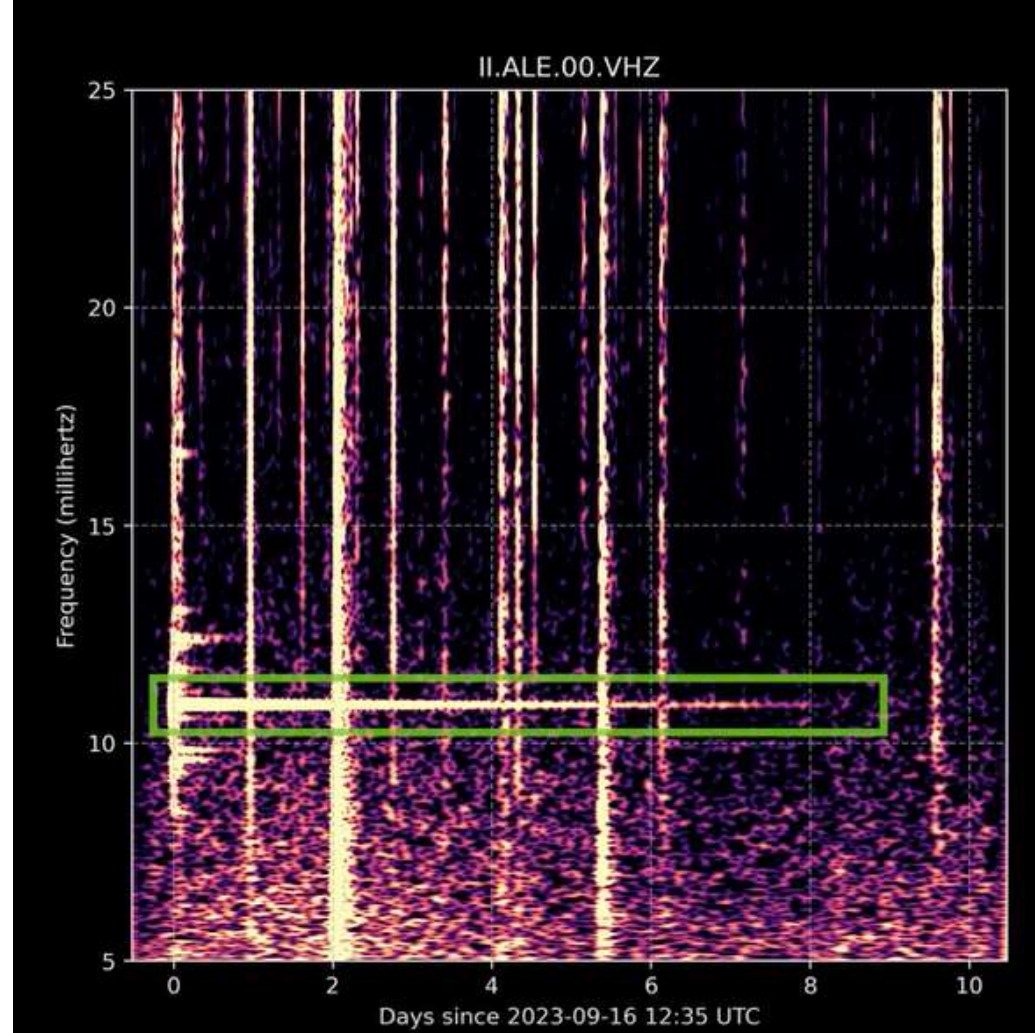
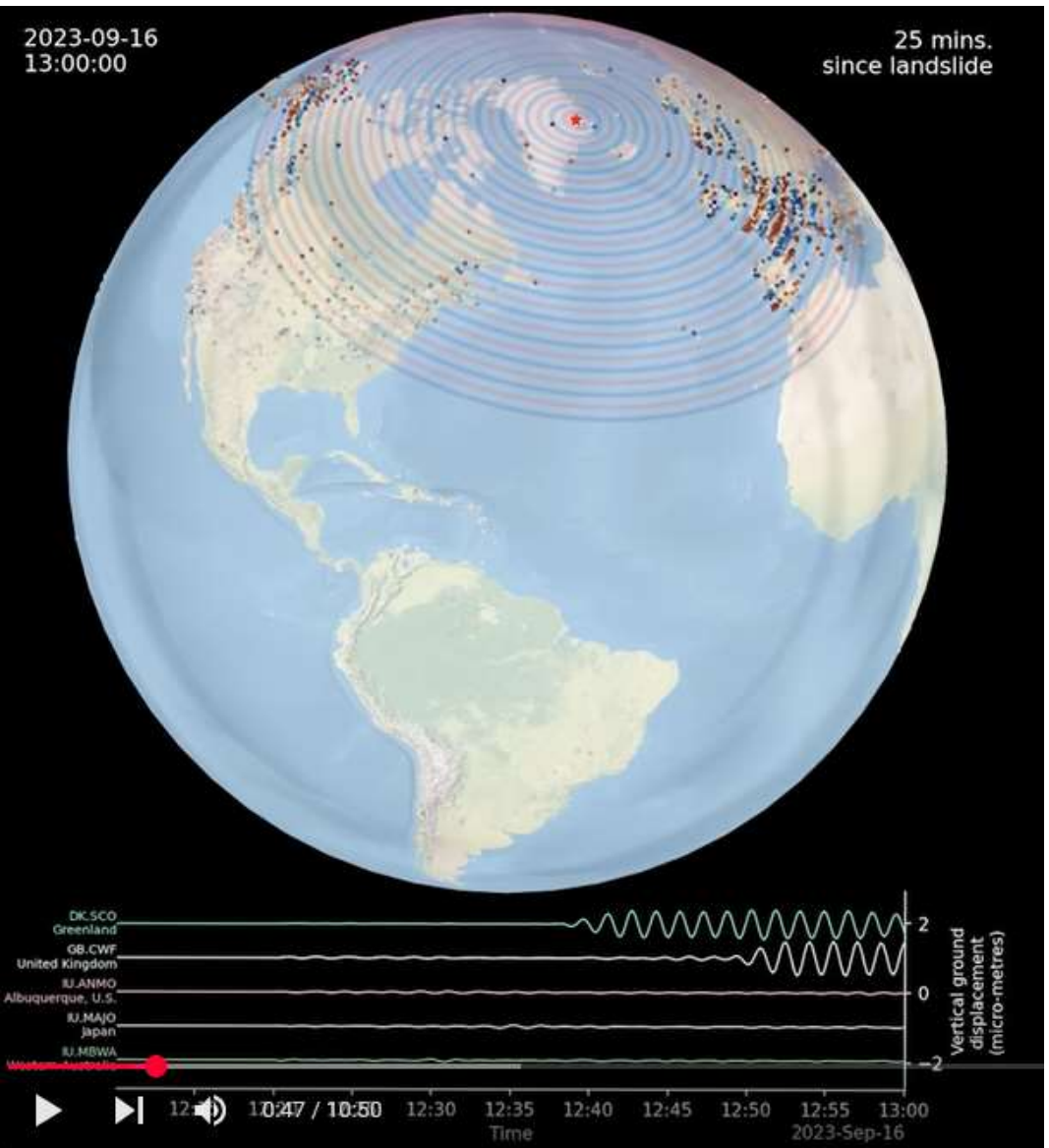


- A seismic signal all over planet Earth for 9 days => never seen before!
- Signal lasted longer than any other recorded signal. Sometimes vibrations are maintained by strong winds, but not here.
- A fascinating investigation with experts from many different domains:
Une enquête passionnante avec des experts dans différents fields:
 - Geology, seismology, geophysics, meteorology, biology, marine, oceanography, vulcanology, glaciology

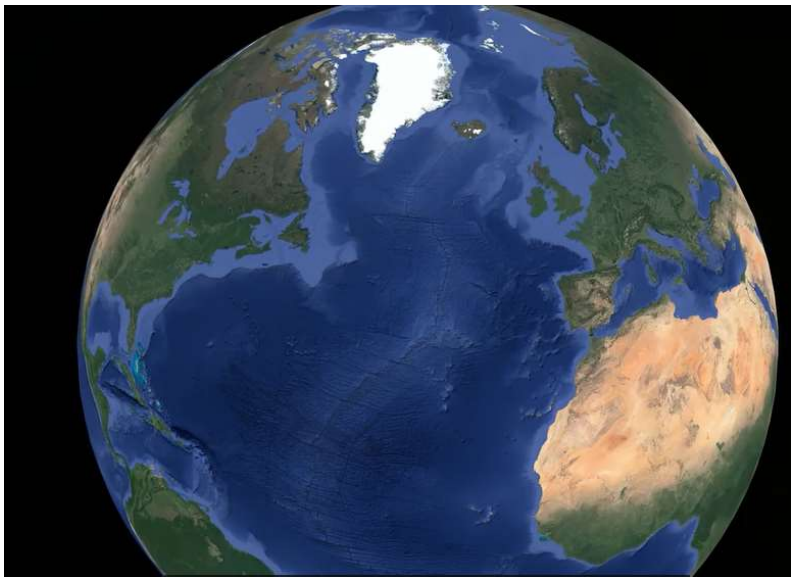
=> It's origin has been traced back to Greenland





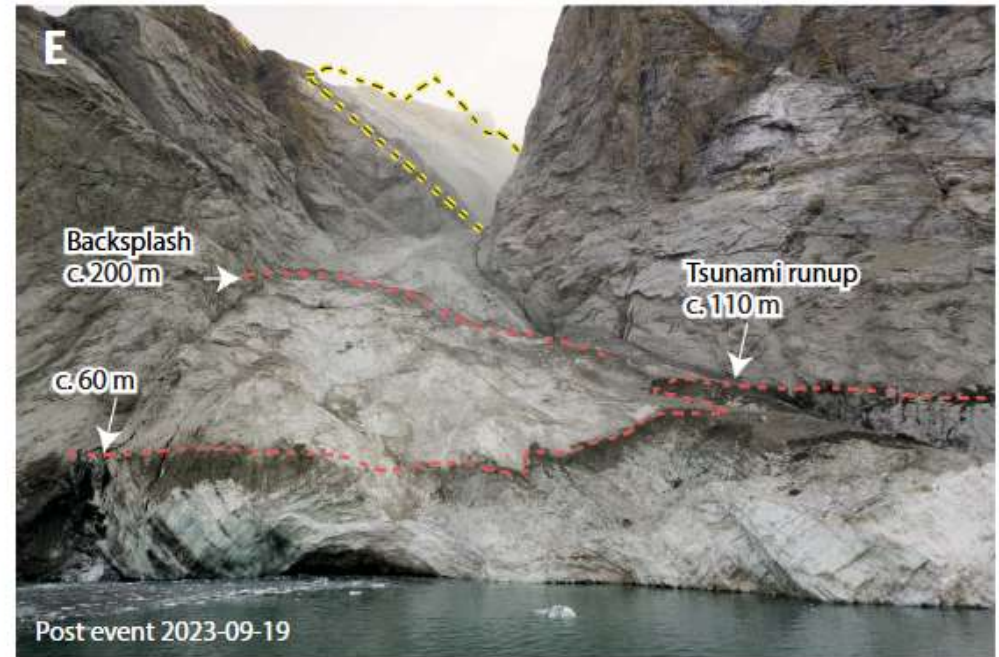


Event called USO : Unidentified Seismic Object

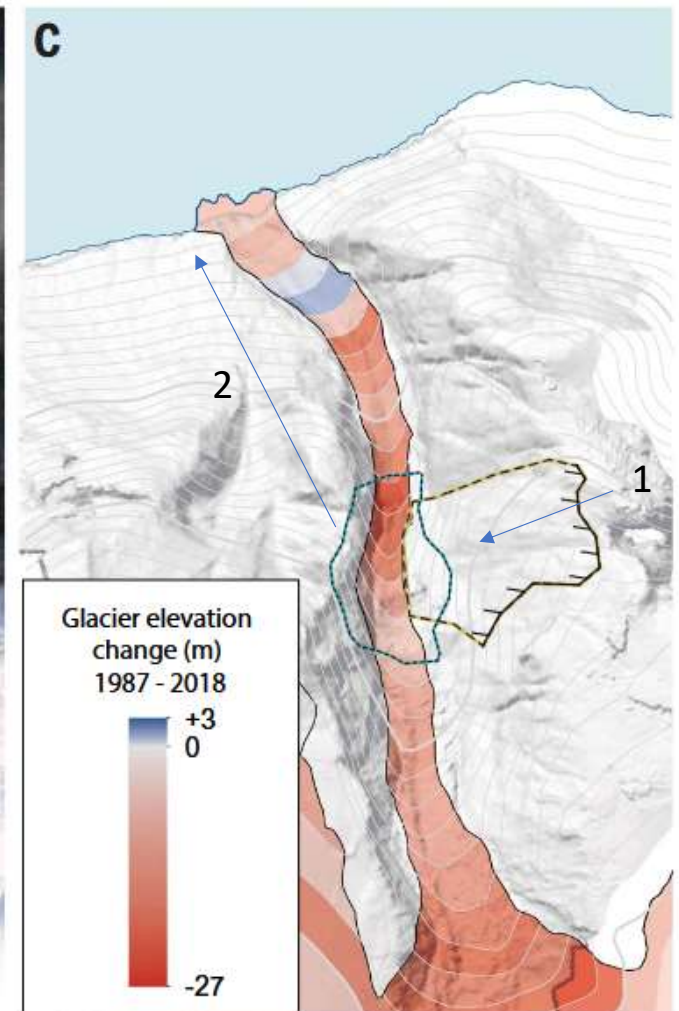
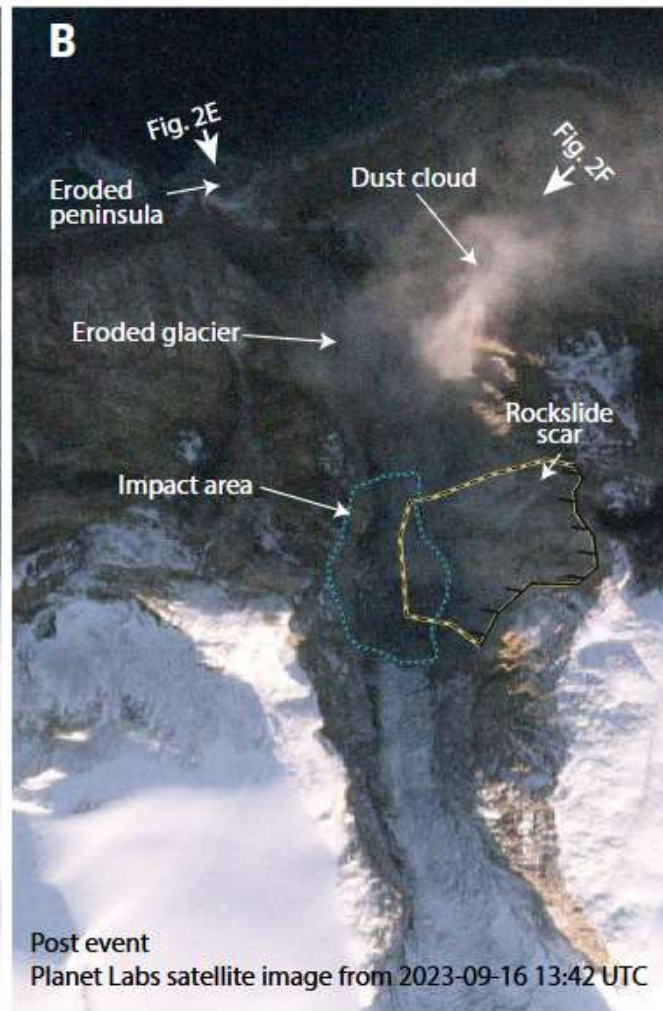




Landslide fallen into the fjord



25 million m³ fell into the water generating a 200m high tsunami
An infrasound acoustic signal (low frequency sound) was registered 3000km away

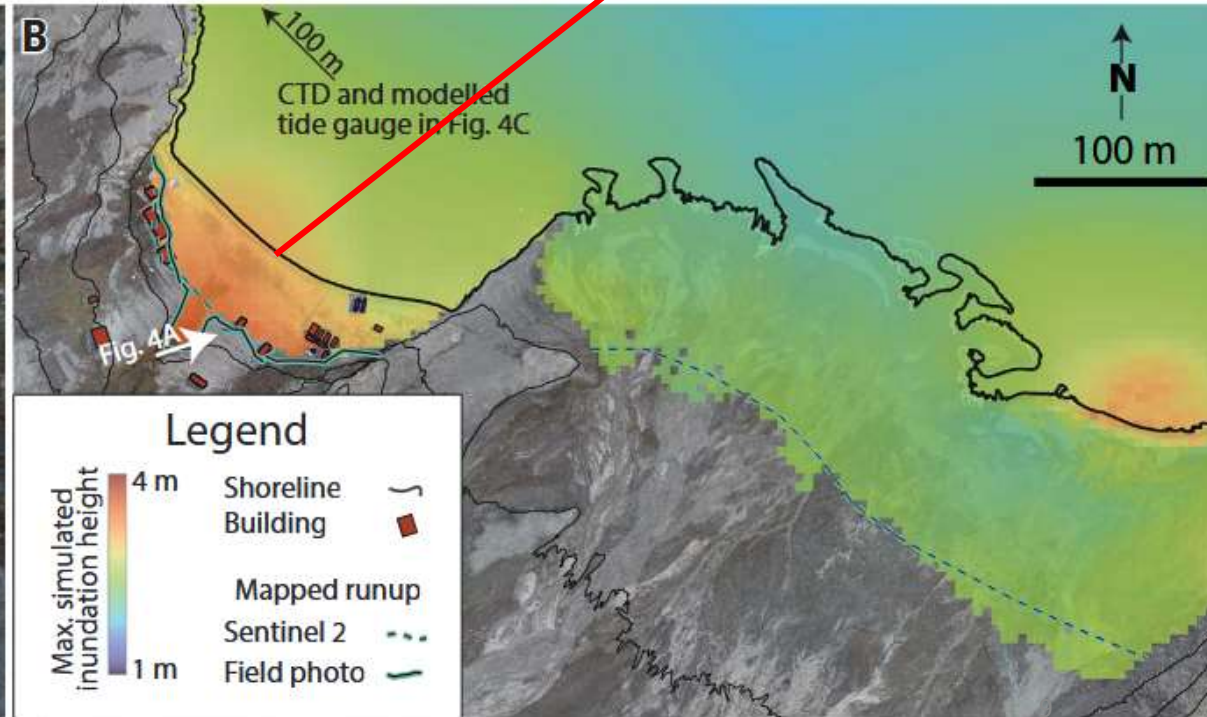
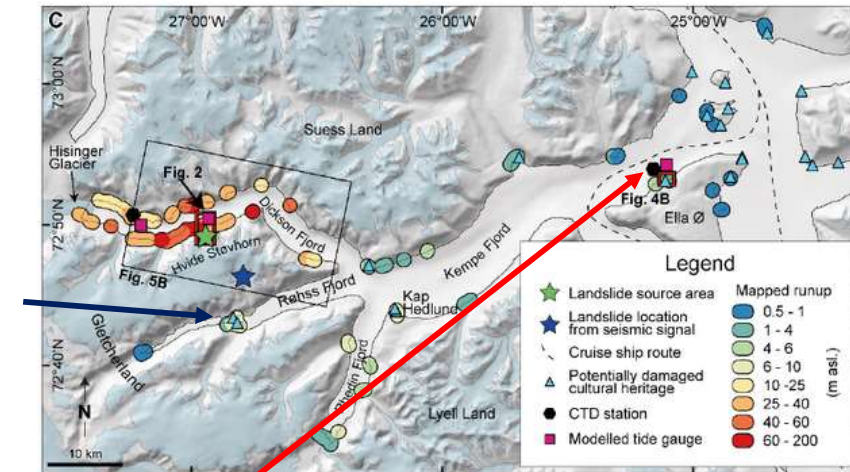


Glacier thickness reduced because of climate change until it broke

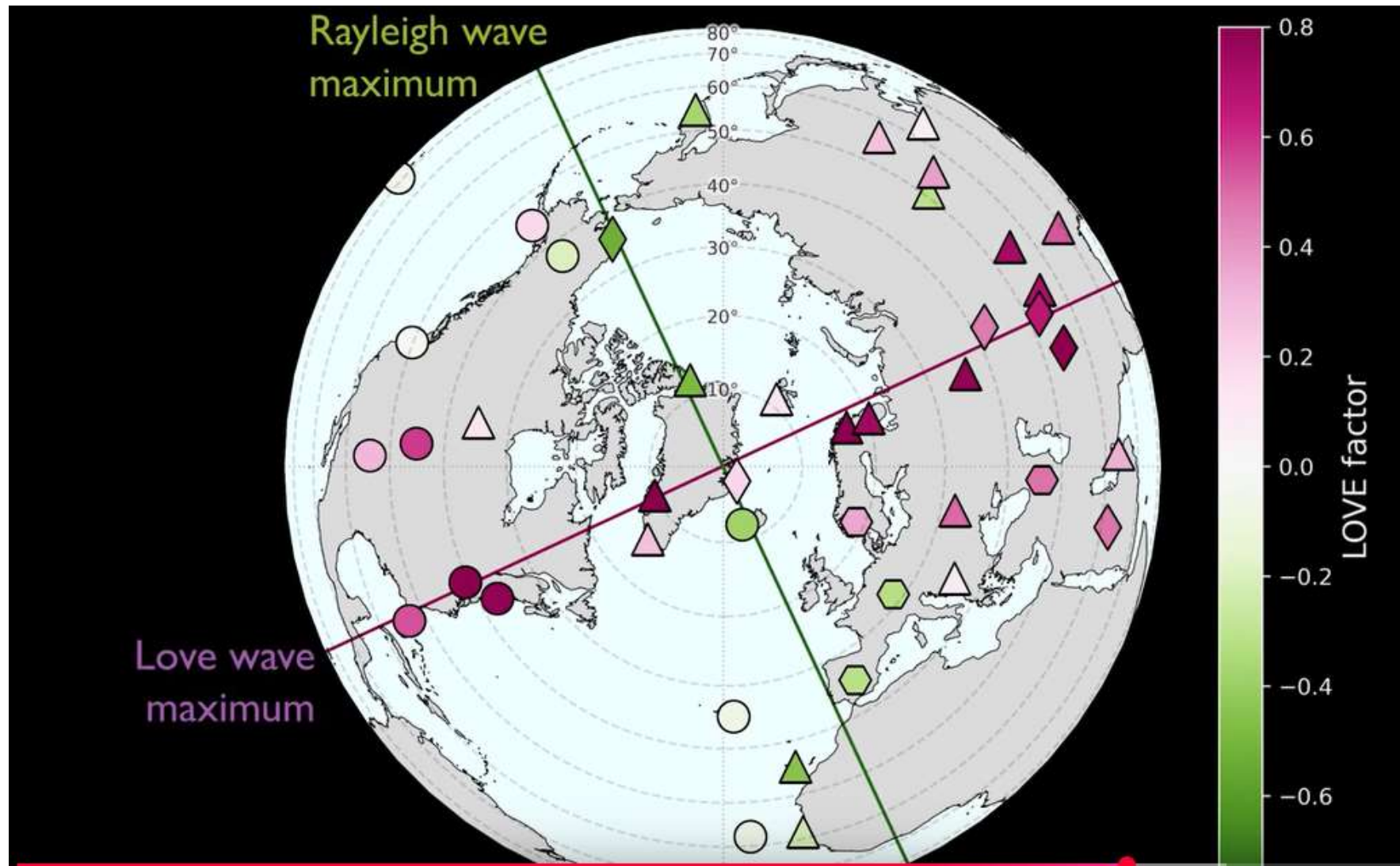
A tsunami in the area

Probable destruction of historic
Inuit camps and trapper huts

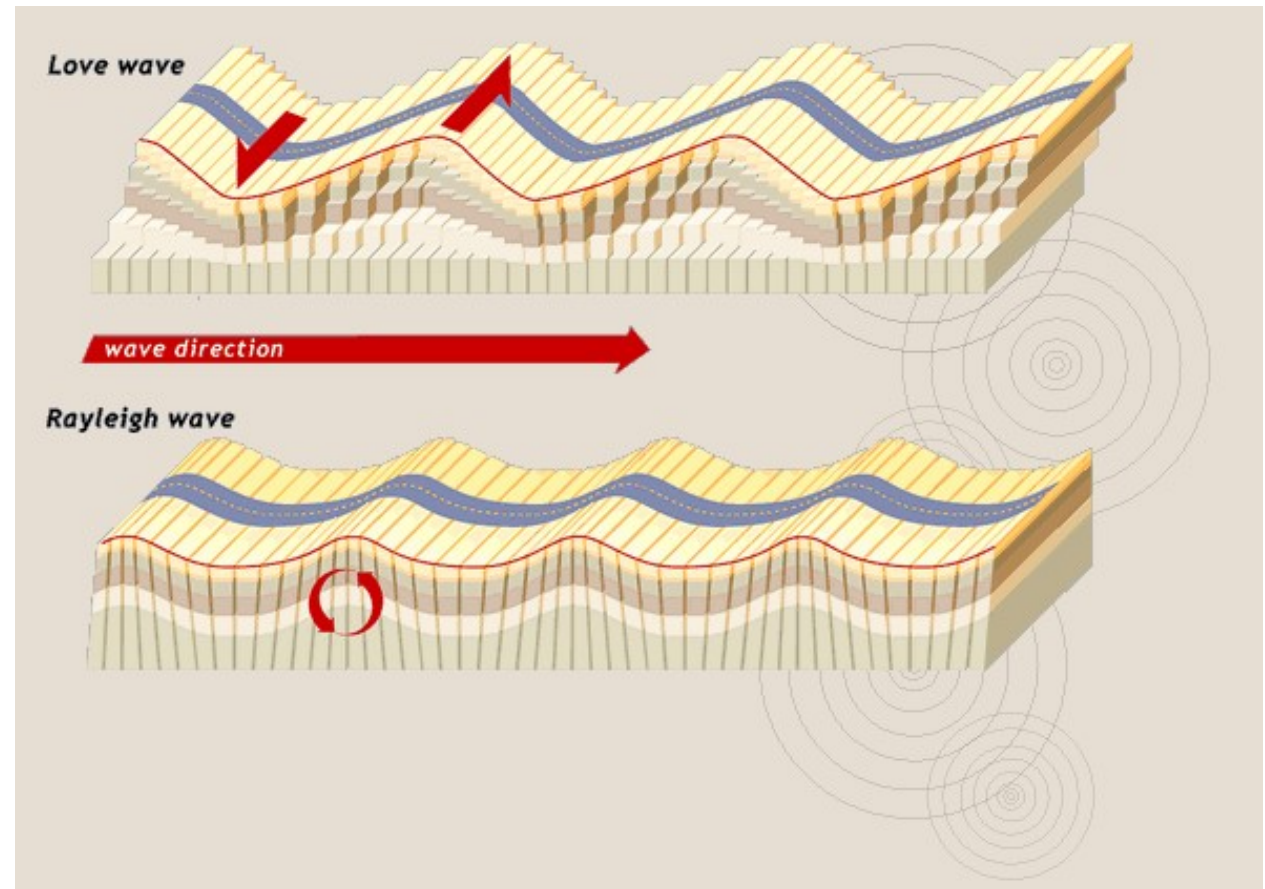
- Ella: base at 70 km was flooded





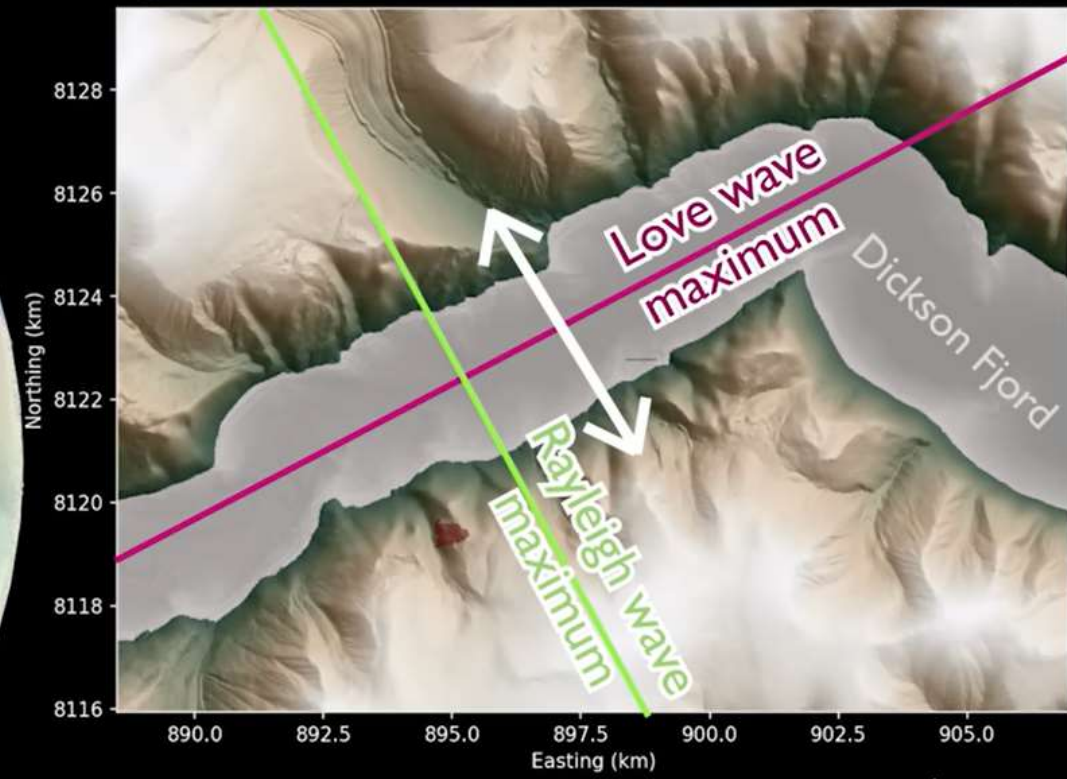
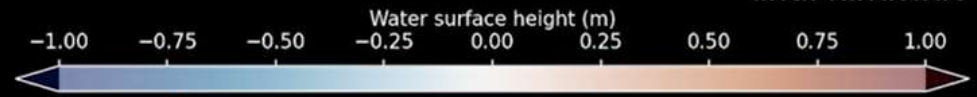
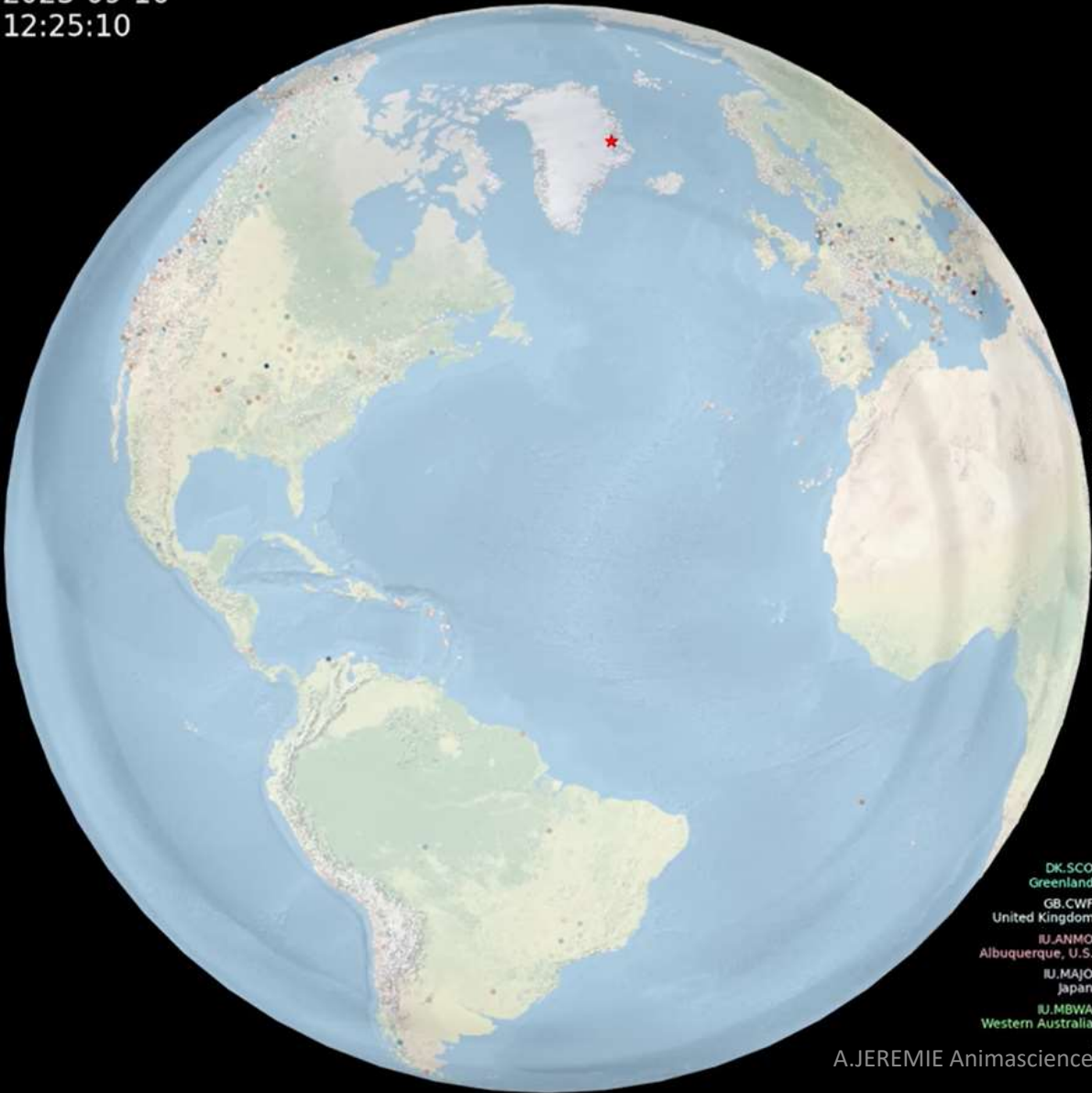


Different wave types depending on direction

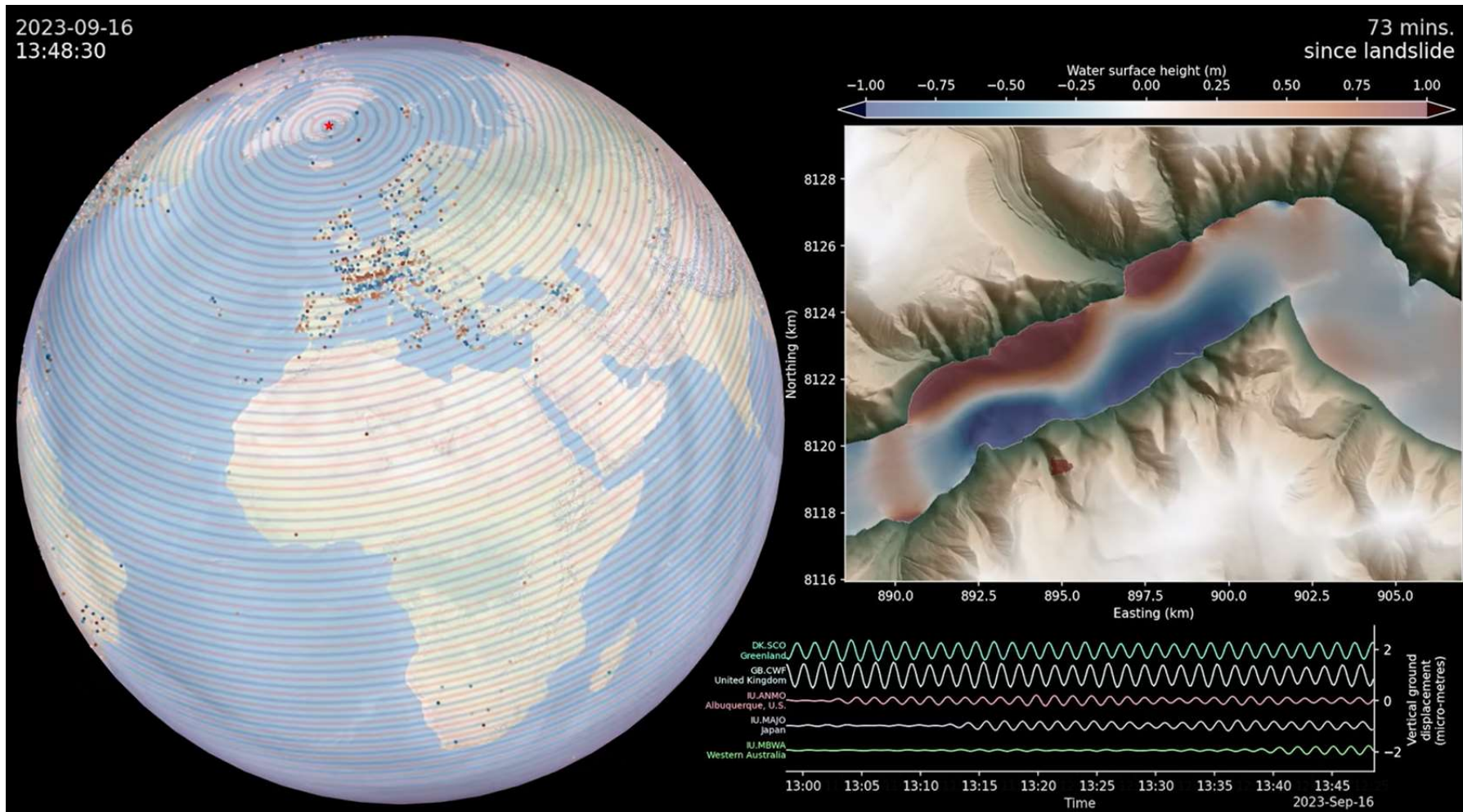


2023-09-16
12:25:10

9 mins.
until landslide



A.JEREMIE Animascience 28/03/2025
Time 11:40 11:45 11:50 11:55 12:00 12:05 12:10 12:15 12:20 12:25
2023-Sep-16



- 7 m high waves slushed in the fjord
- The waves were trapped in Dickson Fjord for 9 days, reflecting on the shores, without escape because of the straight angle exit
- A combination of a big tsunami in a confined space
- It's long duration allowed precise simulations (different models)

Did the LAPP sensors see something?

- LAViSta/FCC
 - The seismic sensors at LAPP and in Japan only go down to a few tenths of Hz
- LSST/Rubin
 - The sensors on the telescope mirror (M1M3) measure down to the Hz
- Virgo
 - Sensors measure down to about 10 mHz

Only dedicated stations could detect this event



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This investigation discovering the cause of this mysterious event show the need for :

- A diverse and multidisciplinary team
- A network of sensors

GEOPHYSICS

A rockslide-generated tsunami in a Greenland fjord rang Earth for 9 days

Kristian Svennevig^{1*}, Stephen P. Hicks², Thomas Forbriger³, Thomas Lecocq⁴, Rudolf Widmer-Schmidrig⁵, Anne Mangeney⁶, Clément Hibert⁷, Niels J. Korsgaard¹, Antoine Lucas⁶, Claudio Satriano⁶, Robert E. Anthony⁸, Aurélien Mordret^{9,1}, Sven Schippkus¹⁰, Søren Rysgaard¹¹, Wieter Boone¹², Steven J. Gibbons¹³, Kristen L. Cook⁹, Sylfest Glimsdal¹³, Finn Løvholt¹³, Koen Van Noten⁴, Jelle D. Assink¹⁴, Alexis Marboeuf⁶, Anthony Lomax¹⁵, Kris Vanneste⁴, Taka'aki Taira¹⁶, Matteo Spagnolo¹⁷, Raphael De Plaen⁴, Paula Koelemeijer¹⁸, Carl Ebeling¹⁹, Andrea Cannata^{20,21}, William D. Harcourt¹⁷, David G. Cornwell¹⁷, Corentin Caudron^{22,23}, Piero Poli²⁴, Pascal Bernard⁶, Eric Larose⁹, Eleonore Stutzmann⁶, Peter H. Voss¹, Bjorn Lund²⁵, Flavio Cannavo²¹, Manuel J. Castro-Díaz²⁶, Esteban Chaves²⁷, Trine Dahl-Jensen¹, Nicolas De Pinho Dias⁶, Aline Déprez²⁸, Roeland Develter¹², Douglas Dreger¹⁶, Láslo G. Evers^{14,29}, Enrique D. Fernández-Nieto³⁰, Ana M. G. Ferreira², Gareth Funning³¹, Alice-Agnes Gabriel^{19,32}, Marc Hendrickx⁴, Alan L. Kafka³³, Marie Keiding¹, Jeffrey Kerby^{11,34}, Shfaqat A. Khan³⁵, Andreas Kjær Dideriksen¹¹, Oliver D. Lamb³⁶, Tine B. Larsen¹, Bradley Lipovsky³⁷, Ikha Magdalena³⁸, Jean-Philippe Malet^{7,39}, Mikkel Myrup⁴⁰, Luis Rivera⁷, Eugenio Ruiz-Castillo¹¹, Selina Wetter⁶, Bastien Wirtz⁷

Climate change is increasingly predisposing polar regions to large landslides. Tsunamigenic landslides have occurred recently in Greenland (*Kalaallit Nunaat*), but none have been reported from the eastern fjords. In September 2023, we detected the start of a 9-day-long, global 10.88-millihertz (92-second) monochromatic very-long-period (VLP) seismic signal, originating from East Greenland. In this study, we demonstrate how this event started with a glacial thinning–induced rock-ice avalanche of 25×10^6 cubic meters plunging into Dickson Fjord, triggering a 200-meter-high tsunami. Simulations show that the tsunami stabilized into a 7-meter-high long-duration seiche with a frequency (11.45 millihertz) and slow amplitude decay that were nearly identical to the seismic signal. An oscillating, fjord-transverse single force with a maximum amplitude of 5×10^{11} newtons reproduced the seismic amplitudes and their radiation pattern relative to the fjord, demonstrating how a seiche directly caused the 9-day-long seismic signal. Our findings highlight how climate change is causing cascading, hazardous feedbacks between the cryosphere, hydrosphere, and lithosphere.