

Definitions and Applications of Terms Related to Pyroclastic Rocks in Volcanology: A Case Study of Liuhuanggu and Longfenggu Volcanic Deposit

<u>Chien-Hua Lai</u> and Yu-Ming Lai Department of Earth Sciences, National Taiwan Normal University

Abstracts

Several terms in volcanology can easily be confused with "pyroclastic rocks" due to similarities in their occurrences, mechanisms, or lithofacies. As volcanic research has advanced, terms like "pyroclastic flow (PF)" and "pyroclastic surge (PS)" have gradually been replaced by "pyroclastic density currents (PDCs)." However, during field observations, PDCs are often confused with lahars and volcanic avalanches. This study first investigates the historical evolution of the term PDCs and examines two

Applications



outcrops in the Tatun Volcano Group (TVG) located at Liuhuanggu and Longfenggu. Evidence is presented to argue that these outcrops should be reclassified from previously identified "pyroclastic flow deposits" to "lahar deposits".

Introductions

The usage of terms related to "pyroclastic rocks" in volcanology has varied over different periods, and there are ambiguities in their definitions regarding occurrences, mechanisms, and lithofacies. This study aims to analyze the frequency and definitional changes of these terms by examining 6000 previous papers to understand the evolution of the term PDCs. Additionally, field investigations will be conducted on the volcanic deposits in the TVG to determine whether they are PDCs,

Methods

 Conduct a review of the terms related to "pyroclastic rocks" using Google Scholar papers.

2. Perform field investigations on the volcanic deposits at Liuhuanggu and Longfenggu.



Liuhuanggu outcrop in Mt. Qixing (pic A):

The outcrop is 20 meters wide and 4-6 meters high, with many rounded stones. The cementation is relatively good, with serious weathering and hydrothermal alteration, and shows the formation of hematite. The lower part contains blocks of lapilli size and some fragments of shale and andesite.

Longfenggu outcrop in Mt. Qixing (pic B):

The outcrop is 15 meters long and 4.5 meters high, featuring **reverse grading layers** and containing approximately fifty rounded stones. It includes broken andesite and numerous volcanic breccias, with surrounding sandstone at the mid to upper levels. The cementation is poorer, and it is less weathered compared to the first outcrop.

We suggest that these two outcrops were parts of lahar. When water and volcanic deposits flowed along the Sulfur Creek valley, they splashed out and crossed the watershed, accumulating there.

	Before 2000	2001~2020	After 2021
Pyroclastic flow (PF)	volcanic gases + cold fragments	hot gases + cold fragments	hot gases hot fragments flows rapidly
Pyroclastic surge(PS)	hot gases and fine solid liquid-gas separation (two layers)	single-phase fluid (one layer)	less dense layers of PDCs
Pyroclastic density currents (PDCs)	consisting of volcanic debris and steam	poorly sorted structureless accumulate in depressions	dense layers (PF) less dense layers (PS)

Conclusions

- 1. PDCs usage increased, PS increased in the mid-term, and PF was high in the early stages but low in recent years.
- 2. Volcanic deposits can no longer be simply classified as flow or surge based on clast density. PDCs, defined as "a mixture of high-temperature volcanic debris and gases, divided into high-density and low-density layers," is the internationally recommended term in volcanology, and this study suggests adopting it in domestic research as well.
- 3. The two outcrops on the mountain were caused by a lahar.