

# Influence of extreme weather and geology on forced migrations in southern Taiwan

April 29 2021, by Jordi Cortés

---



Drone image of the village of Paridrayan (Taiwan) after the Morakot typhoon. The erosion had been removing the material on which the village was built during the last 350 years. Credit: Slawomir Jack Ciletycz

In August of 2009, typhoon Morakot passed over Taiwan, triggering over 22,000 landslides and adding another chapter to the forced migration of indigenous settlements in the mountainous areas. A new study recently published in the journal *Tectonophysics* has analyzed how extreme weather such as that caused by Morakot, when coupled with local geological conditions, can trigger landslides that have caused two forced settlement relocations of one Paiwan group in southern Taiwan in the last 350 years.

In this study, researchers from National Central and National Tsing Hua universities in Taiwan and Geosciences Barcelona (GEO3BCN-CSIC) in Spain combined information from the oral tradition of the Paiwan people with geological data to assess the effects of [natural disasters](#) on the communities that inhabit the Central Range of southern Taiwan. The study is focused on the sequence of forced settlement migrations of one Paiwan group caused by natural disasters in the the last 350 years.

"One of the objectives of this paper is to show that the oral traditions of indigenous peoples can be a reliable source of information about natural disasters. We show that when these oral traditions are combined with other geological field-based data insights into how regional geology and [extreme weather](#) can affect indigenous peoples lives in terms of socio-economic impact.", said Slawomir Jack Ciletycz from the National Central University and lead researcher of the study.

The background for the study was developed during interviews with members of Paiwan group who now live in the villages of Paridrayan and Linali. These interviews were conducted as part of the Ph.D. research of Olimpia Kot-Giletycz at the National Tsing Hua University, co-author of the study.

Part of these interviews focused on the indigenous peoples stories of past natural disasters that had had an important impact on the community.

The villagers recounted major events in their migration history, among which was the story of a "collapse of the rock in the mountain across the river" that was followed by a "great wáter that appeared suddenly." The interviewees indicated that this rise in the water was a cause of their ancestors having abandoned the village of Tjuvung about 350 years ago when they moved to Paridrayan.

The authors then carried out site investigations in the area of Tjuvung and Paridrayan to determine the local geological and geomorphological conditions and their possible relation to the events that caused the abandonment of Tjuvung and forced the settlement migration as recorded in the Paiwan group oral traditions.

"The oral traditions told a story. What we did was to investigate whether or not there was a geological reason that could fit with these stories. We found that there was a plausible geological explanation," said Dennis Brown, researcher from Geosciences Barcelona (GEO3BCN-CSIC).

Geological measurements collected in the field were combined with Lidar data, satellite data, and climate data. With all this information, the researchers were able to verify the occurrence of a [landslide](#) triggered by rainfall during a time of known enhanced typhoon activity in Taiwan. The data analysis also corroborated the oral tradition which says that the river was blocked resulting in a barrier lake that was deep enough to flood the lower parts of Tjuvung village.

"Landslides have an important role in the lives of these people; not only because of natural disasters but also they provide areas of low relief that can be used for settlement and farming. A long-term issue is that landslides are typically recycled during subsequent events and are subject to erosion. This means that settlements built on them are transient and forced settlement migrations are a consequence," said Giletycz.

"This is an area of high mountains, sharp relief, and dense jungle cover where typhoons and earthquakes are common. The locations of landslides are conditioned by the regional geology in that they occur on dip-slopes where the regional cleavage is parallel to the slope," said Dennis Brown.

Rainfall and the vibrations caused by earthquakes are two of the most common causes of landslides in the region. "Landslides typically occur along a planar element in the rocks, be it fractures, bedding, or cleavage. In our case, this part of southern Taiwan has a well-developed cleavage along which slip occurs. This fabric is the defining element in the geomorphology of the area," said Giletycz.

"The results of our study provide insight into one way (involuntary [settlement](#) migration) in which Taiwan's indigenous mountain societies have been and continue to be, affected by extreme climate and the geological setting in which they live," the researchers write. According to Kot-Giletycz, the study also shows that "natural disasters and decisions made in adapting to their consequences can have a long-lasting effect on the lives of these people. This is evidenced by the fact that it still persists in their oral tradition some 350 years later."

"Landslides are difficult, if not impossible, to prevent, but the risks can be reduced if enough is known about the regional geology to more accurately determine the placement of man-made infrastructure," concludes Dennis Brown.

**More information:** Slawomir Jack Giletycz et al. Regional geology, extreme weather events and natural disasters: Environmentally-forced, involuntary settlement migrations of the indigenous people of southern Taiwan, *Tectonophysics* (2021). [DOI: 10.1016/j.tecto.2021.228796](https://doi.org/10.1016/j.tecto.2021.228796)



Provided by Geosciences Barcelona

Citation: Influence of extreme weather and geology on forced migrations in southern Taiwan (2021, April 29) retrieved 11 May 2024 from <https://phys.org/news/2021-04-extreme-weather-geology-migrations-southern.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.