

Cumbre Vieja volcanic eruption: Cartographic animation on a 3D print



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The 2021 eruption of the Cumbre Vieja volcano, situated on La Palma in the Canary Islands, was an event with significant impact on both society and the environment. [1, 2] It is important to visualise the dynamics of such volcanic events for raising public awareness and advancing scientific research.

Emerging technologies like 3D printing and geanimation can help understand complex processes happening in the environment and their further effects.

AIMS OF THE PROJECT

1. Creation of a physically accurate 3D model of a La Palma segment, employing a Digital Elevation Model (DEM) as the foundation. [3]
2. Processing of remote sensing and Volunteered Geographic Information datasets to extract intricate details regarding the dynamic day-to-day alterations in lava flow patterns and the consequential impact on the infrastructure.
3. Development of an animation presenting the story of the eruption including rescue efforts and the aftermath in the form of a surface-projected video suited with narration.

DATA AND METHODS

In our project documenting the island's volcanic activity, we utilised data from the Copernicus Emergency Mapping Service for lava cover layers and Digital Elevation Model (DEM), alongside land cover data from OpenStreetMap.

The map compositions were generated using QGIS, integrating a 3D terrain model created with the DEMto3D plugin. The map animation, a pivotal element of our presentation, was crafted in ArcGIS Pro, with calculation of the number of destroyed buildings by performing multiple intersections.

To augment the informational content, the animation's base incorporating essential details about the island and the eruption was designed in Inkscape.

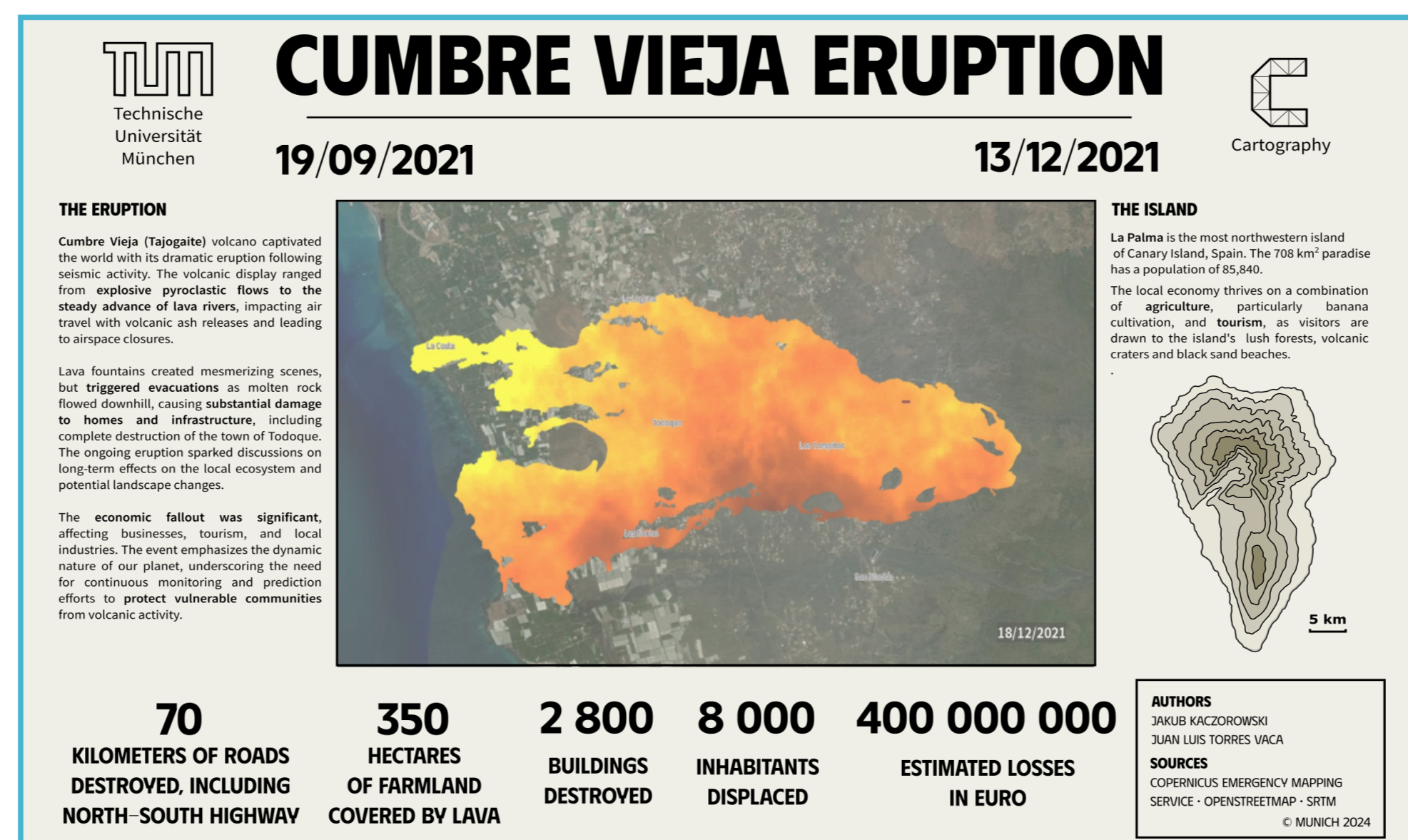


Fig 1. Mockup of the final product with projected animation and laser-cut contour map

This design, including an extruded contour map of the island, was then translated into a physical form through laser engraving and cutting in plywood using the Epilog FusionPro 32 machine. Then, the 3D model was produced, customized in UltiMaker Cura, and printed on UltiMaker S5 machines.



Fig 2. Photo of the final product: laser-engraved base, 3D print with projection and laser-cut contour map

The final animation, featuring photos and videos of the island, was edited in Sony Vegas, incorporating AI-generated voiceover from ElevenLabs and music composed in Soundraw.

FINAL RESULT

The concluding video, projected onto the model positioned at the base, begins by introducing viewers to the local conditions. It then delves into an explanation of the eruption, showcasing the lava flow over the course of 86 days. The video concludes by providing insights into the long-term impacts, including forced displacement, land degradation, and economic repercussions.

Our project demonstrates the successful integration of various technologies, resulting in an innovative cartographic animation that bridges the physical and digital realms. It can be used to educate about the eruption and its effects or serve as a tool for teaching about disaster management.

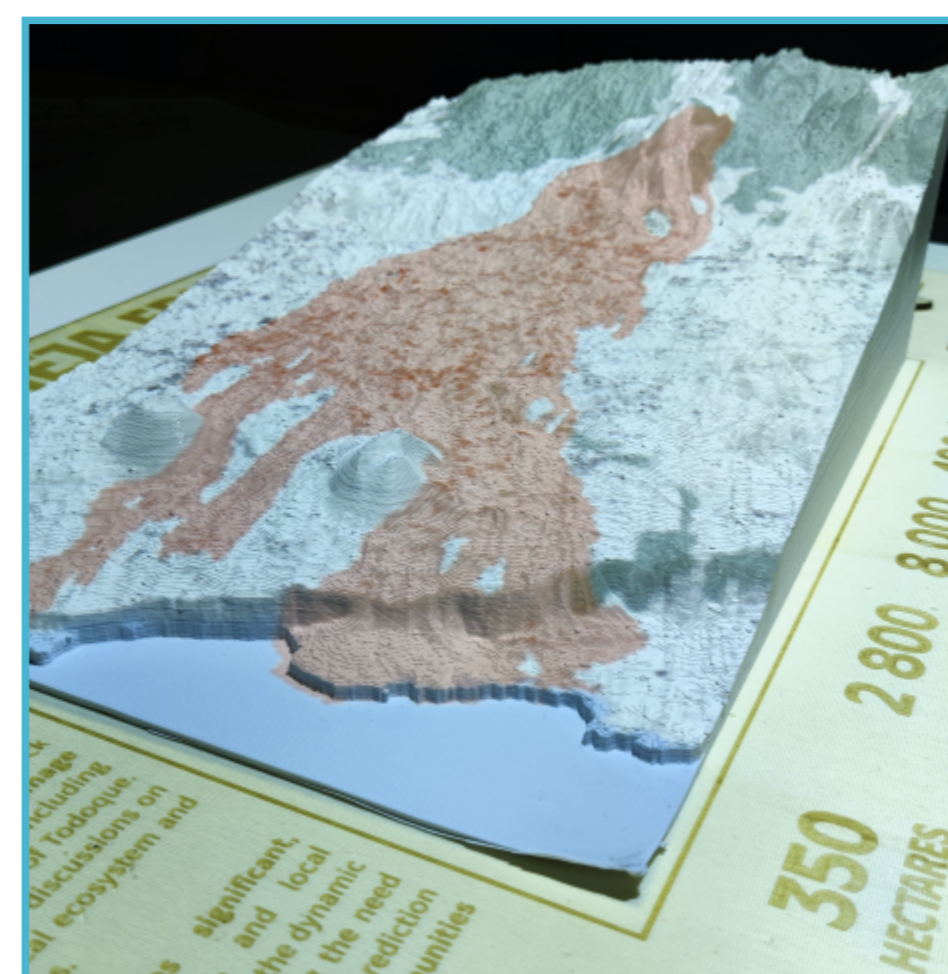


Fig 3. Photo of the final product: projection of final lava cover and location of destroyed buildings and roads

IMPRINT

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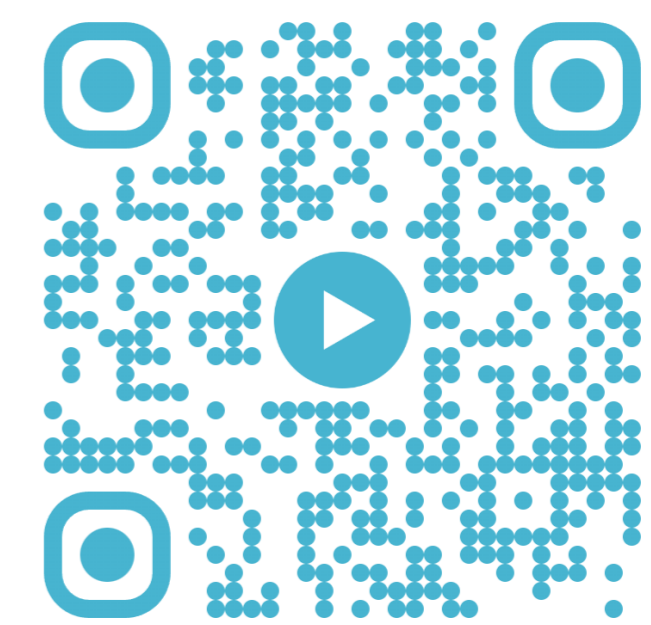
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KEYWORDS

volcanic eruption,
disaster management,
storytelling,
spatio-temporal analysis,
3D printing.

VIDEO OF THE ANIMATION

https://youtu.be/S_hzNCBQB9w



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