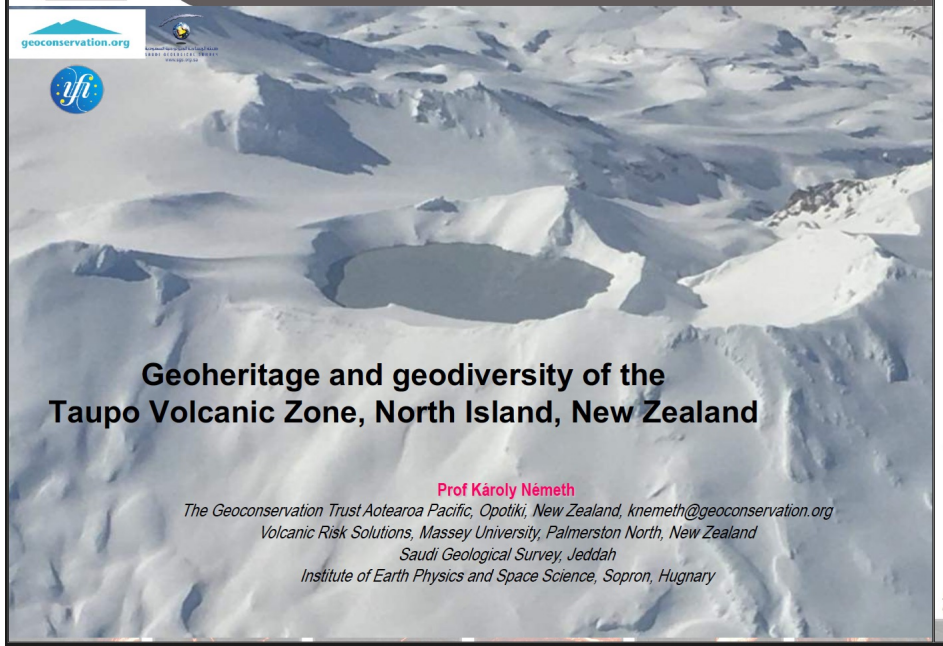
Hong Kong 30 September 2023



Geoheritage and geodiversity of the Taupo Volcanic Zone, North Island, New Zealand

Prof Károly Németh

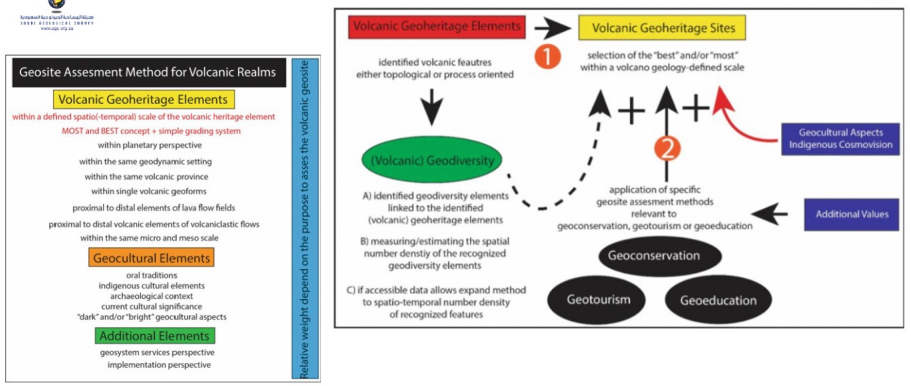
The Geoconservation Trust Aotearoa Pacific, Opotiki, New Zealand, knemeth@geoconservation.org

Volcanic Risk Solutions, Massey University, Palmerston North, New Zealand

Saudi Geological Survey, Jeddah

Institute of Earth Physics and Space Science, Sopron, Hugnary

Volcanic geology vs Volcanic geoheritage

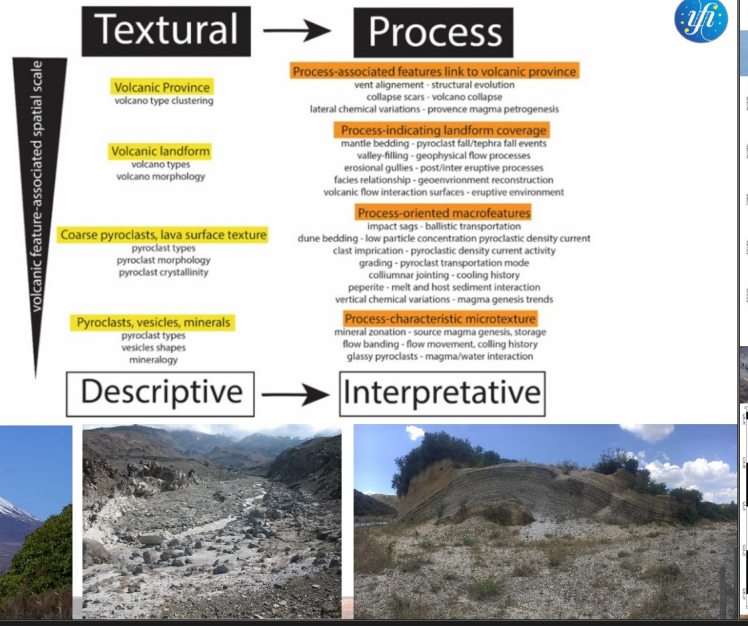


Geodiversity in Volcanic Terrains – Quantitative – qualitative valorization methods

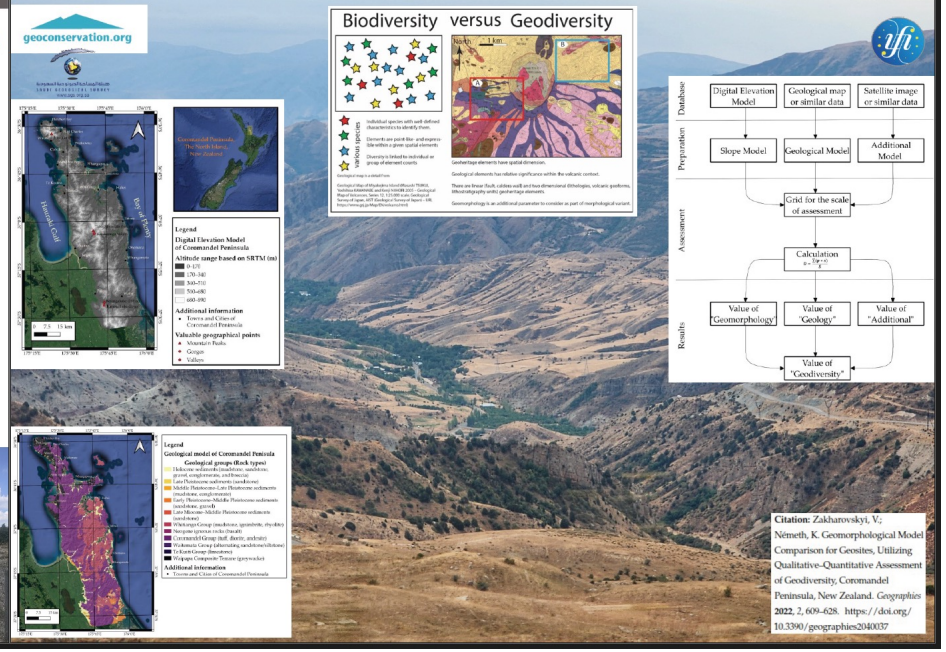
Global + Local

J. Dóniz-Páez and N. M. Pérez (eds.), *El Hierro Island Global Geopark*, Geoheritage, Geoparks and Geotourism, https://doi.org/10.1007/978-3-031-07289-5_1

Volcanic geology vs Volcanic geoheritage



Volcanic geodiversity – advanced methods



Citation: Zakharovskyi, V.; Németh, K. Geomorphological Model Comparison for Geosites, Utilizing Qualitative-Quantitative Assessment of Geodiversity, Coromandel Peninsula, New Zealand. *Geographies* **2022**, *2*, 609–628. https://doi.org/10.3390/geographies2040037

Volcanic geodiversity – advanced methods

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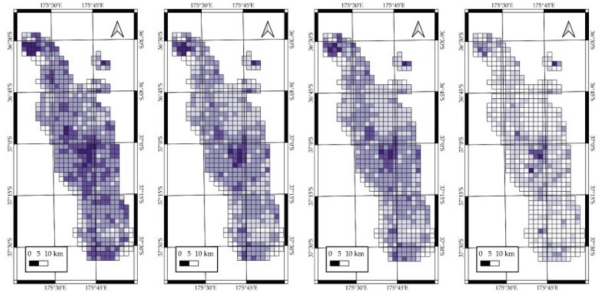
Citation: Zakharovskyi, V.; Németh, K. Geomorphological Model Comparison for Geosites, Utilizing Qualitative-Quantitative Assessment of Geodiversity, Coromandel Peninsula, New Zealand. *Geographies* **2022**, *2*, 609-628. https://doi.org/10.3390/geographies2040037



Geodiversity values of Coromandel Peninsula based on Slope model

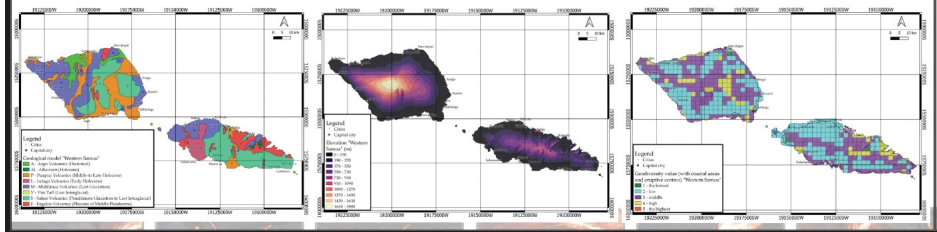
Geodiversity values of Coromandel Peninsula based on Roughness model

Geodiversity values of Coromandel Peninsula based on Ruggedness model

Geodiversity values of Coromandel Peninsula based on Total curvature model

The lowest Low Middle High The highest

Citation: Zakharovskyi, V.; Németh, K. Qualitative-Quantitative Assessment of Geodiversity of Western Samoa (SW Pacific) to Identify Places of Interest for Further Geoconservation, Geoeducation, and Geotourism Development. *Geographies* **2021**, *1*, 362-380. https://doi.org/10.3390/geographies1030020



Volcanic geodiversity vs volcanic geology

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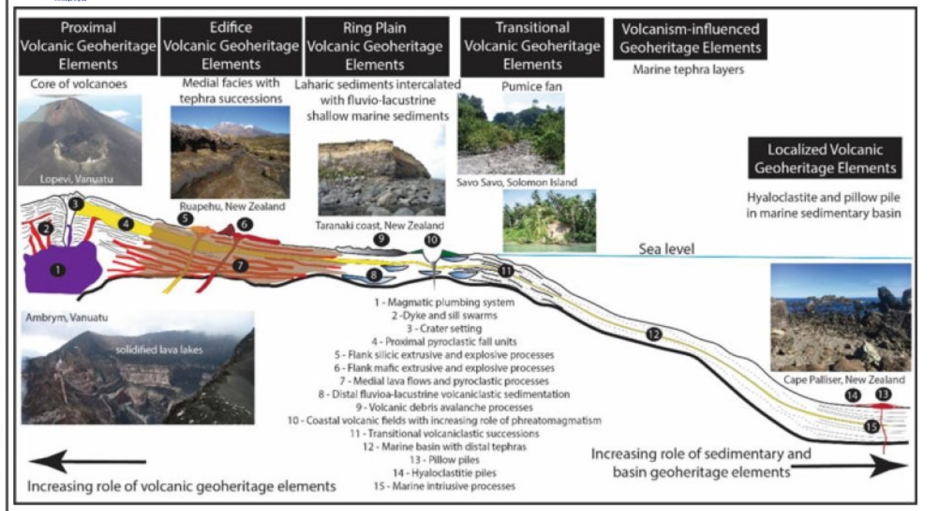

Volcanic geodiversity vs volcanic geology

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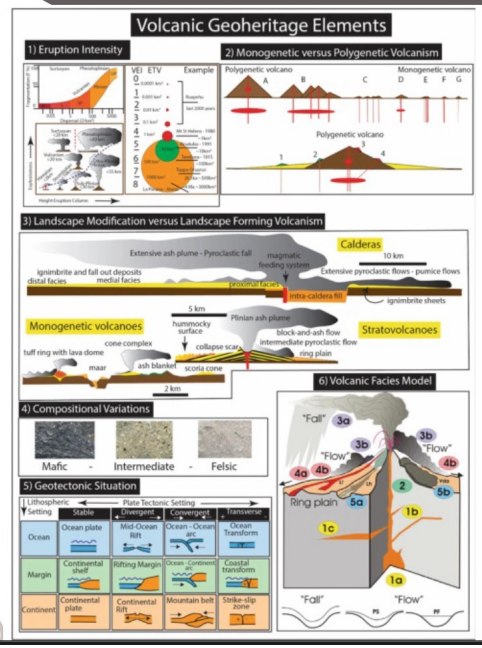

North Island of New Zealand

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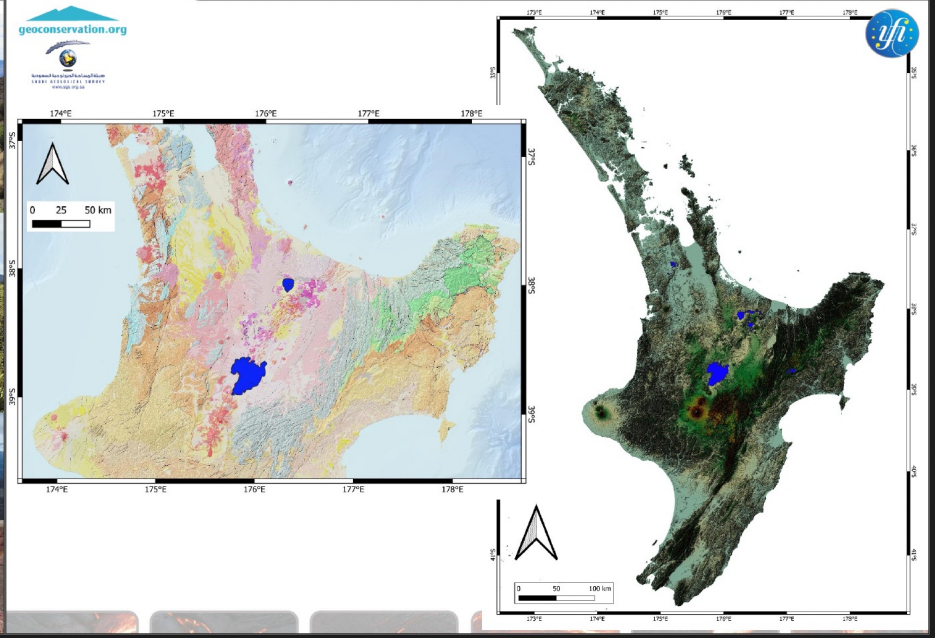
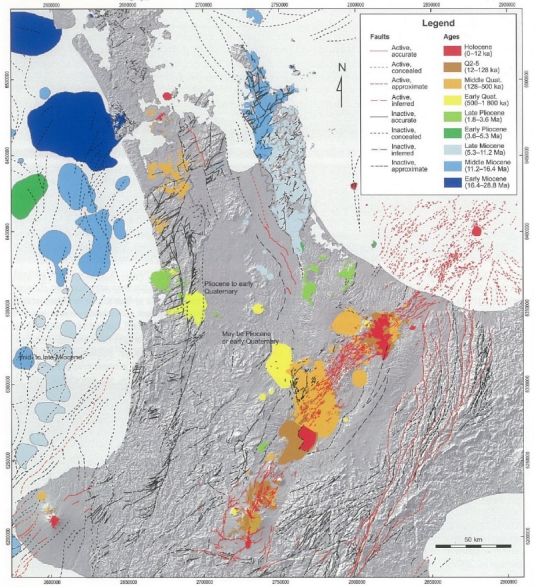
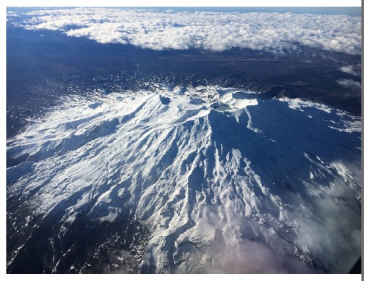


Quarternary Volcanism in the North Island

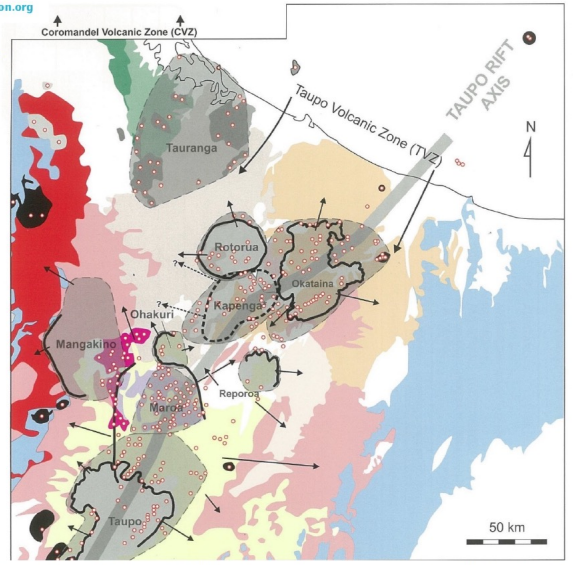


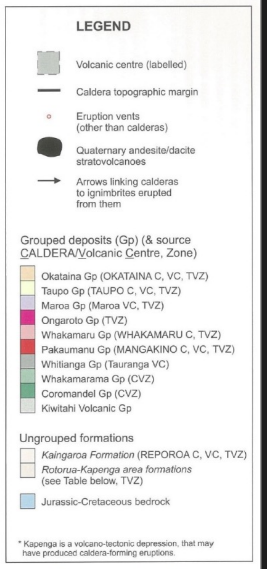
Monogenetic (basaltic) fields, Auckland



Composite (basaltic-andesite) volcanoes, Ruapehu

Volcanic facies concept in geoheritage

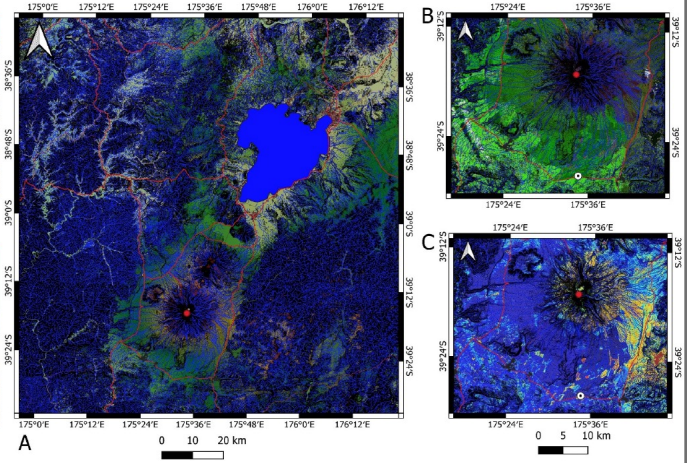




The Taupo Volcanic Zone (TVZ) has been the most productive silicic volcanic region in the world with at least 12 caldera forming eruptions producing over 3300 km3 of magma during the last 350 ka.

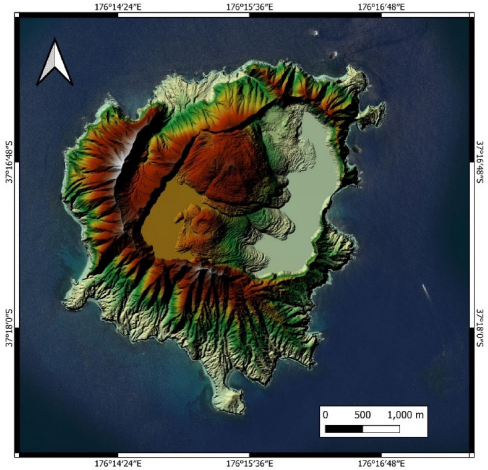
Taupo Volcanic Zone

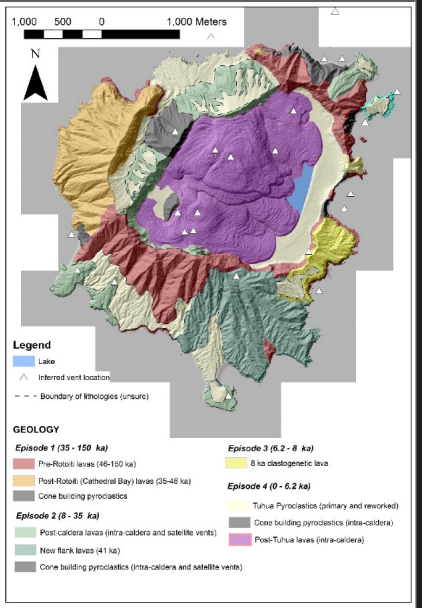
From Calderas the Andesitic Stratovolcanoes



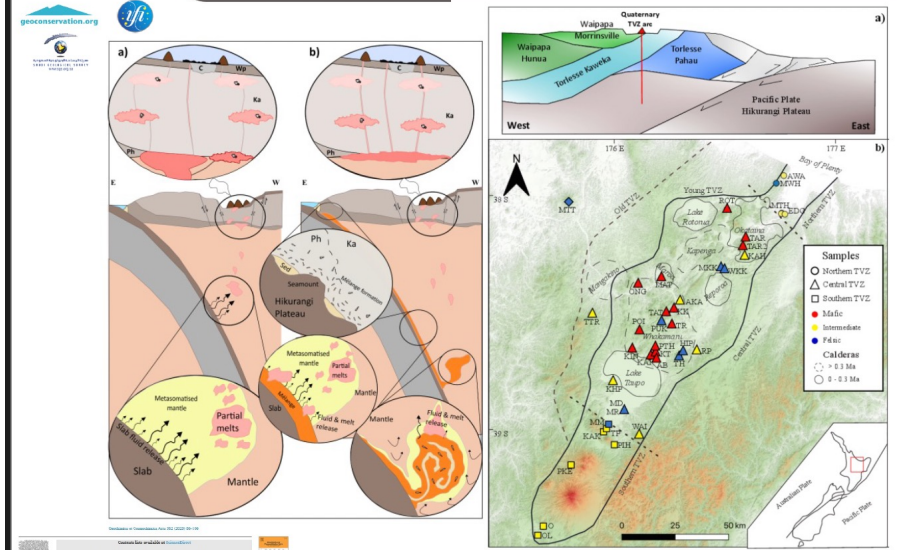
Taupo Volcanic Zone

Off-shore Volcanoes





TVZ origin of magmas



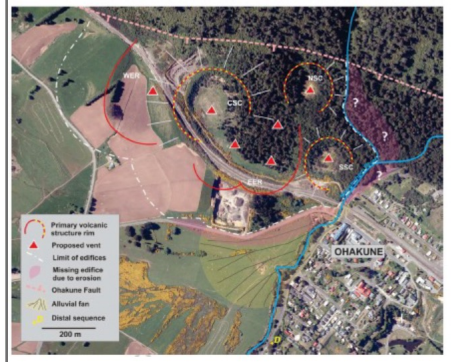
Geochimica et Cosmochimica Acta

Transcrustal and source processes affecting the chemical characteristics of magmas in a hyperactive volcanic zone

Fig. 1. (a) Schematic view of the crust of the Central North Island, after Price et al. (2015). (b) Sample locations, using Land Information New Zealand (LINZ) 3 m digital elevation model (DEM), with brown representing the elevated regions. Calderas delimited within Lake Taupo and Lake Rotorua correspond to Taupo and Rotorua calderas respectively. Young and old TVZ and southern, central and northern TVZ after Wilson et al. (1995). Coordinate reference system WGS84/UTM zone 60S. Map abbreviations: KT = K-TRIG, PTH = Punatekahi, TAT = Tatua, AB = Acacia Bay, TR = TramRoad, POI = Poihipi, EAI = Kaiapo, ROT = Rotokawau, TAR = Tarawera, EIN = Kinloch, MAT = Matipan, MTH = Motuhi, AKA = Akatarewa, RP = Rollet Peak, OL = Ohakune Lahar, O = Ohakune, TTR = Tittiraupenga, PIH = Pihanga, EAE = Eskaramaea, EDG = Edgecumbe, TP = Te Pouanga, AWA = Awakaponga, MEK = Maungakakaramea, MWH = Manawahe, WKK = Waihohonuku, MTT = Maungatautari, TH = Tauhara, HIP = Hipaua, MM = Maungamamo Mesquite, MD = Motuoapa Dacite, MR = Motuoapa Rhyolite, PUK = Puketarata, WAI = Waimarino, IOHP = Karangahape, PKE = Pukeonake, EAH = Kaharoa, KK = Kakaki, ONG = Ongaroto.

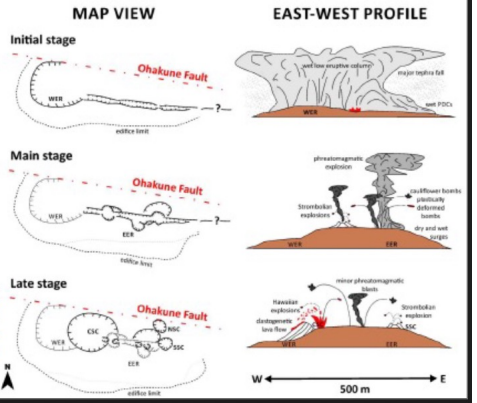
Small mafic volcanoes in TVZ

Fissure-fed – Basaltic Spectrum

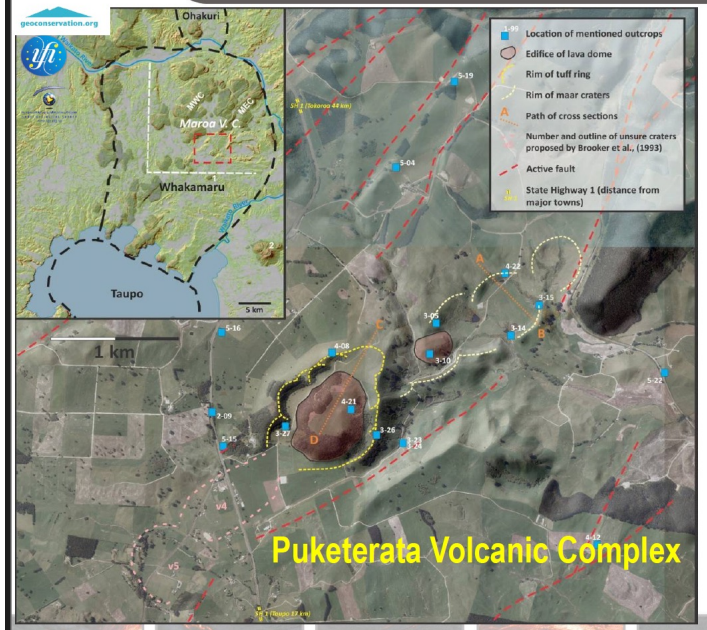


Kosik et al 2016

Please cite this article as: Kósik, S., Németh, K., Kereszturi, G., Procter, J.N., Zellm G.F., Geshi, N., Phreatomagmatic and water-influenced Strombolian eruptions o small-volume parasitic cone complex on the southern ringplain of Mt. Ruapehu, N Zealand: Facies architecture and eruption mechanisms of the Ohakune Volcanic Comp controlled by an unstable fissure eruption, *Journal of Volcanology and Geothermal Resea* (2016), doi: 10.1016/j.jvolgeores.2016.07.005



Monogenetic silicic tuff rings and domes

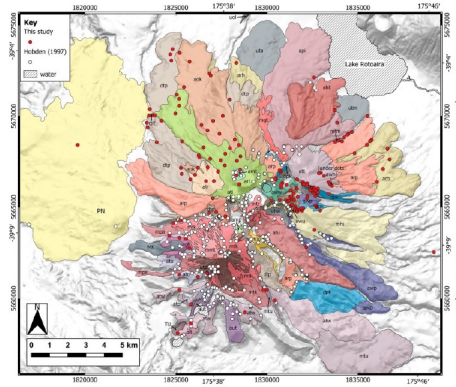


From a volcanic hazards perspective, the 2-3 orders of magnitude more frequent pre/post-caldera eruptions need more attention within the TVZ hazardscape.

These eruptions are mostly characterized by small eruptive volumes (<1 km3 DRE) through a single eruptive episode originating from newly forming vents.

Such explosive/effusive characteristics of these events meet the diagnostic features of monogenetic/small-volume volcanism

Central Volcanic Plateau – Lava flows

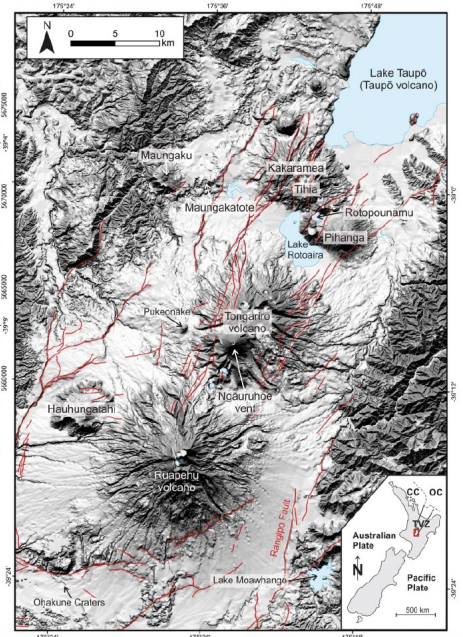


Contributions to Mineralogy and Petrology (2023) 178:30
https://doi.org/10.1007/s00410-023-02004-0

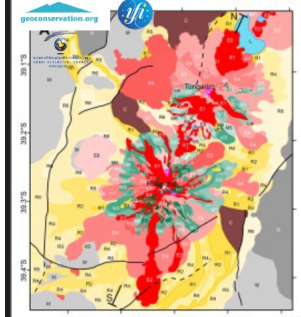
ORIGINAL PAPER

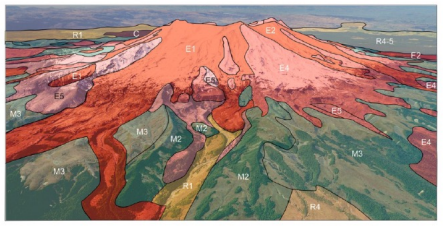
The compositional diversity and temporal evolution of an active andesitic arc stratovolcano: Tongariro, Taupō Volcanic Zone, New Zealand

Leo R. Pure[1,2] · Colin J. N. Wilson[1] · Bruce L. A. Charlier[1,3] · John A. Gamble[1,3] · Dougal B. Townsend[4] · Graham S. Leonard[4]



Tongariro Volcanic Complex





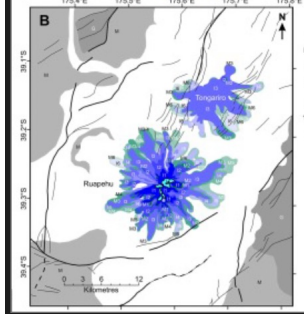


Figure 8. Relationships between ice-bounded lava flows confined to high topography, moraine-bounded glacial valleys, and post-glacial lava flows in-filling valleys on the north-western flank of Ruapehu (modified from Conway et al. 2015). Aerial photograph (upper panel) and draped simplified geology (lower panel; see Figure 3 for legend). The snowline is at about 1700m elevation in this image. GNS Science photo by Dougal Townsend

Graham S. Leonard, Rosie P. Cole, Bruce W. Christenson, Chris E. Conway, Shane J. Cronin, John A. Gamble, Tony Hurst, Ben M. Kennedy, Craig A. Miller, Jonathan N. Procter, Leo R. Pure, Dougal B. Townsend, James D. L. White & Colin J. N. Wilson (2021) Ruapehu and Tongariro stratovolcanoes: a review of current understanding, New Zealand Journal of Geology and Geophysics, 64:2-3, 389-420, DOI: 10.1080/00288306.2021.1909080

Ring plain tephra successions

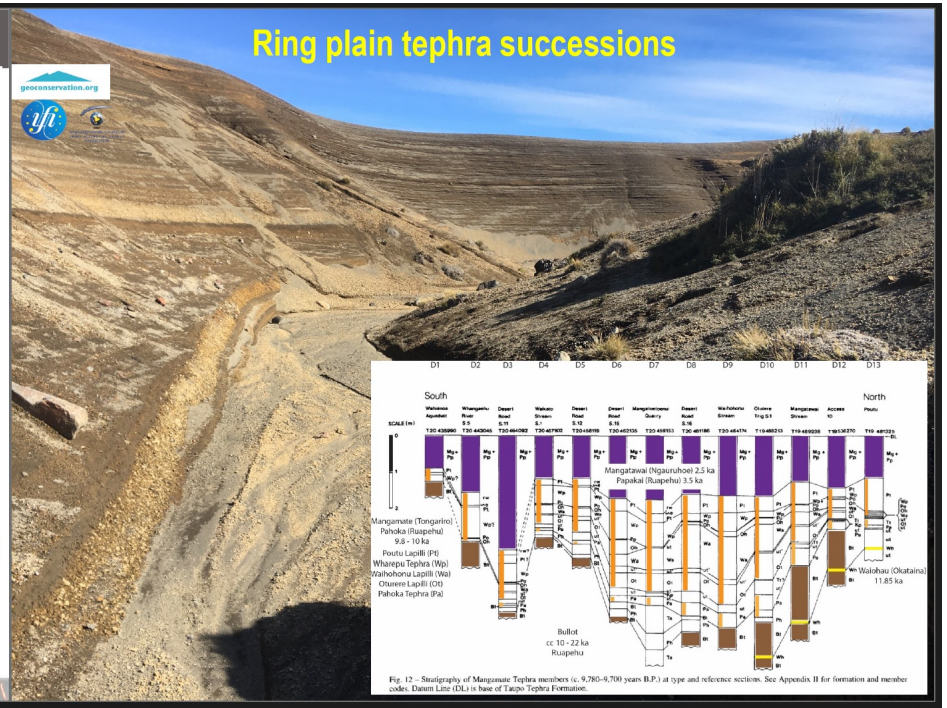
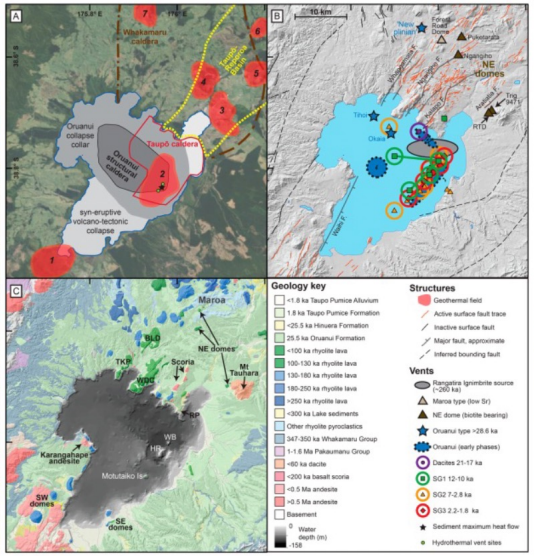


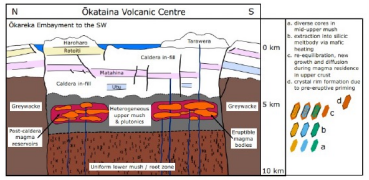
Fig. 12 – Stratigraphy of Mangamate Tephra members (c. 9,780–9,700 years B.P.) at type and reference sections. See Appendix H for formation and member codes. Datum Lite (DL) is base of Taupo Tephra Formation.

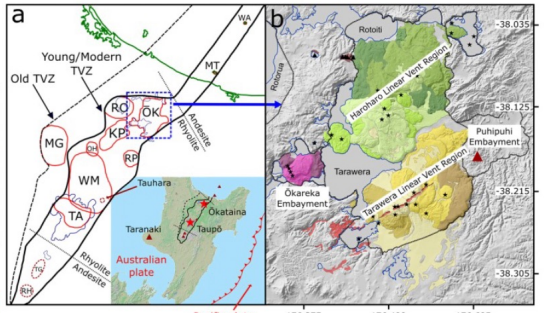
Calderas – Taupo Volcano



Simon J. Barker, Colin J.N. Wilson, Finnigan Illsley-Kemp, Graham S. Leonard, Eleanor R.H. Mestel, Kate Mauriohooho & Bruce L.A. Charlier (2021) Taupō: an overview of New Zealand's youngest supervolcano, New Zealand Journal of Geology and Geophysics, 64:2-3, 320-346, DOI: 10.1080/00288306.2020.1792515

Calderas - Okataina Volcanic Complex



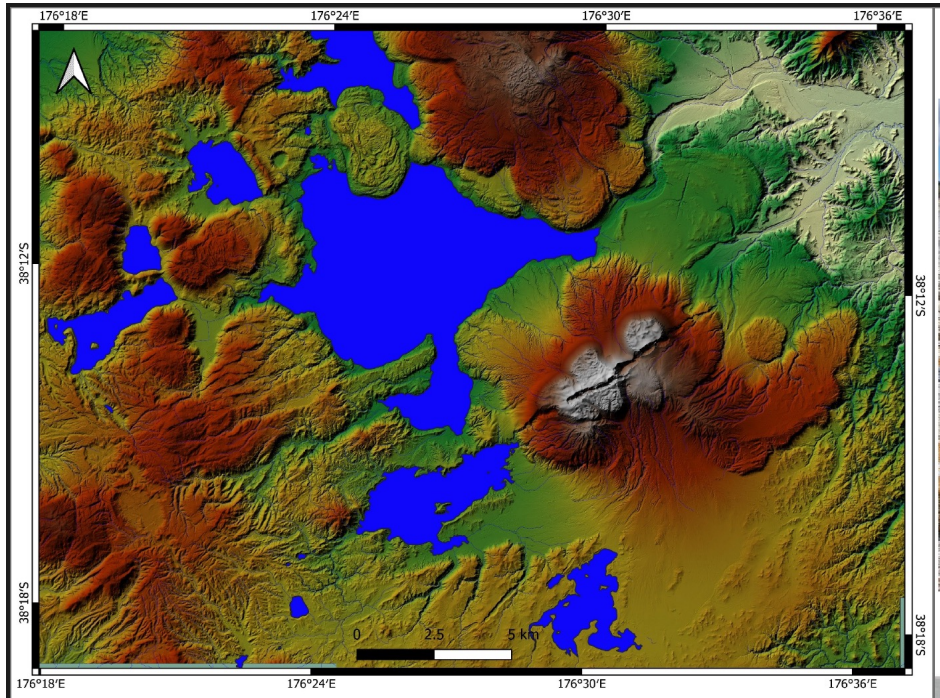


Features
- Subduction plate boundary
- Taupō Volcanic Zone calderas
- Currently active calderas
- Lakes
- Present day Ōkataina boundary
- Rhyolitic vents
- Basaltic vents
- Andesite/dacite volcanoes

Post-26 ka (Rotorua Subgroup) Eruptives
- Tarawera/Rotomahana (1886 CE)
- Kaharoa (1314 CE)
- Rotokawau (3.7 ka)
- Whakatāne (5.5 ka)
- Mamaku (7.9 ka)
- Rotomā (9.4 ka)
- Waiohau (14 ka)
- Rotorua (15.6 ka)
- Rerewhakaaitu (17.5 ka)
- Ōkareka (21.9 ka)
- Te Rere (25.2 ka)
- Te Rere (25.2 ka)

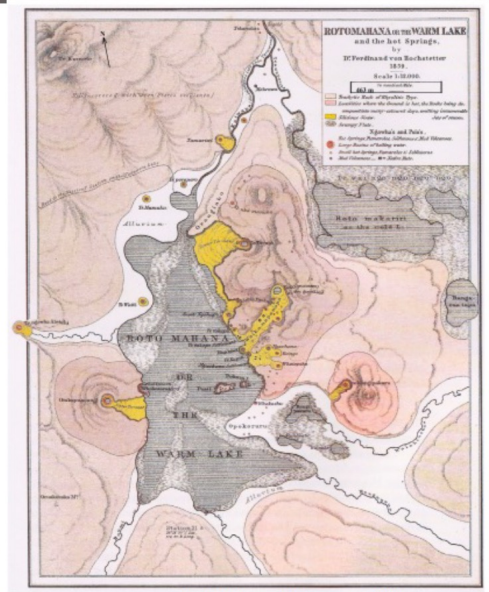
Processes and timescales of magmatic rejuvenation and residence prior to post-caldera rhyolitic eruptions: Ōkataina Volcanic Centre, Aotearoa New Zealand

Hannah C. Elms, Simon J. Barker, Daniel J. Morgan, Colin J.N. Wilson, Bruce L.A. Charlier



Geothermal heritage

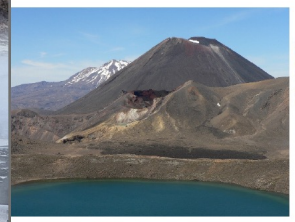
Bunn AR (2023), Resolving the1886 White Terraces riddle in the Taupō Volcanic Zone. Front. Earth Sci. 11:1007148. doi: 10.3389/feart.2023.1007148

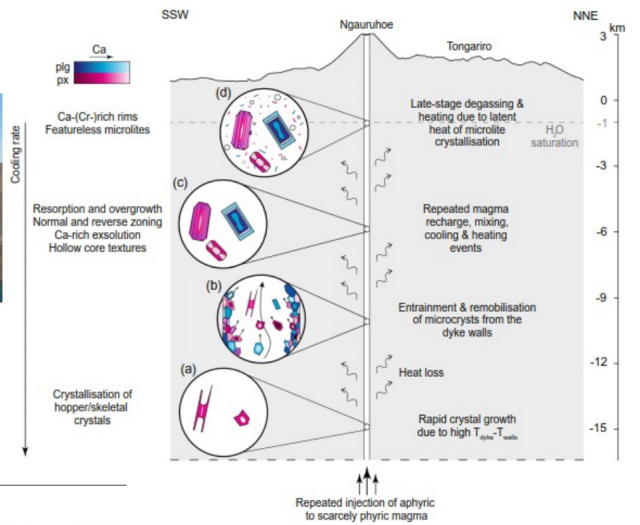


Hochstetter and Petermann, 1864

Blue sky events – impact on geotourism

Mineral level geoheritage





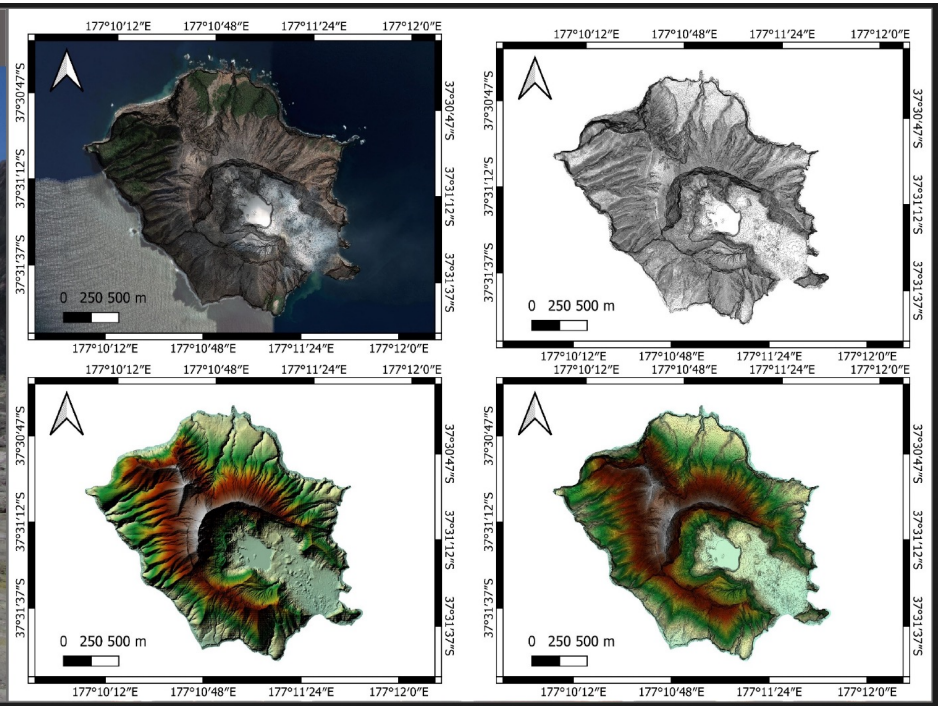
Contributions to Mineralogy and Petrology (2021) 176:97
https://doi.org/10.1007/s00410-021-01857-7

ORIGINAL PAPER

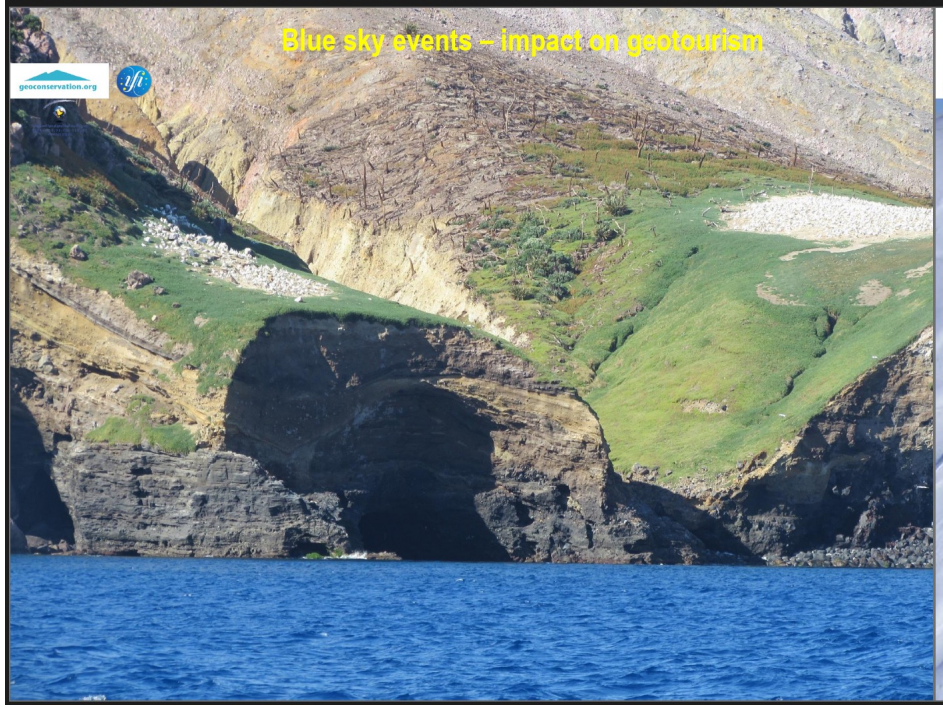
Shallow magmatic processes revealed by cryptic microantecrysts: a case study from the Taupo Volcanic Zone

Charline Lormand[1] · Georg Florian Zellmer[2] · Naoya Sakamoto[3] · Teresa Ubide[4] · Geoff Kilgour[5] · Hisayoshi Yurimoto[3] · Alan Palmer[6] · Karoly Németh[2] · Yoshiyuki Iizuka[7] · Anja Moebis[6]

Volcanic geoheritage vs volcanic hazard



Blue sky events – impact on geotourism



Lahar initiation

Tangiwai Disaster

Interaction of landscape evolution and volcanism

Conclusion