Volcanoes in north Taiwan

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Volcanic Provenance of Taiwan

1. Western Provenance
2. Eastern Provenance
3. Northern Provenance
4. Kueishantou

Chung et al., 1994
Western Provenance

Chung, 1990
Coastal Range of east Taiwan

Eastern Provenance

Lutao

Lanhsu

Hsuilanhshu
Hsiulanhsu

~1000-1300 BP
Northern Provenance

- 0.29~2.1 Ma
- 0.5~2.6 Ma
- 0.8~1.2 Ma
- 0.36~0.63 Ma
- ~1.0 Ma

Locations:
- Penghiahsu
- Chinshang (Hsinchuang) Fault
- Huapinghsu
- Chilungtao
- Chuchih Fault
- Kanchiao Fault
- Nankan Fault
- Linkou Tableland
- TATUN Volcano Group
- TAIPEI Basin
- TAOYUAN Terrace
- HSUEHSHAN Terrane
- WESTERN FOOTHILLS

Time spans:
- 0.29~2.1 Ma
- 0.8~1.2 Ma
- 0.36~0.63 Ma
- 0.5~2.6 Ma
Active volcanoes in Taiwan

[Map showing the location of active volcanoes in Taiwan, including major features like the East China Sea, Luzon Arc, and Okinawa Trough.]

Legend:
- Quaternary Tsinandian
- Main active volcanoes
- Submarine igneous
- Islets (Late Pleistocene)
- Midline detachment of the Philippine Sea Plate
- Contours of the Wulai River (depth in m)

[Images of active volcanic eruptions and islands, illustrating the geological features described on the map.]
Evolution of volcanism in northern Taiwan

Westward Advance of Western Edge of Subducting Philippine Plate (WEP)

Northwestward Advance of Manlia Trench

Opening of Okinawa Trough

Southward Migration of Ryukyu Trench

Teng (1996)
Wang et al., 2004
Tatun Volcano Group – Active? Or Extinct?
Two definitions of active volcano

Empirical Definition

1. historical documented eruptions  
   (Smithsonian Institution, 1989)
2. A volcano is termed active if it has erupted at least once during the last 10000 or, alternatively, 5000 or 2000 years as demonstrated by any scientific method (Szakacs, 1994)
3. A set of time conditions according to volcano topology (Szakacs, 1994)
4. A quantitative ad-hoc rule: a thorough statistical study of the long-term eruptive patterns of volcanoes and a good knowledge of the eruptive history of individual volcanoes (Szakacs, 1994).
Historical records of volcanic activities

- 1853, submarine
- 1854, submarine
- 1867, submarine
- 1916, submarine
Phenomenological Definition

A volcano should be considered active if its magmatic plumbing system is still working:

volcano-monitoring networks → the existence of possible “active“ magma chamber
Volcanic landforms
2 m LiDar of Chihsingshan volcano
Ash deposits in Taipei Basin

(Chen and Lin, 2000)
(Belousov et al., 2010)
Stratigraphic relations of the most recent volcanic deposits in TVG

W-SW foot of Mt. Cising

Last eruptive age: 5,500 年
(Belousov et al., 2010)
Evidence of active volcano --
Phenomenological Definition

Volcanic earthquakes in TVG

Lin et al., 2005
Evidence of active volcano

(Yang et al., 1999)
Characteristics of volcanic rocks
Potential volcanic hazards

Mt. Unzen
Lahar deposits in Taipei Basin

Taipei Basin
Kuanyinshan Volcanoes
Linkou Tableland
Western Foothills
Hsinchuang Fault
Sanchiao Normal Fault

台北盆地井下岩性柱狀圖

關渡井
蘆洲一號井
五股一號井

- 沉積物
- 火山碎屑流堆積物
- 火山砂及礫互層
- 火山泥流堆積物
- 五指砂岩層

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火山泥流堆積物
火山砂及礫互層
火山碎屑流堆積物
沉積物
Dam lake
Distribution of dam lake

Modified from Teng et al., 2004
Recent survey on offshore of north Taiwan
Volcanoes in offshore of north Taiwan
Gas plume in the offshore --
EK60 acoustic images
Gas plume in the offshore --
EK60 acoustic images
Evidence of active volcano

TL age: ~ 7 ka

Chen et al., 2001

Fluids around Kueishantao

Fumarole

spring

Evidence of active volcano
Mapping
Potential volcanic hazards in Kueishantou
Krakatau Volcano, Indonesia

Santorini Volcano, Greece

> 30 m in height of wave
> 25 m in height of wave
Collapse of volcanic body

Unzen Volcano, 1792
Location of Ilan Plain and Kueishantou

Covered flood area of 5 m rising sea level
Thanks!