GEOLOGICAL MAP OF THE SANTORINI ISLANDS

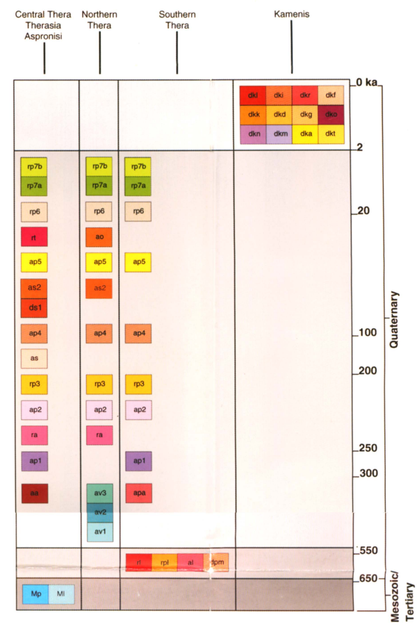
AEGEAN SEA, GREECE

Field work by T.H. Druitt and M.A. Davies 1994-95
Digital cartography by M.A. Davies

Mapping was carried out onto 1:10,000 topographic maps using the stratigraphical framework established by T.H. Druitt, R.A. Mellors, D.M. Pyle and R.S.J. Sparks (Druitt et al. 1989) and the K-Ar and 40Ar/39Ar whole - rock dating of M. Lanphere. Geological relationships were superimposed on a digital terrain model generated from the same base maps using software developed by J.-L. Froger. Age interpretations of Nea Kameni lavas are taken from Georgalas (1962), and those of Palaea Kameni from Fytikas et al. (1990). In each map symbol the first letter denotes the principle rock composition **b** (basalts; <53% SiO_2), **a** (andesite; 53-63% SiO_2), **d** (dacite; 63-68% SiO_2), and **r** (rhyodacite; 68-72% SiO_2), based on anhydrous chemical analyses (Huijsmans 1985; Druitt et al. 1989; this work). A subsequent letter **p** denotes a pyroclastic unit. Absence of the letter **p** denotes a lava - dominated unit. The main pyroclastic succession is subdivided **p1-p7**. Thickness in brackets are the greatest observed for the given deposit. The map was prepared in the computing laboratories of J.-F. Lenat and Richard W.T. Carlton with financial aid from the Thera Foundation, the European Union, and the Centre de Recherches Volcanologiques (French CNRS).

Correlation of map units

Relative ages of units in each of the 4 columns are well established from field evidence. Timescale approximate.



Superficial Formations (Quaternary)

Superficial units

- Scree
- Beach
- Landslip deposits

Volcanic Formations (Quaternary)

Kameni Islands

Dacites of the Kameni Islands. Lava domes, coulées, flows, and thin pyroclastic deposits of the Kameni Islands. dkl (Liatsikis lava 1950),dki (Niki lavas 1940-41), dkr (Reck and Smith lavas 1940),dkf (Fouqué lavas 1939-40), dkk (Ktenas lavas 1939),dkd (Dafni lavas 1925-28), dkg (Georgios lavas 1866-70), dko (Afroessa lavas 1866), dkn (Nea Kameni lavas 1707-11), dkm (Mikri Kameni lavas 1570-1573), dka (Agios Nikolaos lavas 726 AD), dkt (Thira lavas 46-47 AD).

Second explosive cycle

- **Minoan Tuff (phase 4)**. Rhyodacitic ignimbrite (40m) of the Minoan eruption interstratified with lithic - rich coignimbrite lag breccias and locally overlain by alluvium.
- **Minoan Tuff (phases 1-3)**. Rhyodacitic Plinian pumice overlain by base-surge deposits and thick, massive phreatomagmatic ash (55m) with multiple depositional facies. 14C age of 3.6ka (Freidrich et al. 1990).
- **Cape Riva Tuff**. Rhyodacitic Plinian pumice overlain by two thin welded ignimbrites, nonwelded ignimbrite, and lithic-rich coignimbrite lag breccias (40m). 14C age of 18ka (Pichler and Freidrich 1976), corresponding to a calibrated age of 21ka (Bard et al.1990).
- **Andesites of Oia**
- **Rhyodacites of Therasia**. Domes and coulées of Therasia dome complex, which crop out onTherasia and Thira.
- **Upper Scoriae 2**. Andesitic pyroclastic deposits of Upper Scoriae 2 eruption. Dominated in southern Thera by grey scoria-flow deposits (20m) which commonly occupy channels. Dominated in northern Thera and on Therasia by red agglomerates (65m) and subordinate lithic breccias laid down by scoria flows. Agglomerate densely welded at Cape Tourlos. K-Ar age 79 ± 8ka, 40Ar/39Ar age 54 ± 3 ka.
- **Andesites and basalts of Cape Skaros**. Andesitic and basaltic lavas of the dissected Skaros lava shield. Approximately 25 stacked flows.
- **Dacites of Cape Skaros**. Lava domes and coulées forming the base of the Skaros lava shield. 40Ar/39Ar age 67 ± 9Ka.
- **Middle Tuffs**. Andesitic to dacitic pyroclastic deposits of the Cape Thera, Middle Pumice, Vourvoulos, and Upper Scoriae 1 eruptions. Cape Thera: pumice-fall deposit, pyroclastic surge deposits, and pink scoria-flow deposits (60m). Middle Pumice: Plinian pumice (densely welded at Thira) overlain by lithic-lag breccias, ignimbrite and hydrothermal explosion breccias (60m). Vourvoulos: pumice-fall deposit overlain by pyroclastic surge and scoria-flow deposits (2.5m). Upper Scoriae 1: scoria-fall and base-surge deposits overlain by black to red agglomerates (15m) and subordinate lithic breccias laid down by scoria flows. Products of Megalo Vouno cinder cone, Kokkino Vouno cinder cone, and Cape Columbos tuff ring lie stratigraphically within unit ap4, but are of negligible thickness except in NE Thera.
  - Unit **ap4** phreatomagmatic tuffs of the Cape Columbos tuff ring.
  - Unit **ap4** agglutinated spatter and clastogenetic lava flows from Megalo Vouno and Kokkino Vouno cinder cones. K-Ar ages 54 ± 23 ka and 76 ± 28ka.
  - Unit **ap4** black or red scoria of Megalo Vouno and Kokkino Vouno cinder cones.
- **Andesites and basalts of Cape Simandiri**. Andesites and basalts forming the remnant of a lava shield, the ancient summit of which lay in the present caldera. K-Ar age 172 ± 33 ka, 40Ar/39Ar age 172 ± 4 ka.

First explosive cycle

- **Lower Pumices**. Rhyodacitic pyroclastic deposits of the two Lower Pumice eruptions. Lower Pumice 1: Plinian pumice overlain by ignimbrite and red-brown lithic-rich coignimbrite lag breccias (20m). Lower Pumice 2: Plinian pumice overlain by ignimbrite and massive, yellowish phreatomagmatic ash (20m) capped by grey lithic breccias. Lower Pumice 2 acts as a distinctive marker horizon. K-Ar age 203 ± 24 ka (Lower Pumice 1).
- **Cape Therma 3 Tuff**. Andesitic pyroclastic deposits of the Cape Therma 3 eruption. Scoria flow deposits with lithic-rich and pink to red agglomeratic lag facies (25m).
- **Rhyodacites of Cape Alonaki**. Lavas of Cape Alonaki and NE Thera, correlated on the basis of similar ages, stratigraphic positions, and chemical compositions. K-Ar ages 224 ± 5 ka (Alonaki) and 257 ± 31 ka (NE Thera).
- **Cape Therma 1 Tuff**. Andesitic pyroclastic deposits of the Cape Therma 1 eruption. Nonwelded to incipiently welded scoria-flow deposits (80m) with subordinate lithic-rich and agglomeratic lag facies. Unit includes stratified phreatomagmatic tuffs which underlie Cape Therma 1 near Cape Alonaki and the pumice-fall deposit (2.5m) of the Cape Therma 2 eruption which overlies Cape Therma 1.
- **Andesites of Cape Alai**. K-Ar ages 364 ± 62 ka and 345 ± 88 ka. 40Ar/39Ar age of 456 ± 138 ka.

Peristeria Volcano

- **Andesites, basalts and dacites of Peristeria 3**. Dacitic to basaltic lavas and tuffs of the youngest parts of Peristeria Volcano. K-Ar ages 480 ± 5 ka, 464 ± 8 ka, and 433 ± 8 ka. K-Ar age of lava on the NE flank 308 ± 10 ka, 40Ar / 39Ar age 478 ± 3 ka.
- **Andesites of Peristeria 2**. Massive andesitic lava flows and domes of Peristeria Volcano, probably contemporaneous. K-Ar age 496 ± 6 ka.
- **Andesites of Peristeria 1**. Andesitic lavas, tuffs, and breccias of the core complex of Peristeria Volcano. K-Ar age of stratigraphically lowest flow 528 ± 23 ka.

Cinder cones of the Akrotiri Peninsula

- **Andesites and basalts of Akrotiri**. Andesitic and basaltic cinder cones of the Akrotiri Peninsula with subordinate agglutinate and lava. Cape Balos (basaltic), Cape Kokkinopetra (basaltic), and Cape Mavrorachidi (andesitic). Phreatomagmatic deposits of cogenetic tuff ring underlie the cinder cone at Cape Balos. K-Ar ages 344 ± 25 ka (Balos) and 522 ± 104 ka (Mavrorachidi). 40Ar / 39Ar age 451 ± 27 ka on Mavrorachidi.

Early centres of the Akrotiri Peninsula

- **Rhyodacites of Akrotiri**. Hornblende-bearing rhyodacitic lava domes and coulées of Cape Akrotiri and the Loumaravi-Arkhangelos massif. K-Ar ages 645 ± 92 ka, 586 ± 15 ka. 40Ar / 39Ar age 553 ± 10 ka and 582 ± 24 ka.
- **Tuffs of Akrotiri**. Hornblende-bearing rhyodacite pumice tuffs and submarine vitric tuffs of the Loumaravi-Arkhangelos massif. Intercalated lava and hyaloclastite.
- **Andesities of Mount Loumaravi**. Isolated lava of Loumaravi-Arkhangelos-Massif.
- **Dacites of Cape Mavros**. Dacitic phreatomagmatic tuffs and domes of Cape Mavros. K-Ar age 619 ± 35 ka.

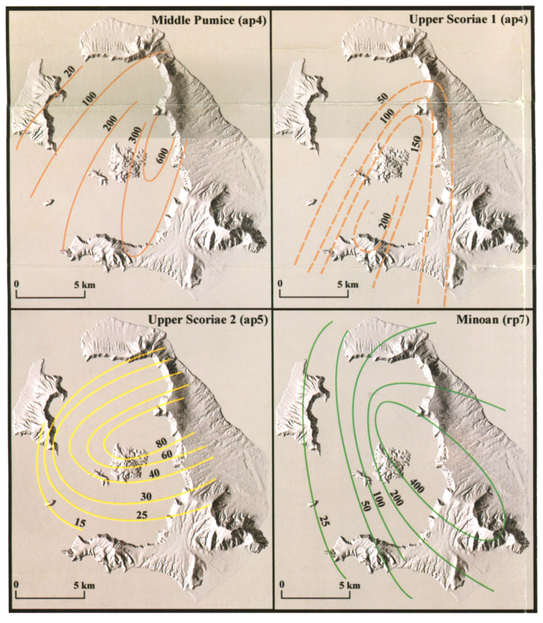
Basement Formation (Mesozoic to Tertiary)

- **Metapelites of Athinios**. Metapelites with subordinate metapsammites, metavolcanics, and marbles metamorphosed to blueschist grade and overprinted under greenschist to amphibolite conditions (Skarpelis & Liati 1990). Occurrence of Miliolidae indicative of Palaeocene-Eocene age (Tartaris 1964). Olistostromic facies between Mt. Profitis Ilias and Mt. Mesa Vouno.
- **Limestones of Mount Profitis Ilias**. Limestones and marbles. Occurrence of Megalodontidae indicative of Triassic, probably upper Triassic, age (Papastamatiou 1958).

- Surfaced road
- Unsurfaced road
- Footpath
- Lighthouse
- Triangulation Pillar (met as)
- Spot height (metres)
- Windmill
- Church
- Houses
- 582 ± 24 ka — K-Ar, 40Ar / 39Ar date
- 15 — Strike and dip (in degrees)
- Fault mapped, tick on downthrow
- Fault inferred
- Dyke
- Contours, 20m intervals
- Bathymetry (50m intervals)

Isopach maps of selected Plinian pumice - fall deposits

Isopach contours in centimetres



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