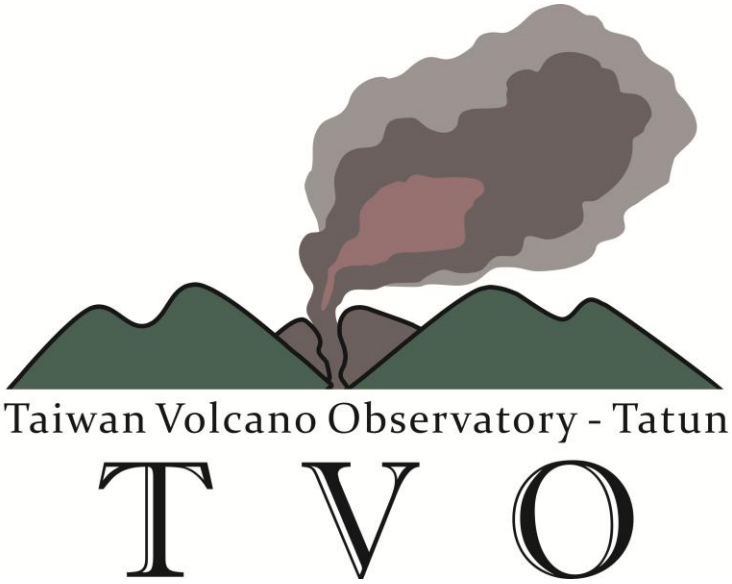
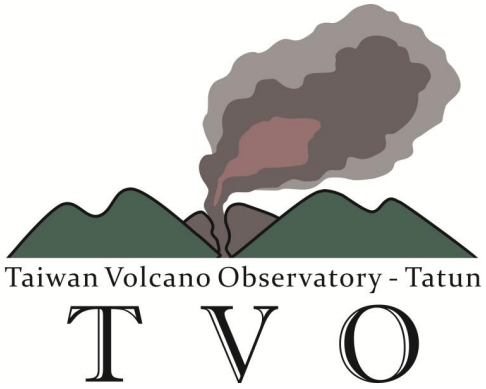
Establishment of Taiwan Volcano Observatory at Tatun



Cheng-Horng Lin
(Institute of Earth Sciences, Academia Sinica)

2012/2/22



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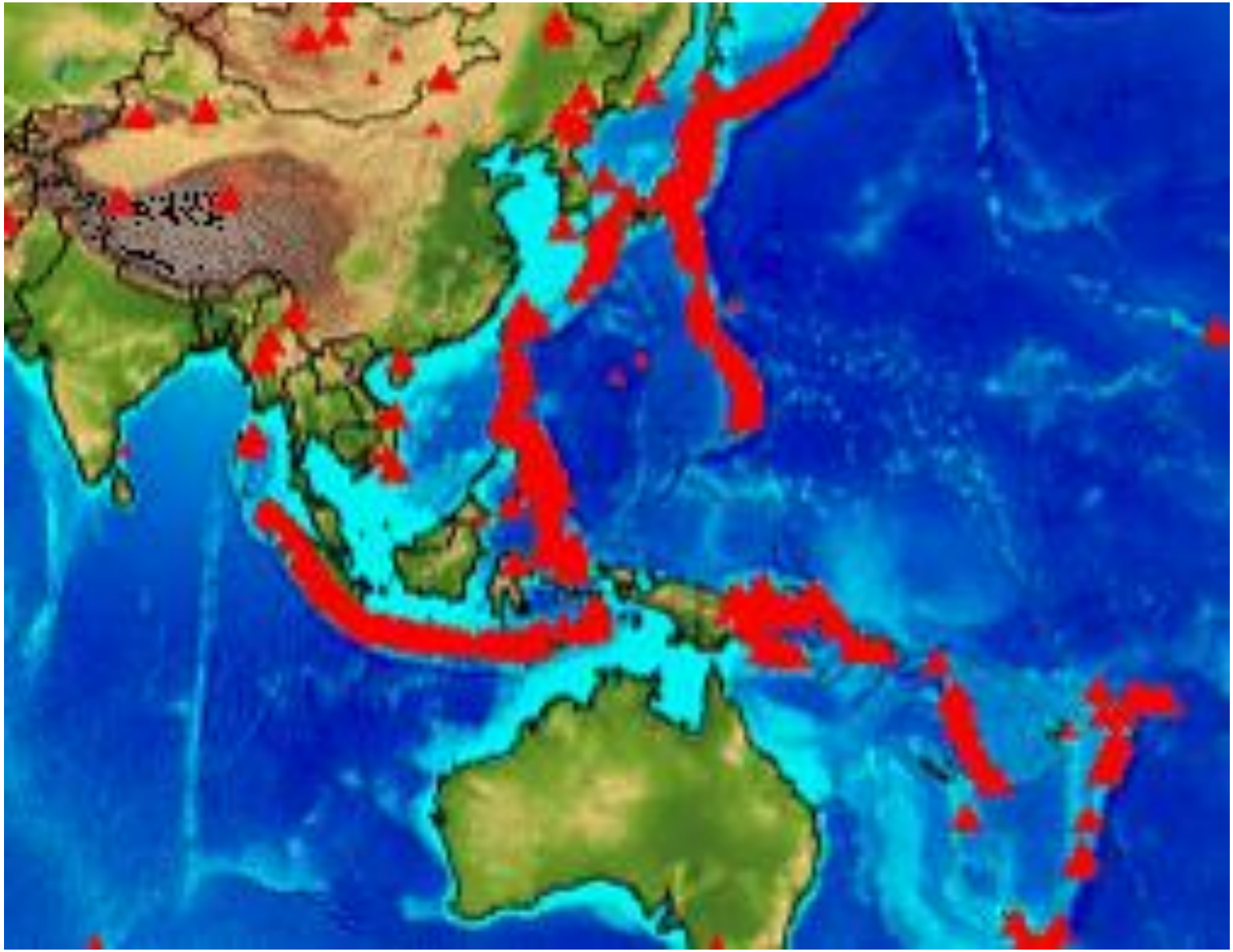
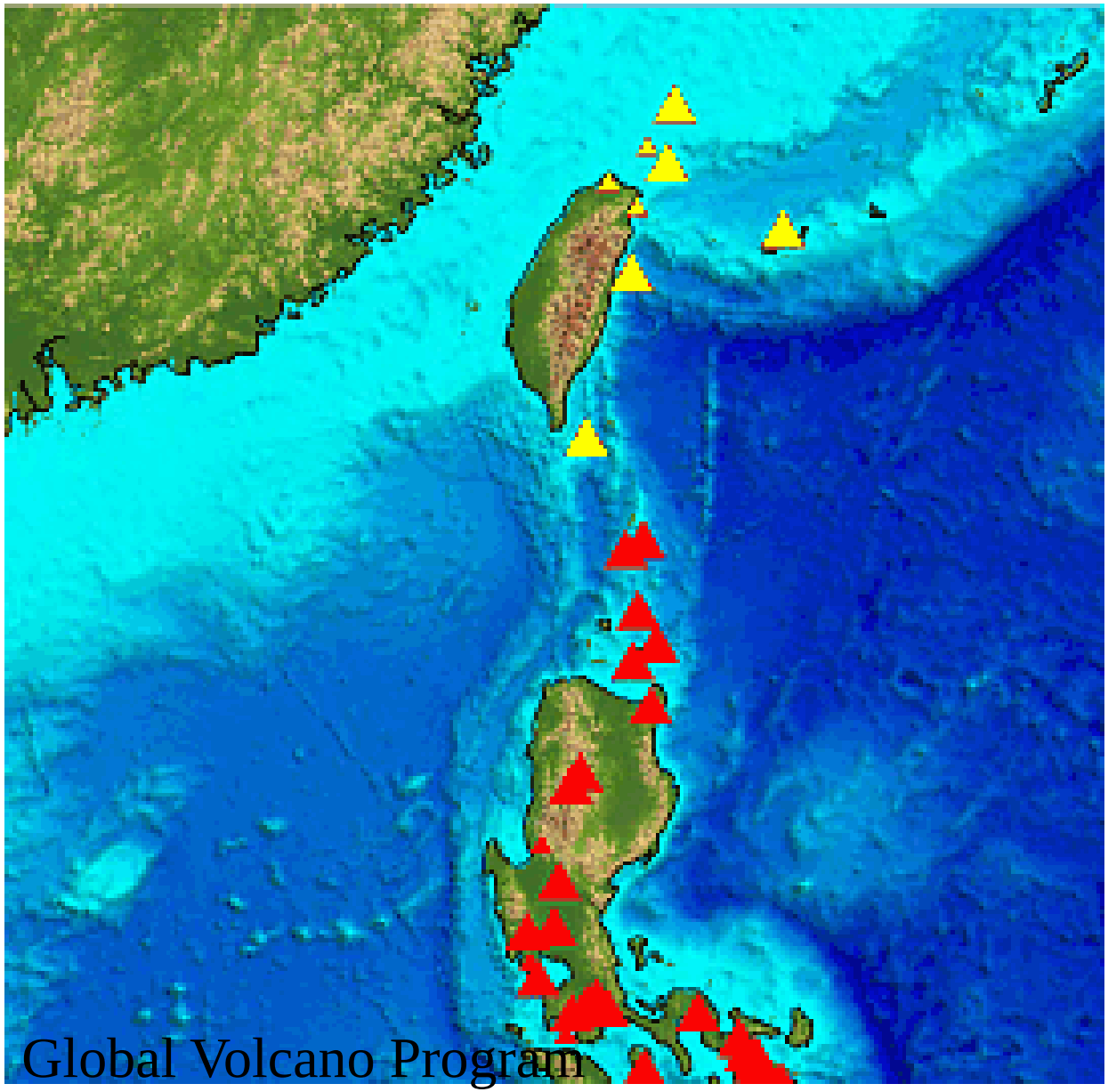
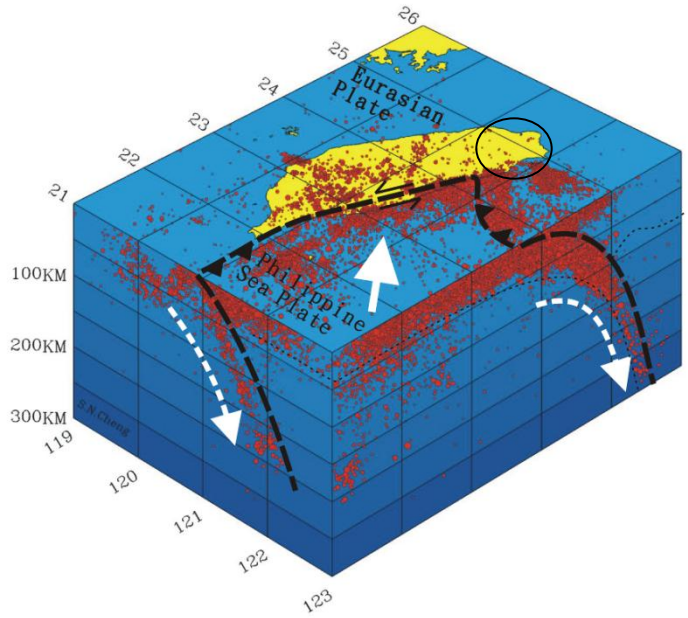
Volcanoes in Asia

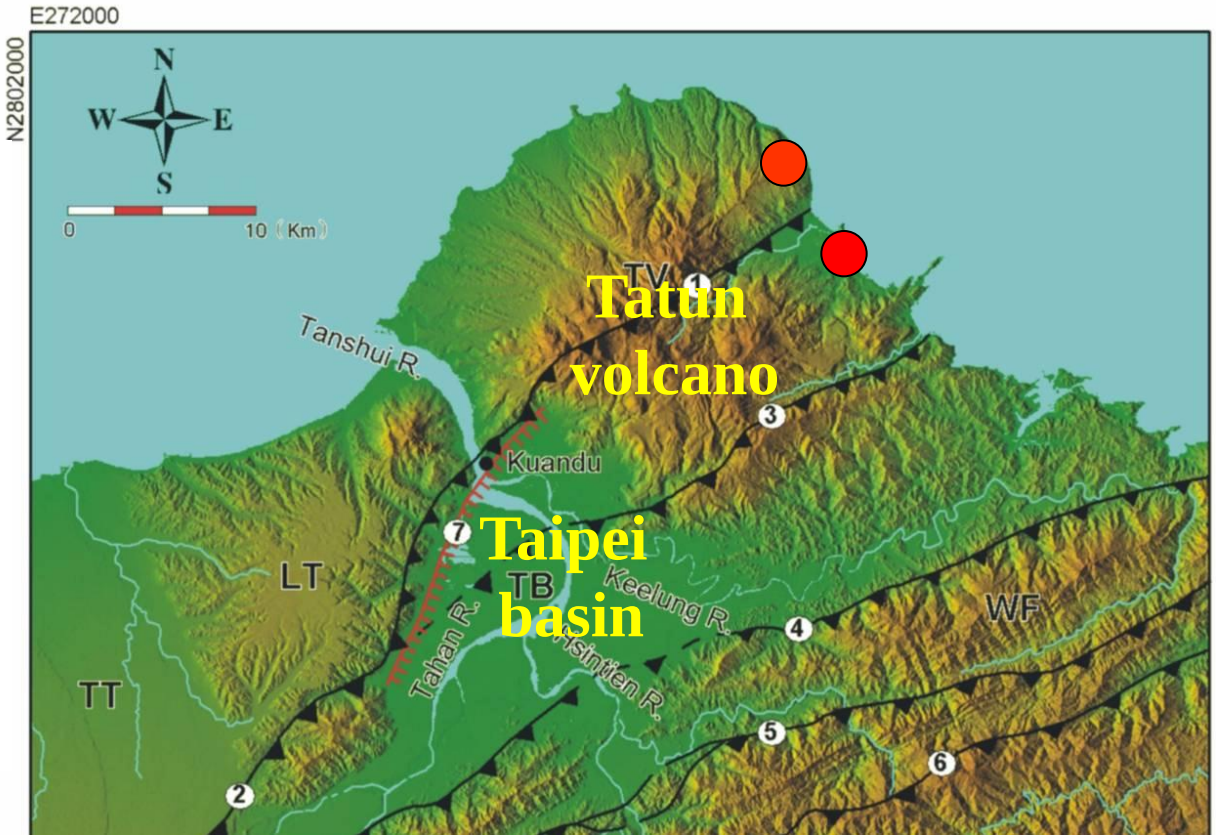


Volcanoes in Taiwan

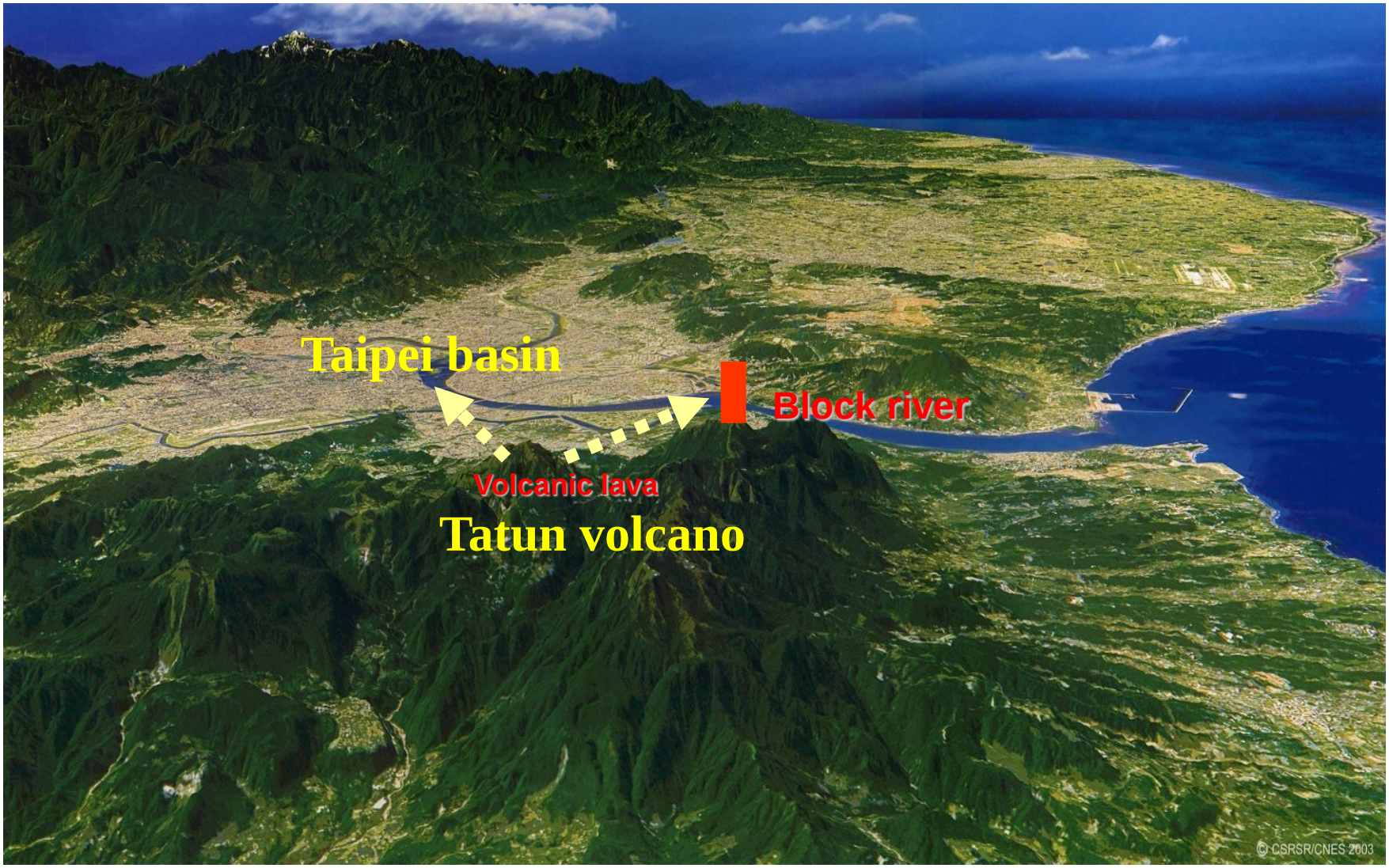


Tatun Volcano⇔ Metropolitan Taipei



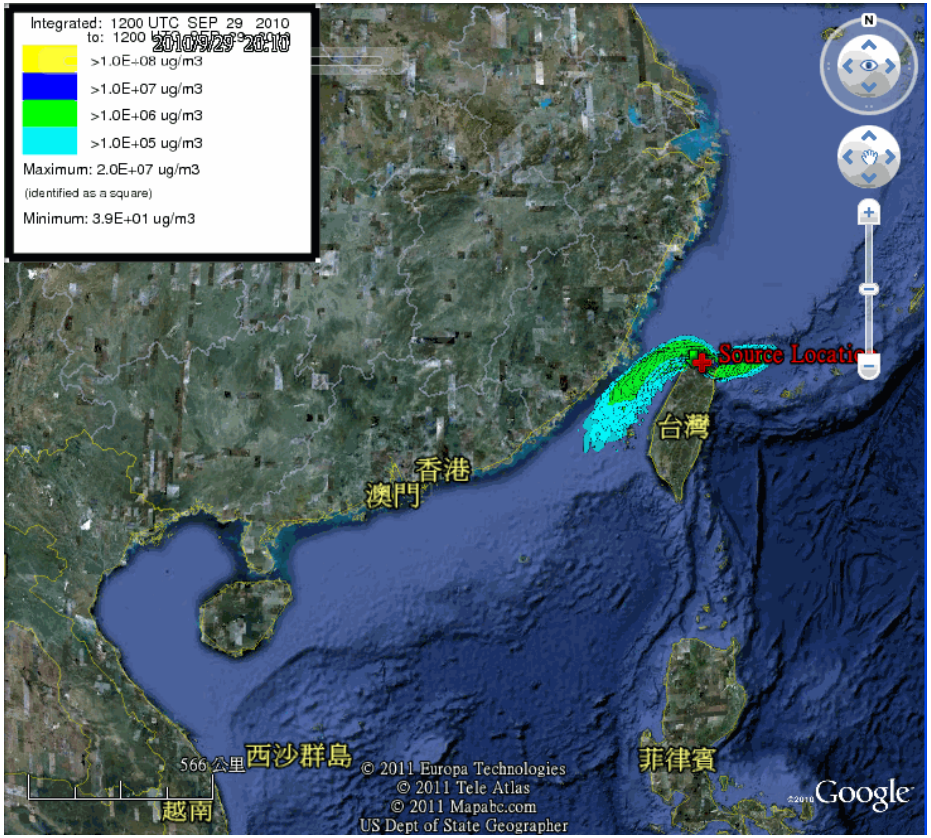


Volcanic eruption ?

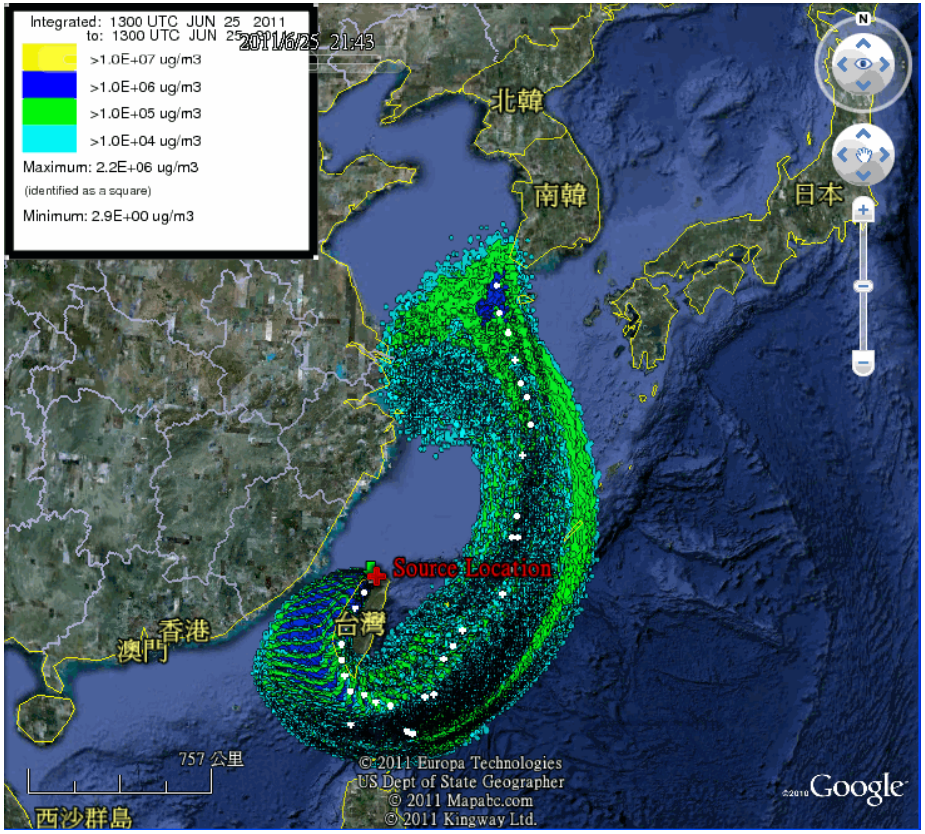


Simulation of volcanic ash

Prof. K.I. Wang (NCU)
中央大學 王國英教授提供



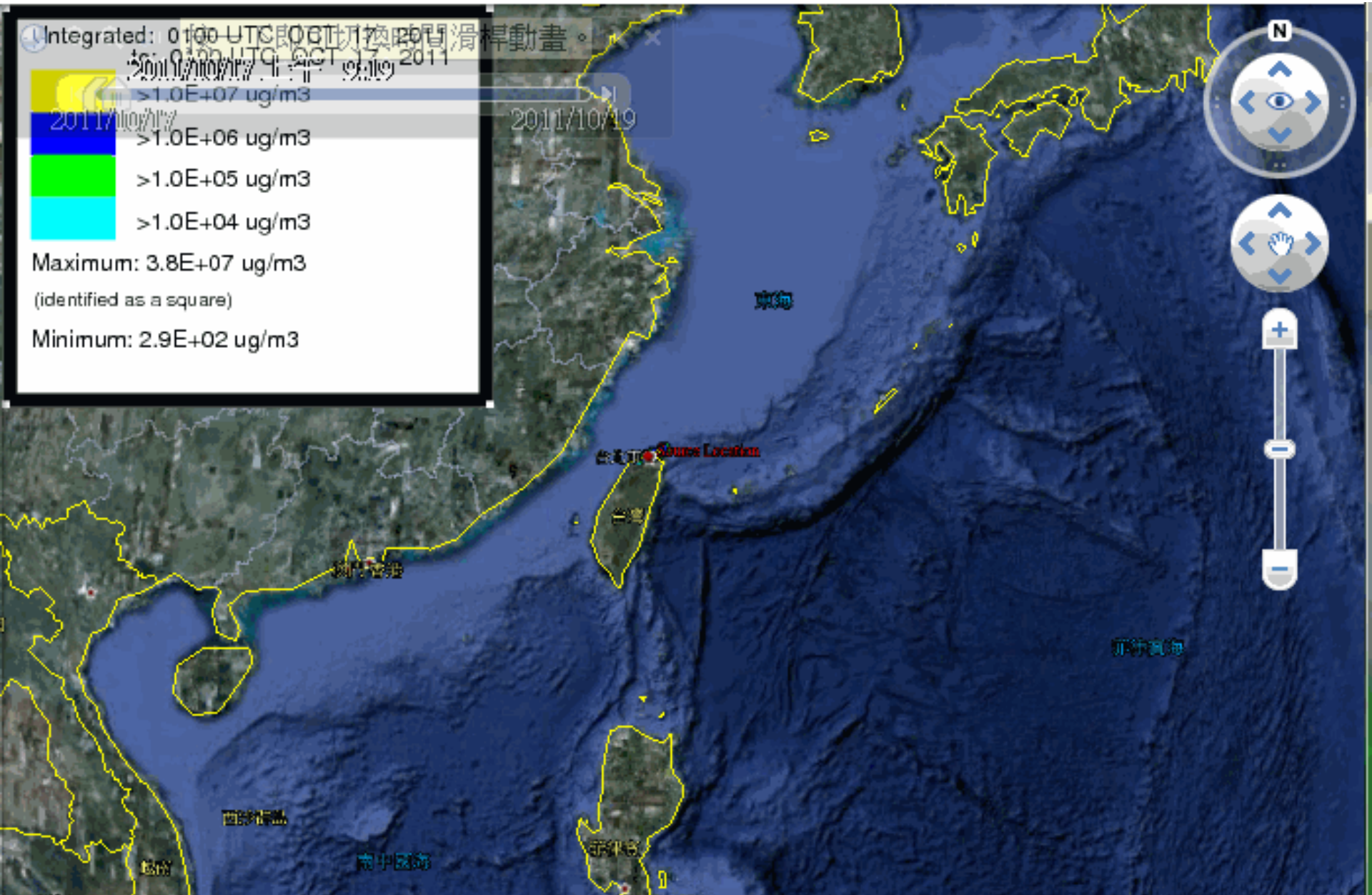
Spring eruption

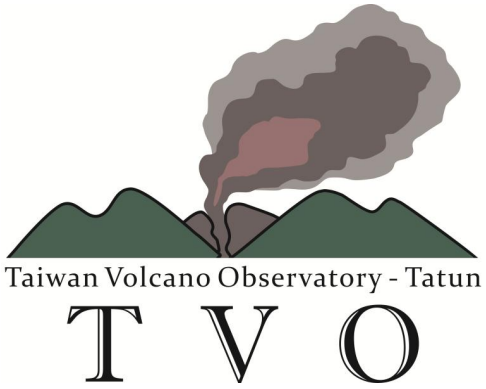


Winter eruption

如果大屯山於2011年10月17日發生火山爆發…

以下為火山灰在火山爆發後的48時內大氣擴散預測模擬





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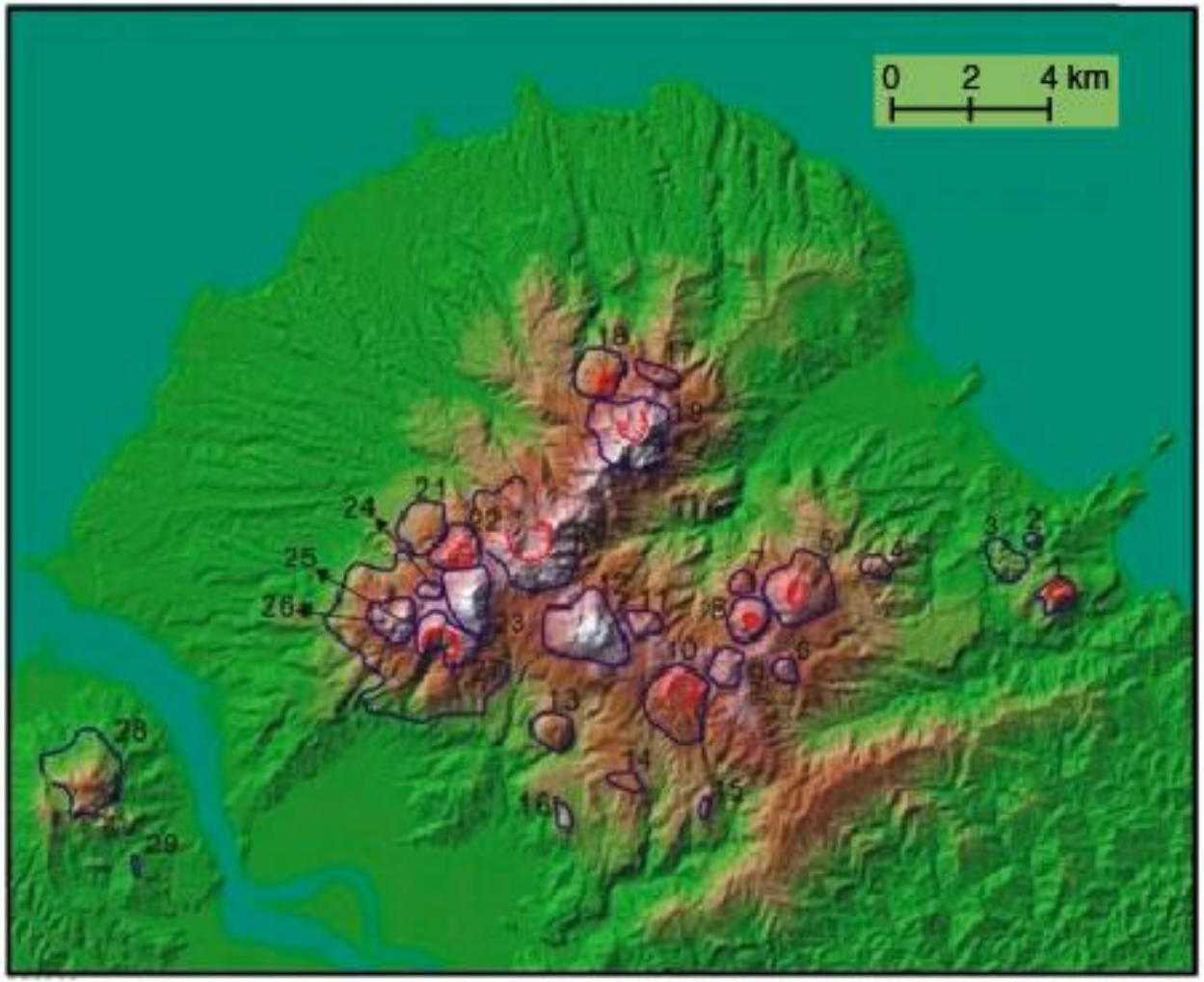
Tatun Volcano Group

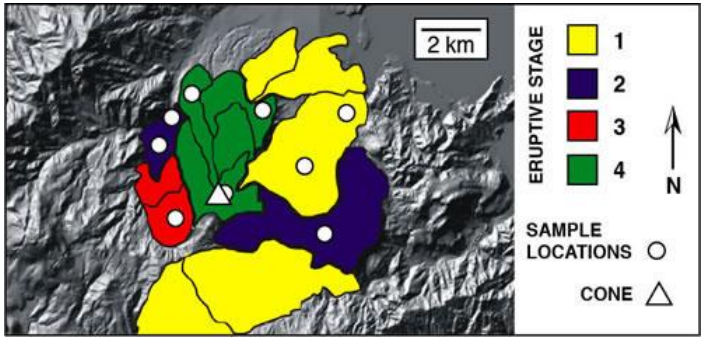
LOCATION MAP

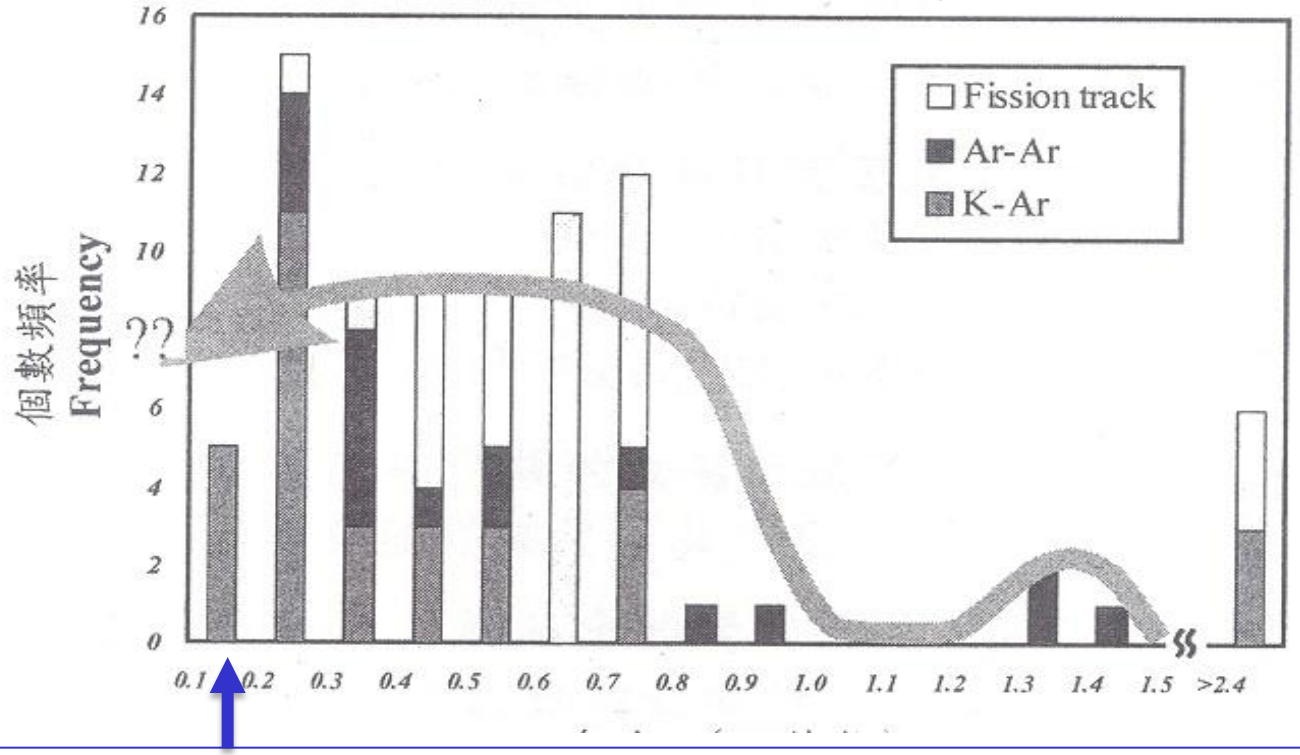
N



Eruption history

(Early result)





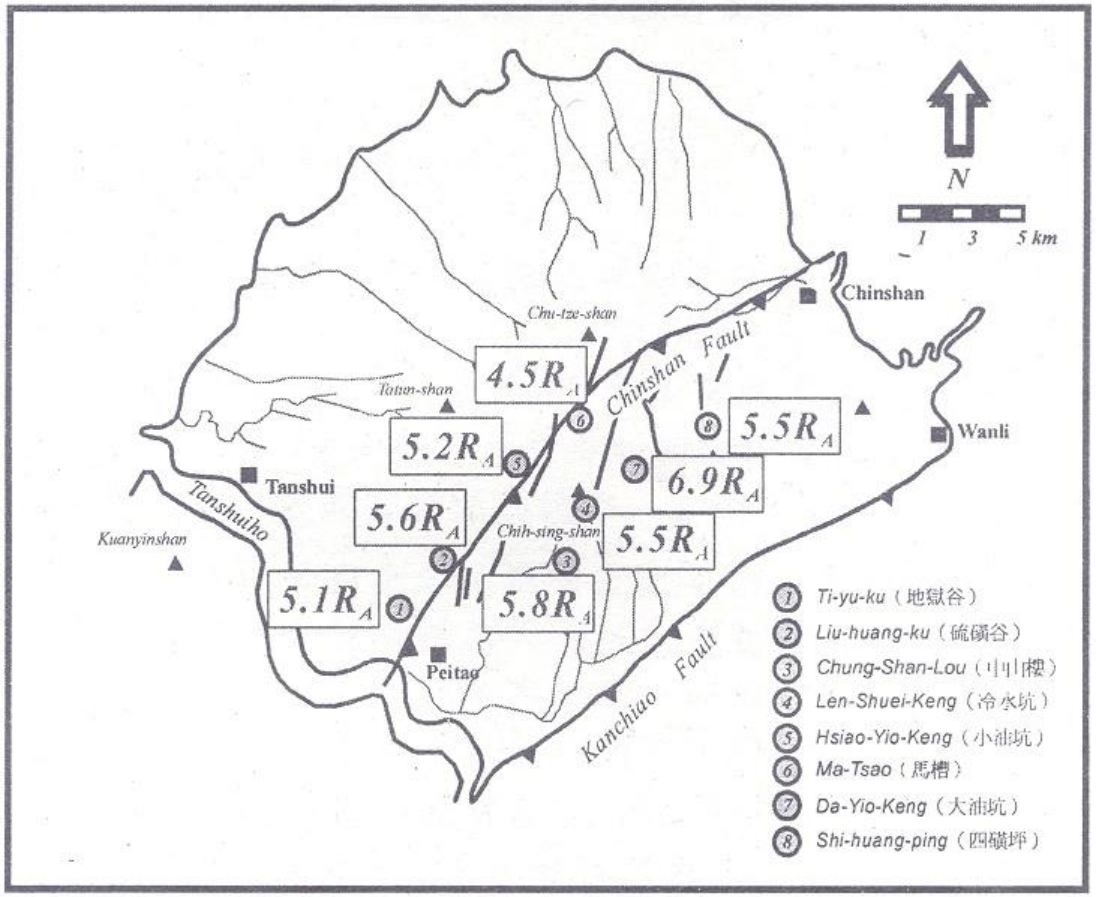
The last eruption was 0.1-0.2 Ma ⇔ Extinct volcano?

Recent studies in past 10 years

1. Geochemical analyses
2. Dating from Volcanic ashes
3. Seismological monitoring
4. Crustal deformation (GPS + leveling survey)
5. Topography (LiDAR)
6. Geothermal measurement

Suggest **the Tatun volcano is still active**

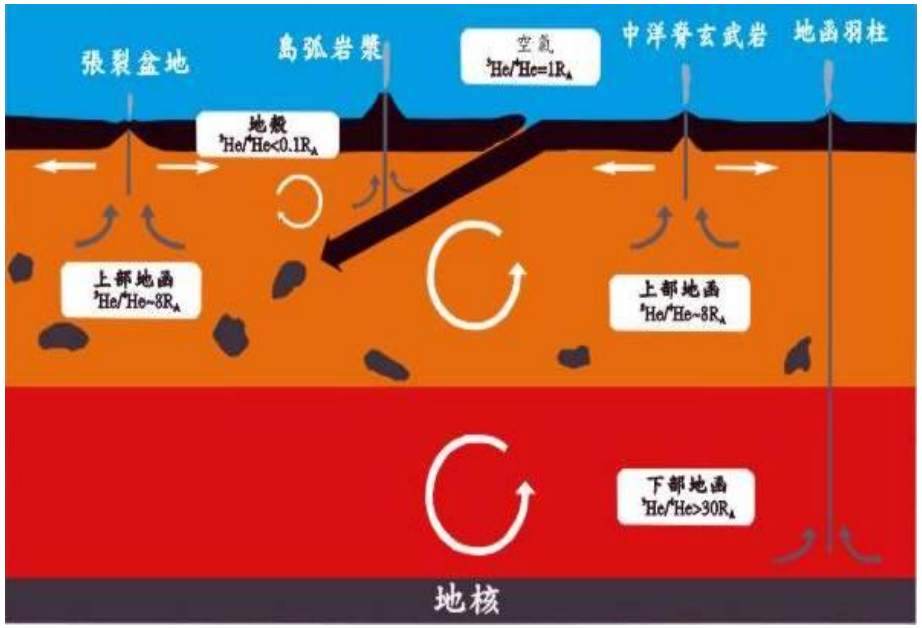
Helium isotope analyses

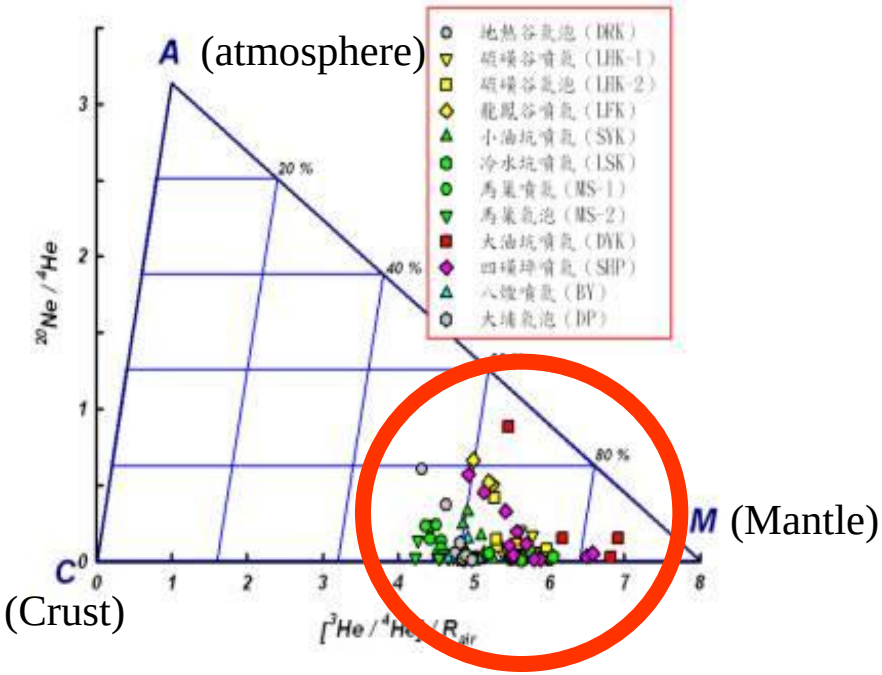


圖二十：大屯火山群各地噴氣之平均氦同位素比值

（Yang et al., 1999）

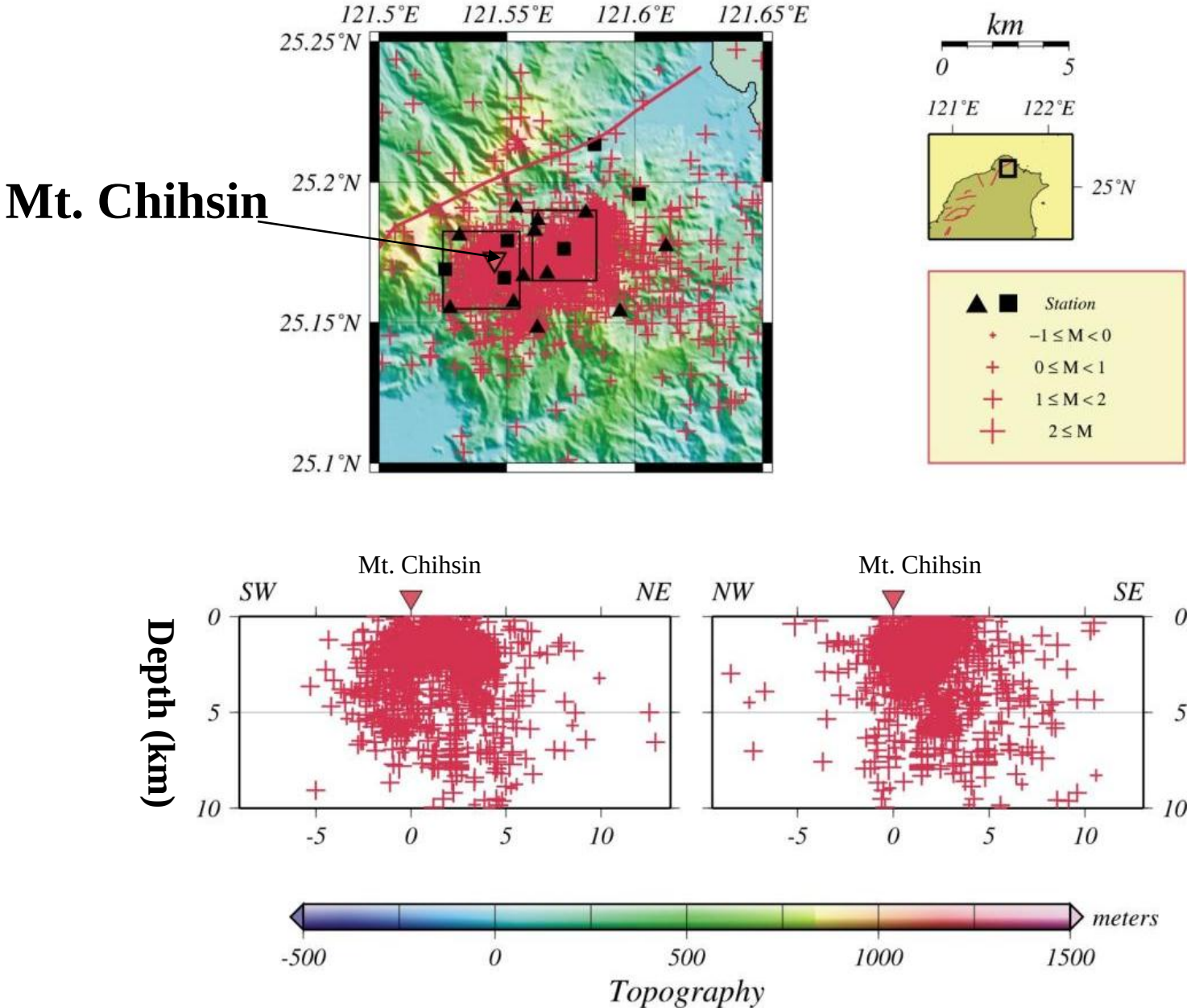
Volcanic gas (He)



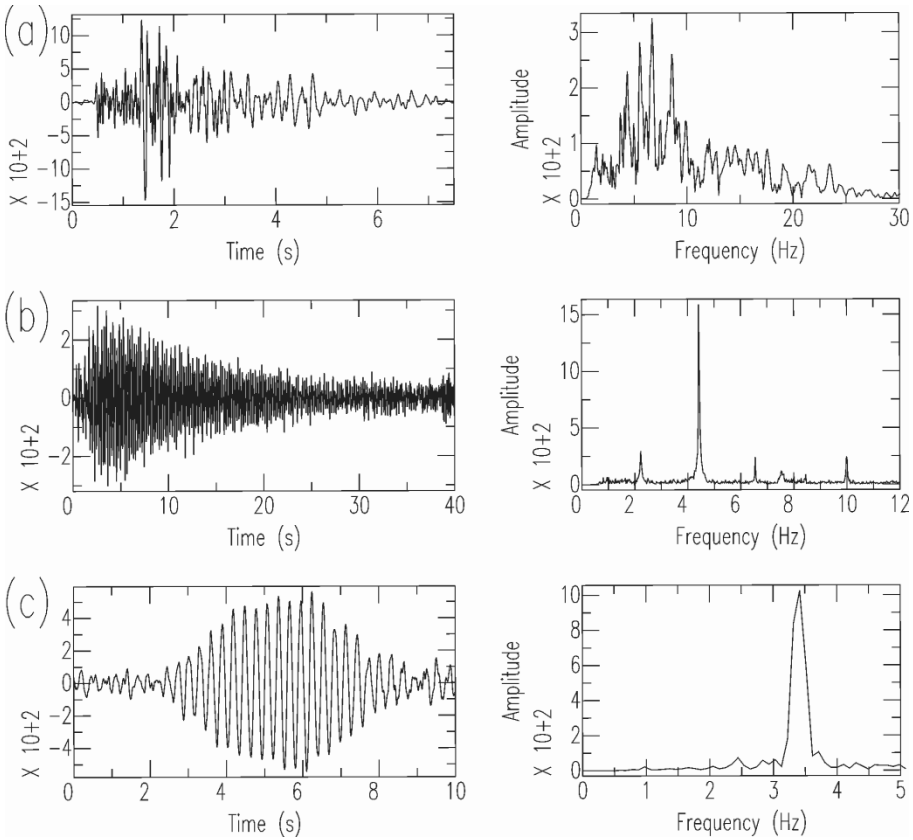


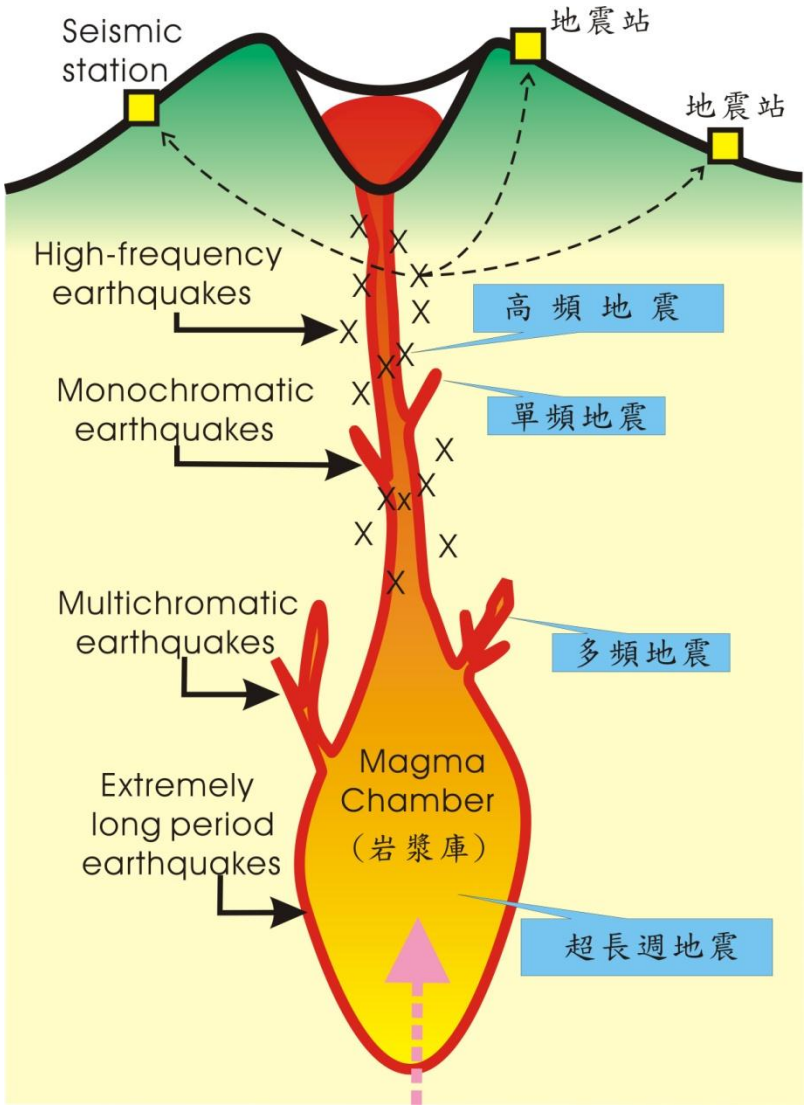
(Prof. Yang, T.F.)

Clustering earthquakes

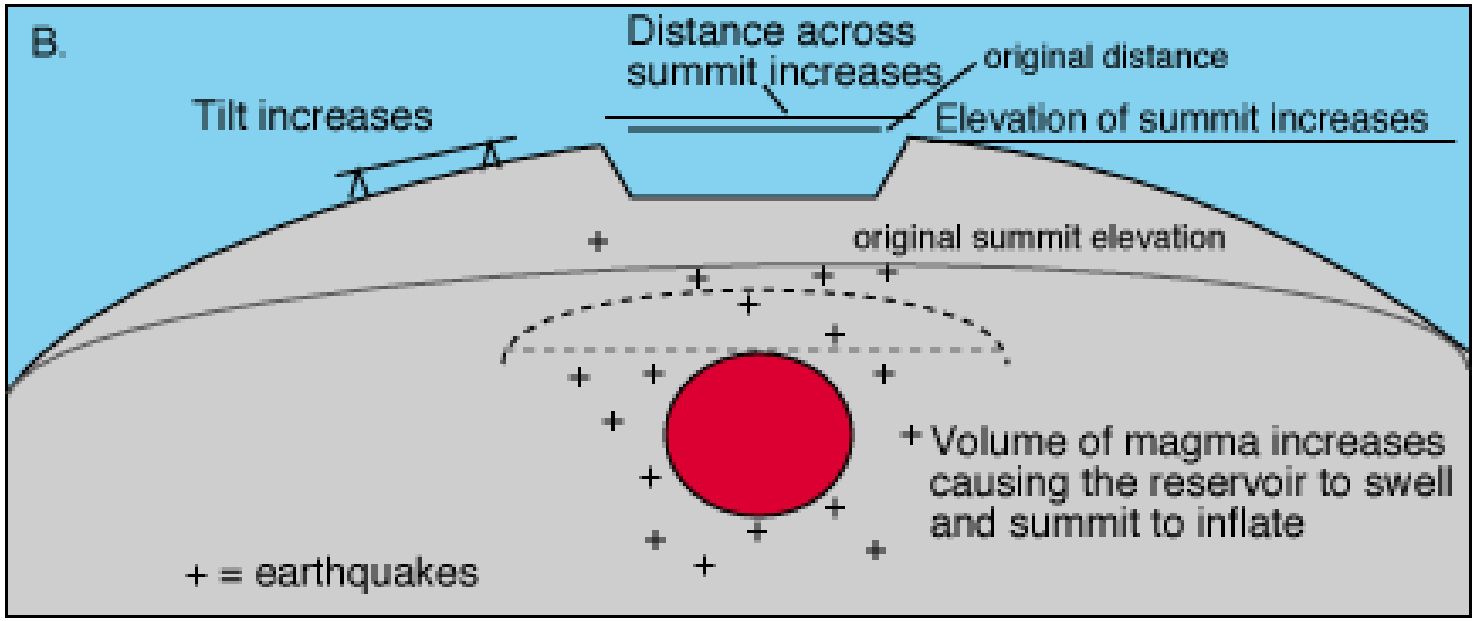


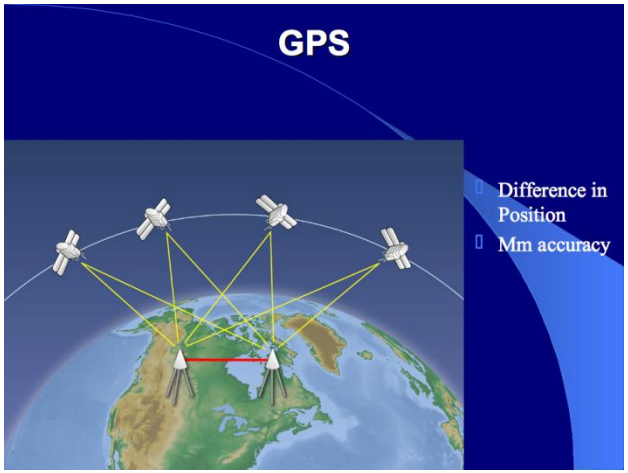
Volcanic earthquakes

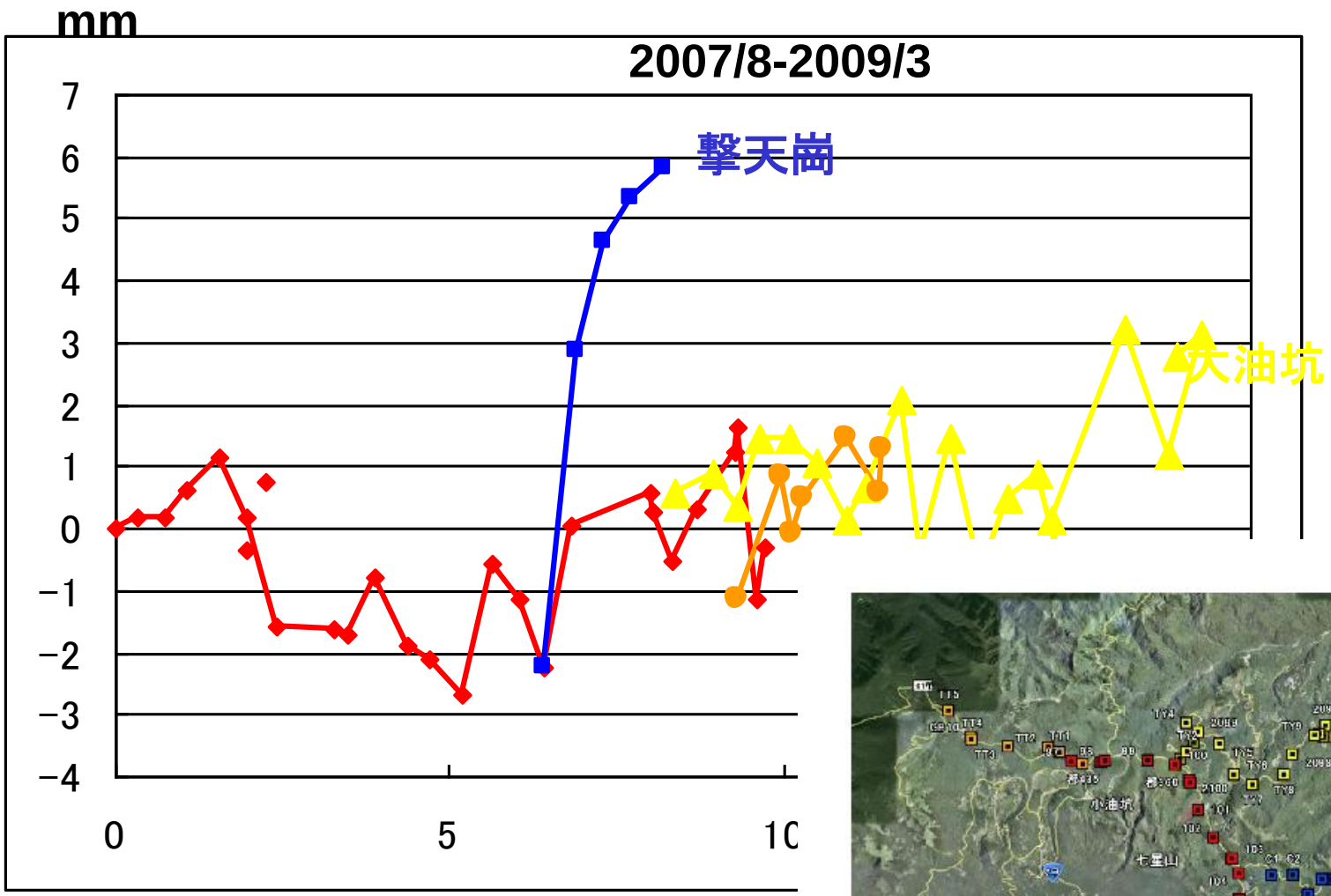




Crustal deformation







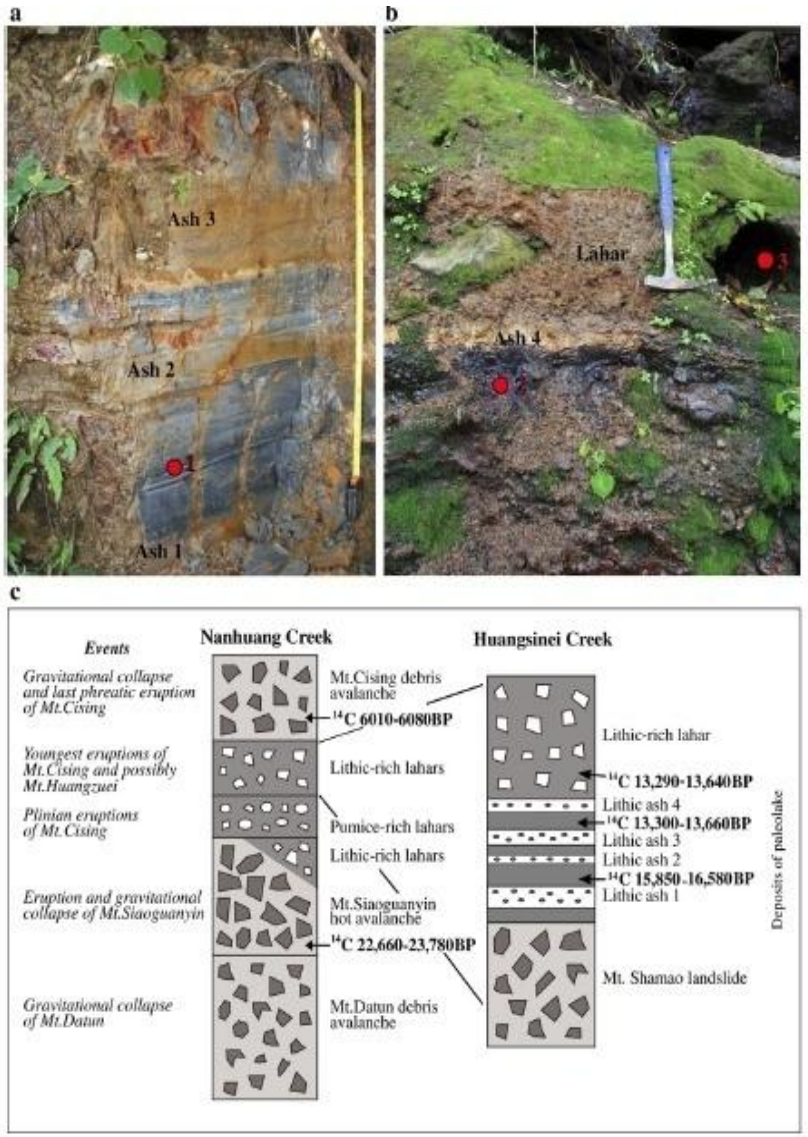
Leveling survey

(Murase et al., 2007)

Last eruption: Dating ashes (^{14}C)

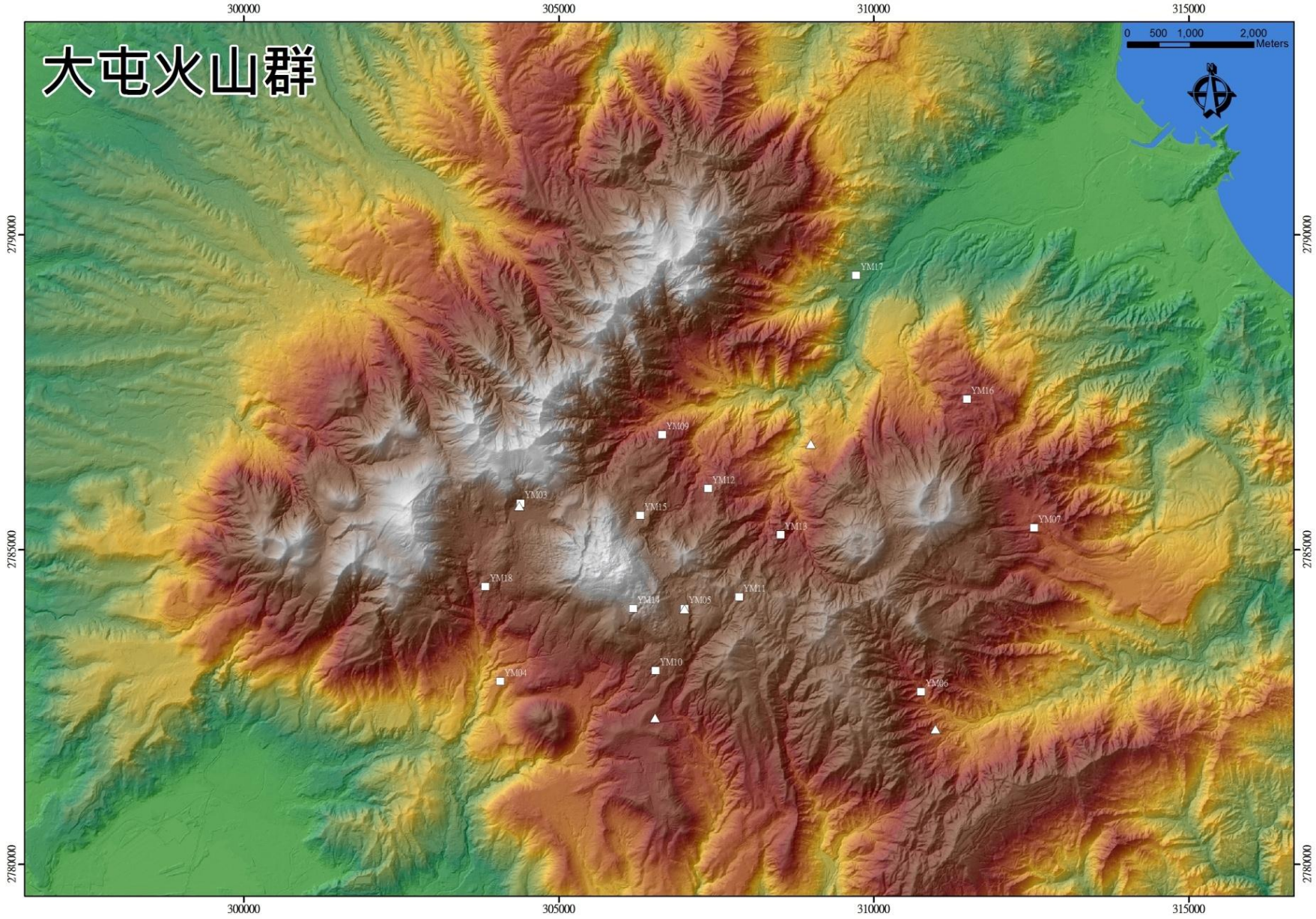
1. Ashes (~20ka) in Taipei basin
   (Chen and Lin, 2002)

2. Ashes (**~6 ka) in Tatun**
   (Belousov et al., 2010)



(Belousov et al., 2010)

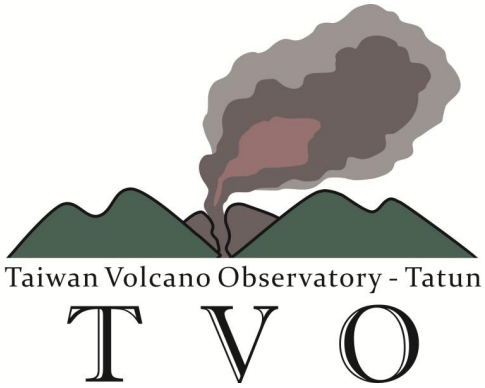
LiDAR topography (2 m)



Volcanic features in Tatun:

- Geochemical analyses ⇔ Mantle signals (He)
- Geology ⇔ Geothermal activity strong
- Seismic monitor ⇔ Clustered volcanic earthquakes
- Ashes in Tatun ⇔ 5 - 6 Ka
- LiDAR⇔ Young volcanic features and active faults
- Leveling survey⇔ Local uplifting (~5 mm/yr)

Tatun Volcano might be still active!



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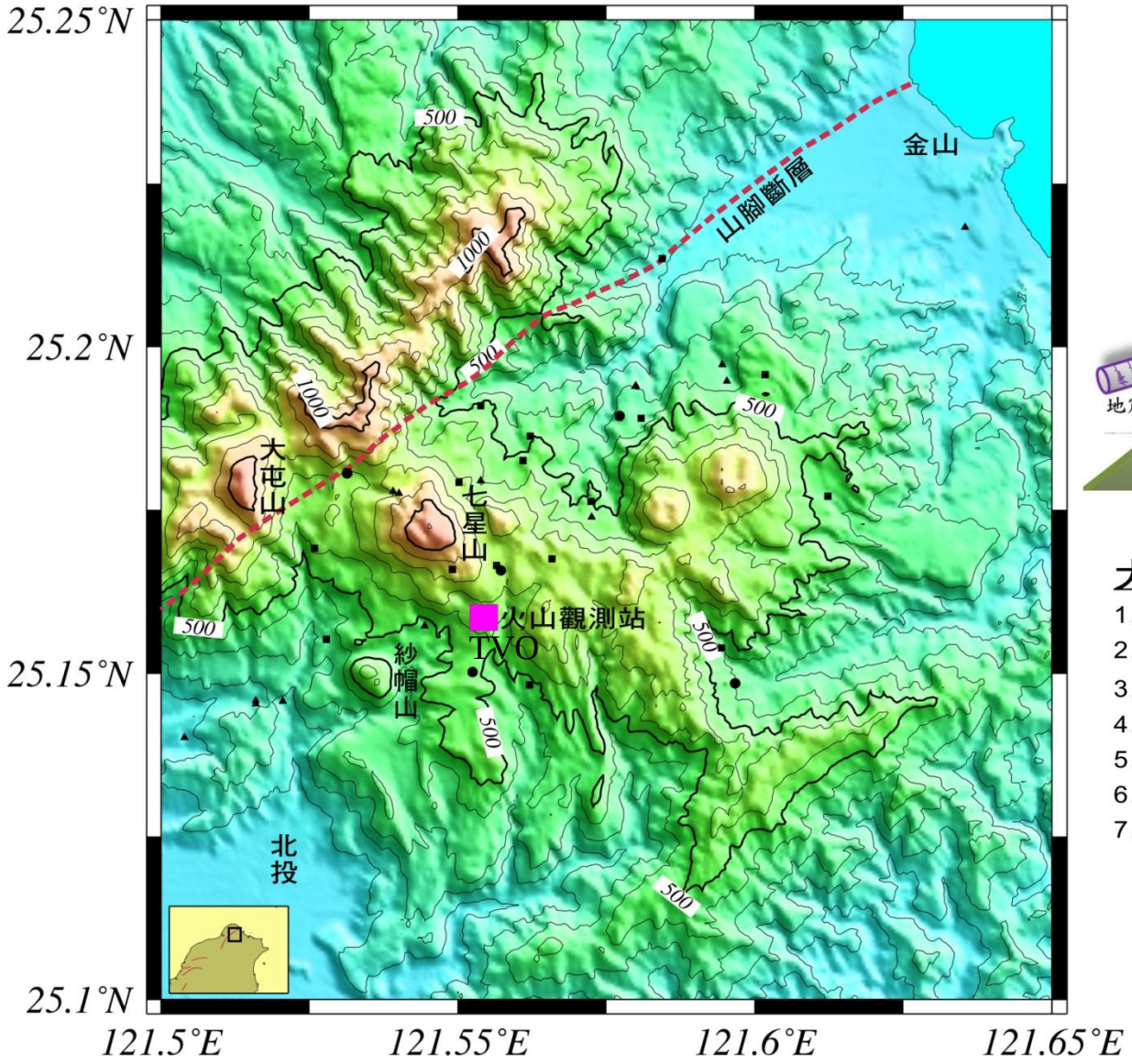
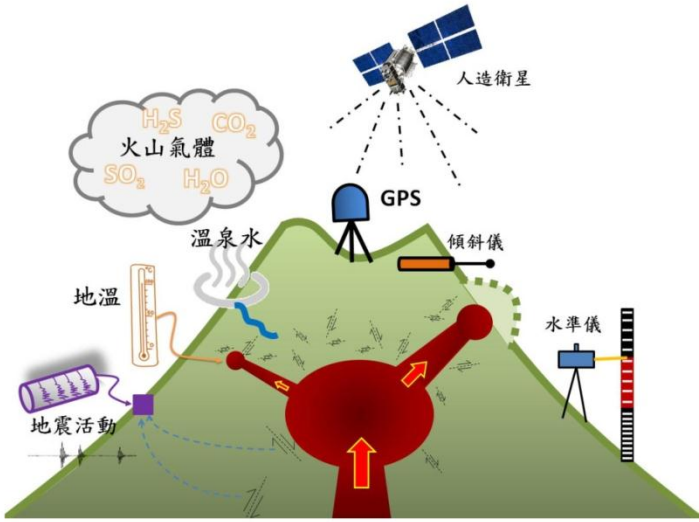
Taiwan Volcano Observatory - Tatun

TVO


陽明山國家公園
菁山自然中心
JingShan Nature Center
Yangmingshan National Park
lohas-bikelife

Monitoring stations at Tatun





大屯火山主要監測與分析方法:

1. 火山氣体分析(▲)
2. 地震觀測(■)
3. 地殼變形: GPS(●), 水準測量
4. 地溫:小油坑
5. 溫泉水監測(▲)
6. 即時影像監測:小油坑
7. 其他地球科學方法:
   (地磁場, 重力, 地電,傾斜儀, InSAR等)

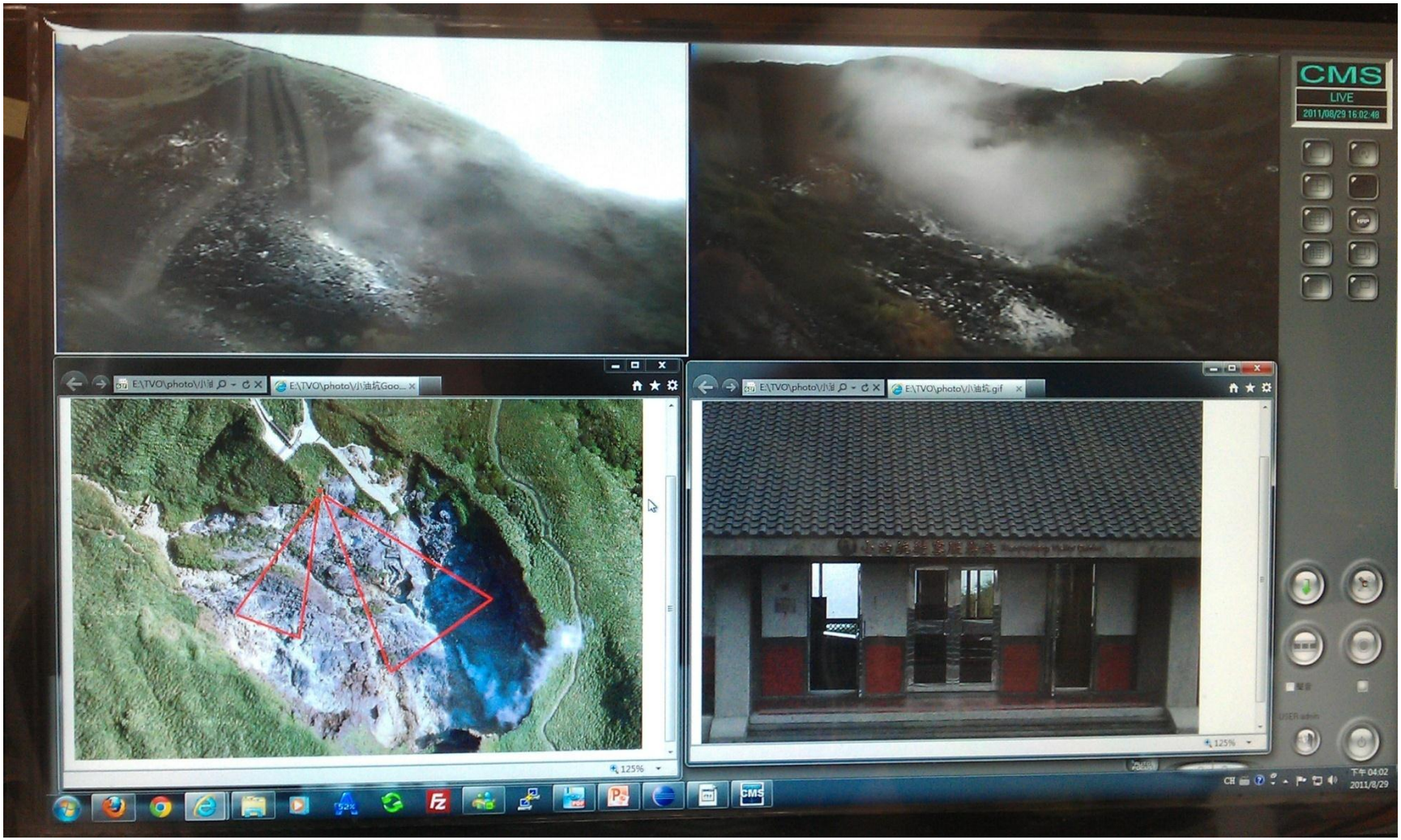
誌謝: 感謝政府相關單位及各大學研究團隊, 多年來之全力支持與共同努力,方可順利建置大屯火山觀測站. 特別感謝對象包括: 中央大學,中央地質調查所,中央氣象局, 中央研究院,台灣大學,國家科學委員會, 陽明山國家公園管理處等(以上依筆畫順序)

Monitoring methods at TVO

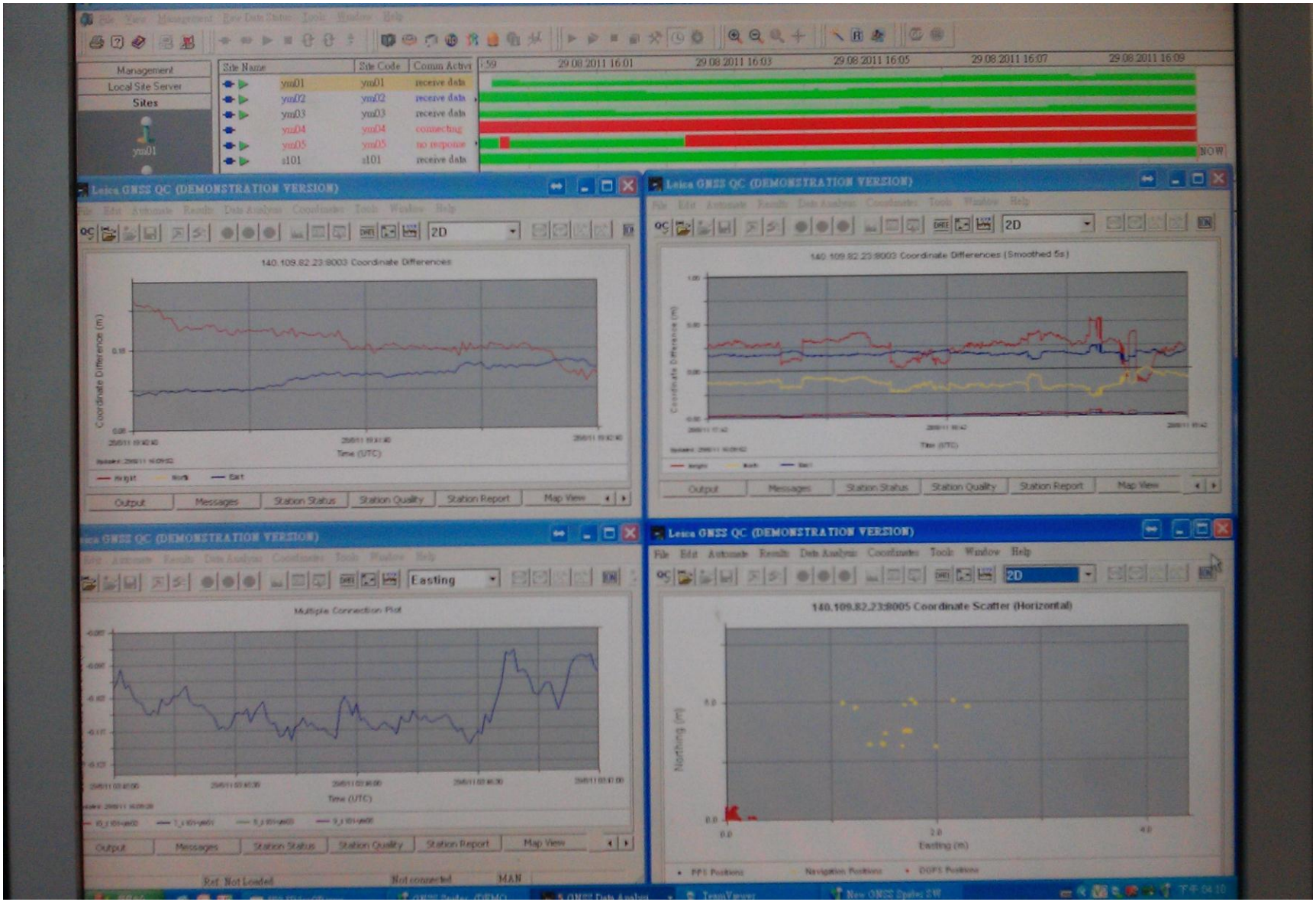
- Seismic network:
  - 18 seismic stations (9 real-time transmitted)
- Crustal deformation:
  - 5 GPS stations (3 real-time positioning)
  - repeated leveling survey
- Geochemical analyses:
  - volcanic gases (CO_2 real-time transmitted)
  - hot springs
- Geothermal monitor (real-time transmitted)
- Fumarole image (real-time transmitted)

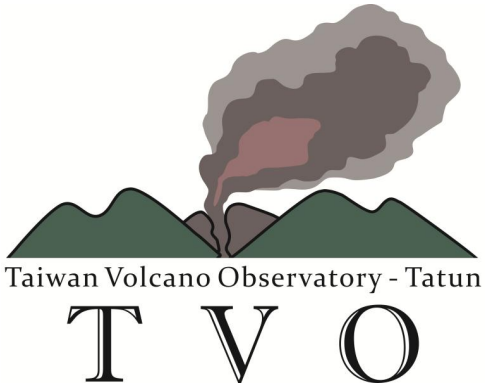
Real-time Monitoring system

Monitoring of fumaroles



Crustal deformation (GPS-real-time)





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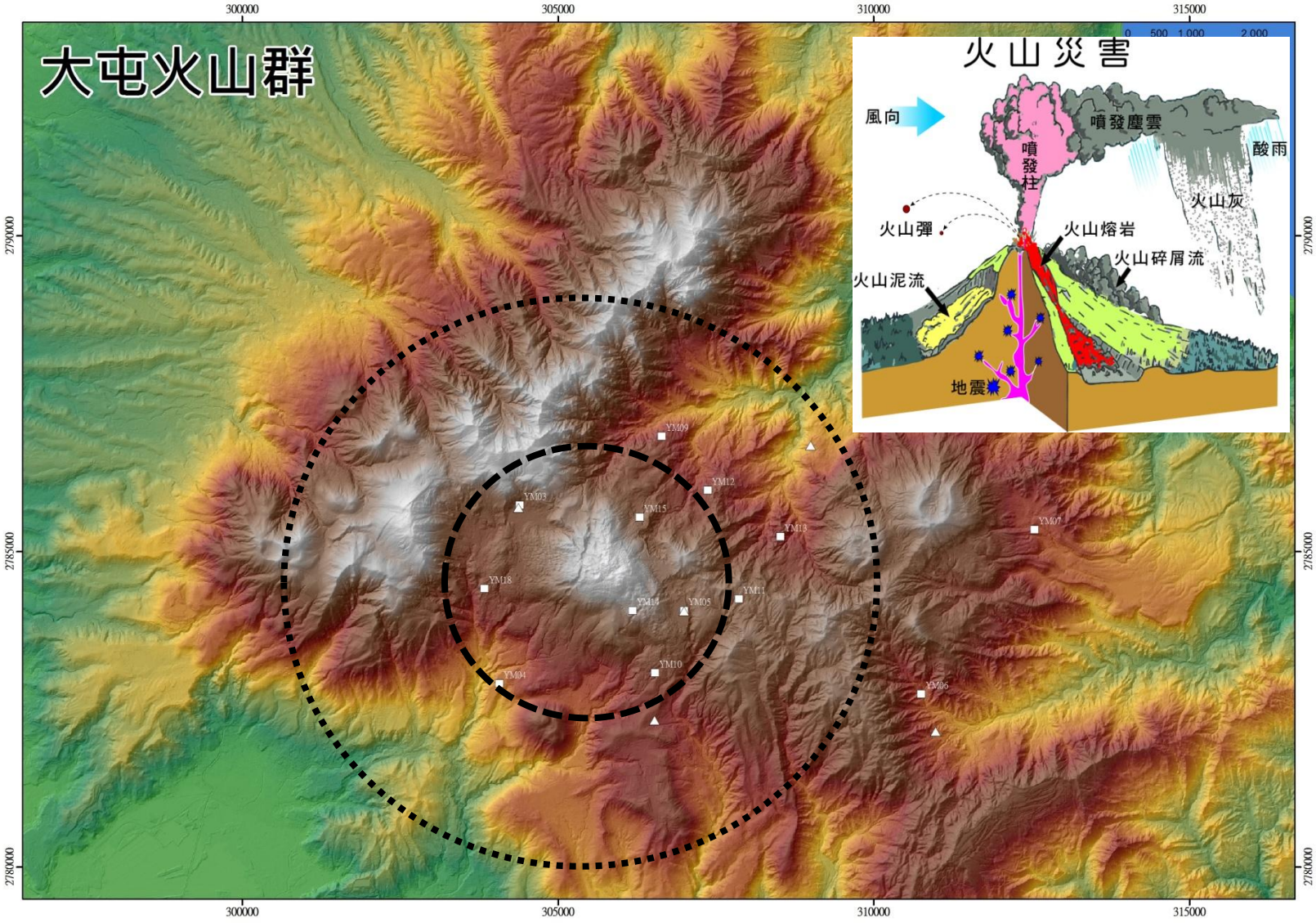
Goal:

Taiwan Volcano Observatory - Tatun

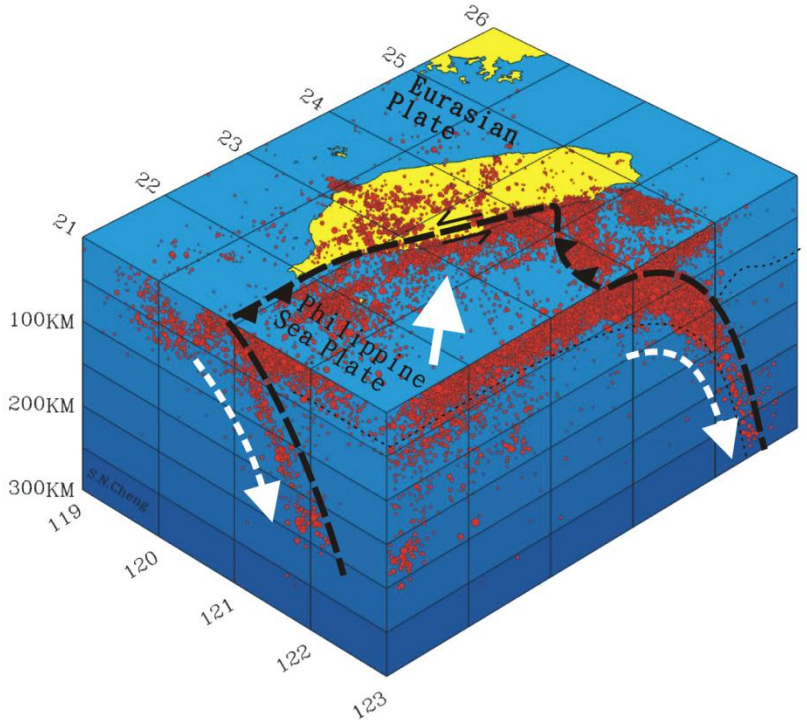
TVO

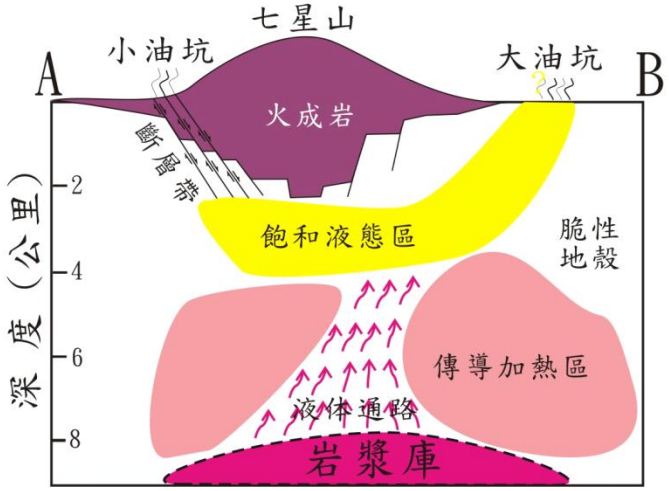
1. Hazard warning
2. Research and education
3. Resource exploration

1. Hazard warning

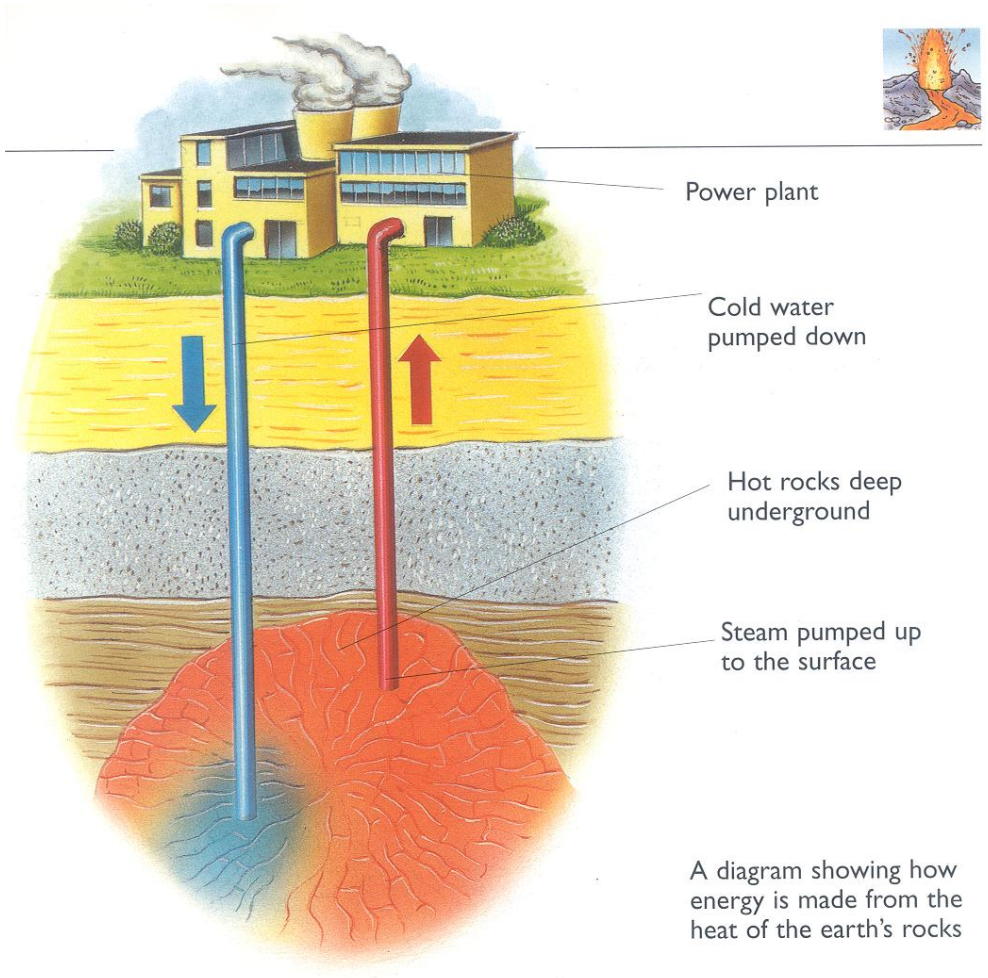


2. Research and education





3. Resource exploration



A diagram showing how energy is made from the heat of the earth's rocks

Heat resource?

Thanks for your attention!