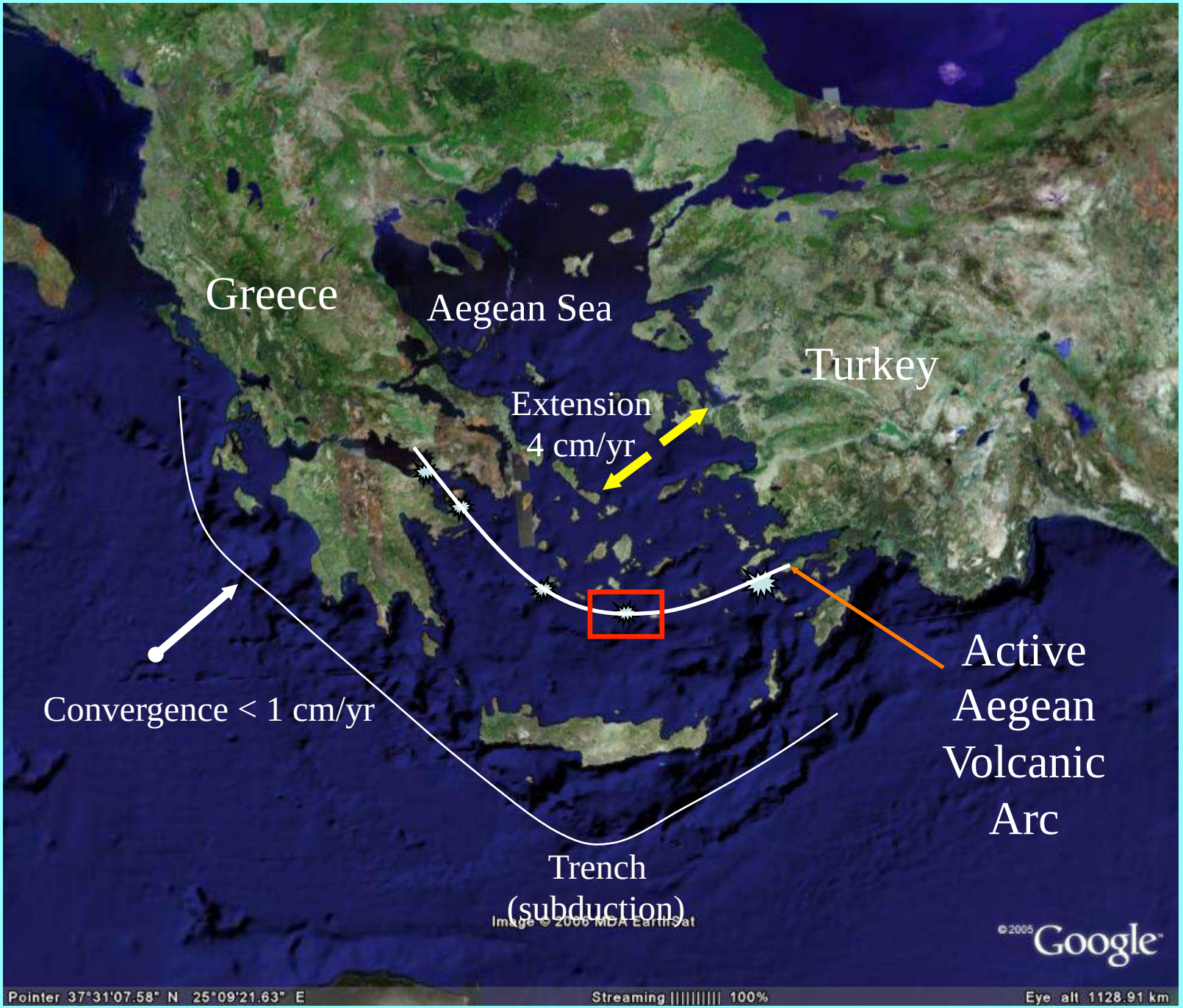
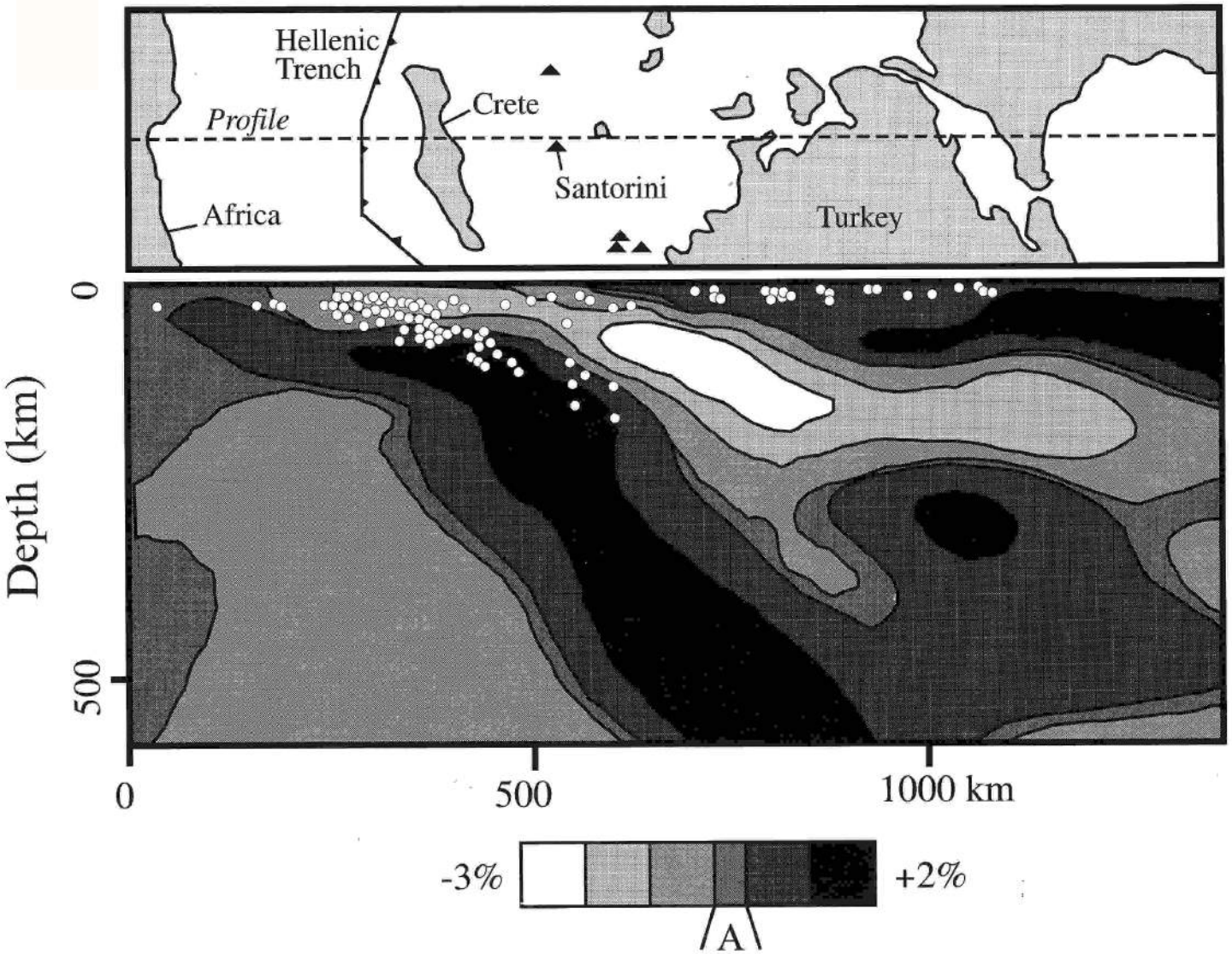
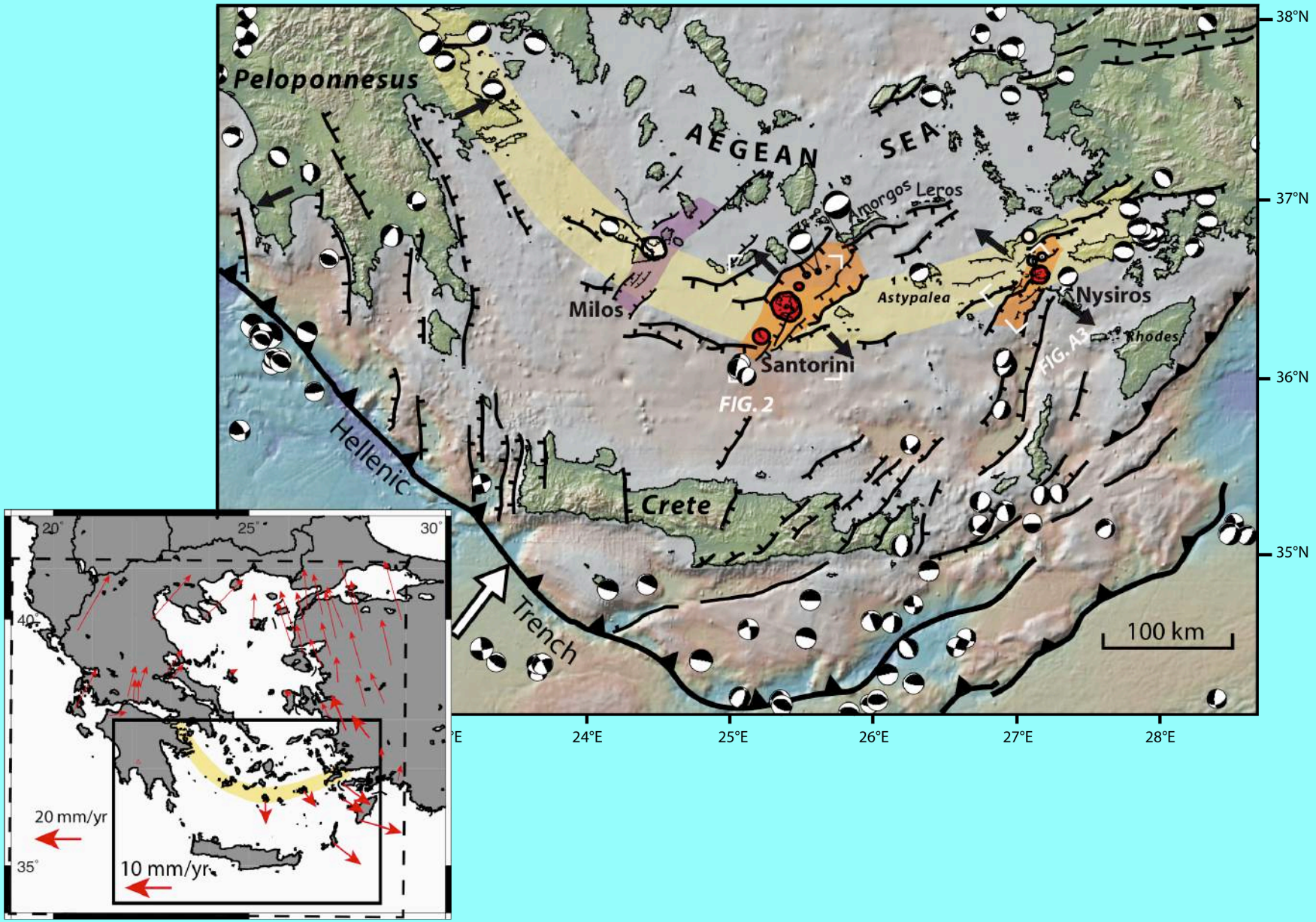
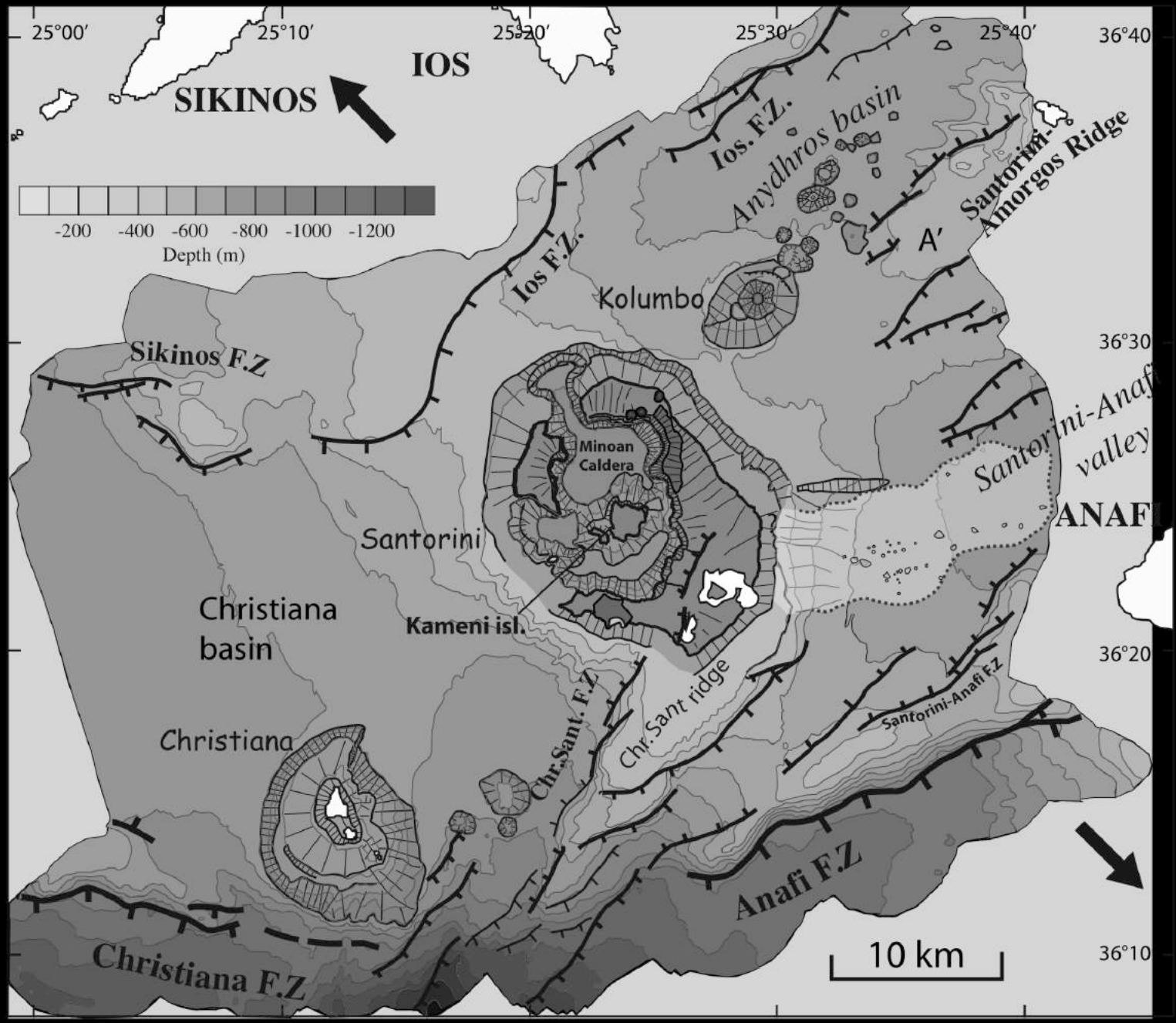
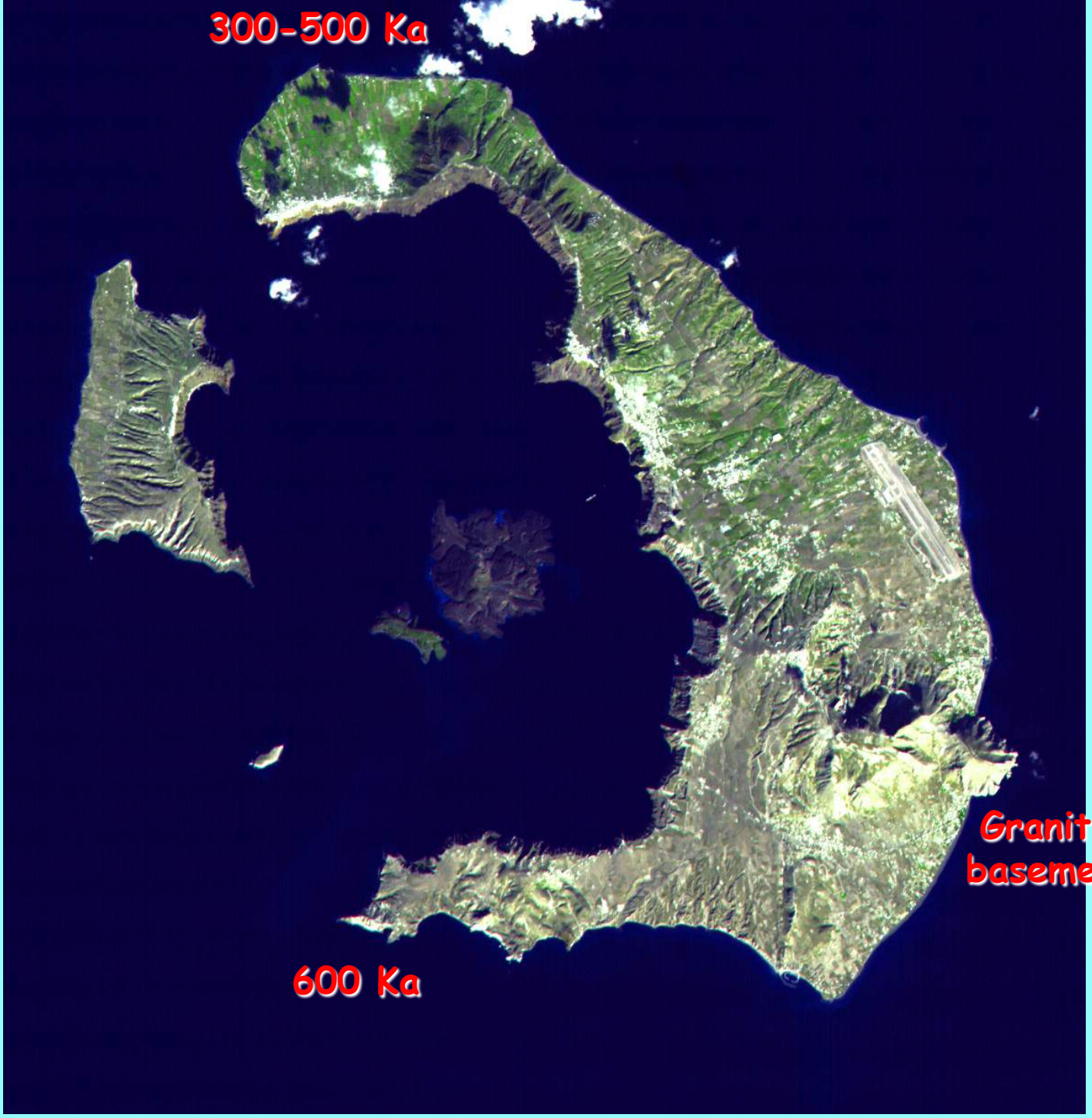
SANTORINI VOLCANO


Greece
Aegean Sea
Turkey
Extension
4 cm/yr
Convergence < 1 cm/yr
Active
Aegean
Volcanic
Arc
Trench
(subduction)
Image © 2006 MDA EarthSat
©2005 Google
Pointer 37°31'07.58" N 25°09'21.63" E
Streaming 100%
Eye alt 1128.91 km


Hellenic
Trench
Crete
Profile
Santorini
Africa
Turkey
0
500
Depth (km)
0
500
1000 km
-3%
+2%
A

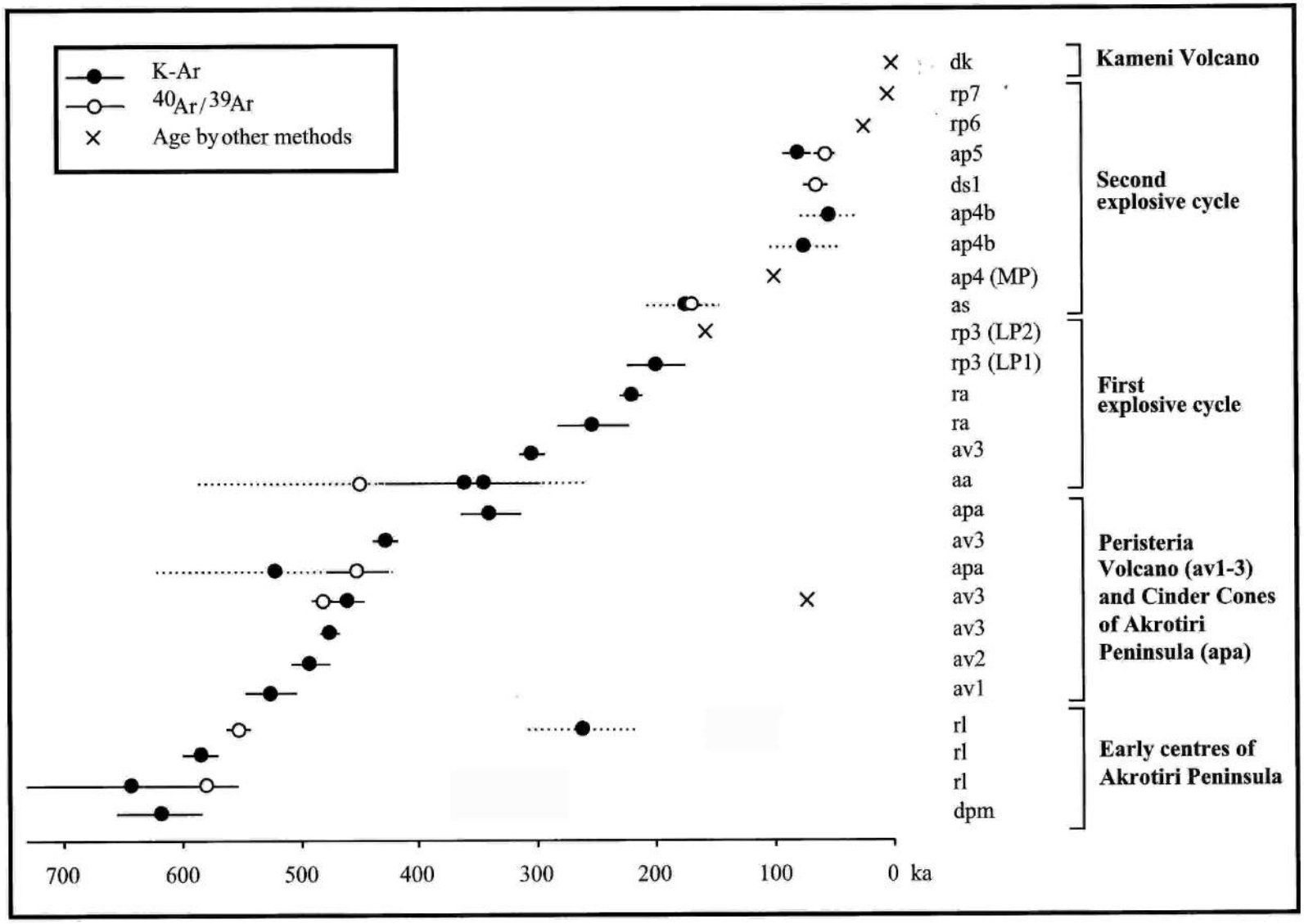

Peloponnesus
AEGEAN SEA
Amorgos
Leros
Milos
Astypalea
Nysiros
Rhodes
Santorini
FIG. 2
FIG. A3
Hellenic
Crete
Trench
100 km
38°N
37°N
36°N
35°N
24°E
25°E
26°E
27°E
28°E
20°
25°
30°
40°
35°
20 mm/yr
10 mm/yr

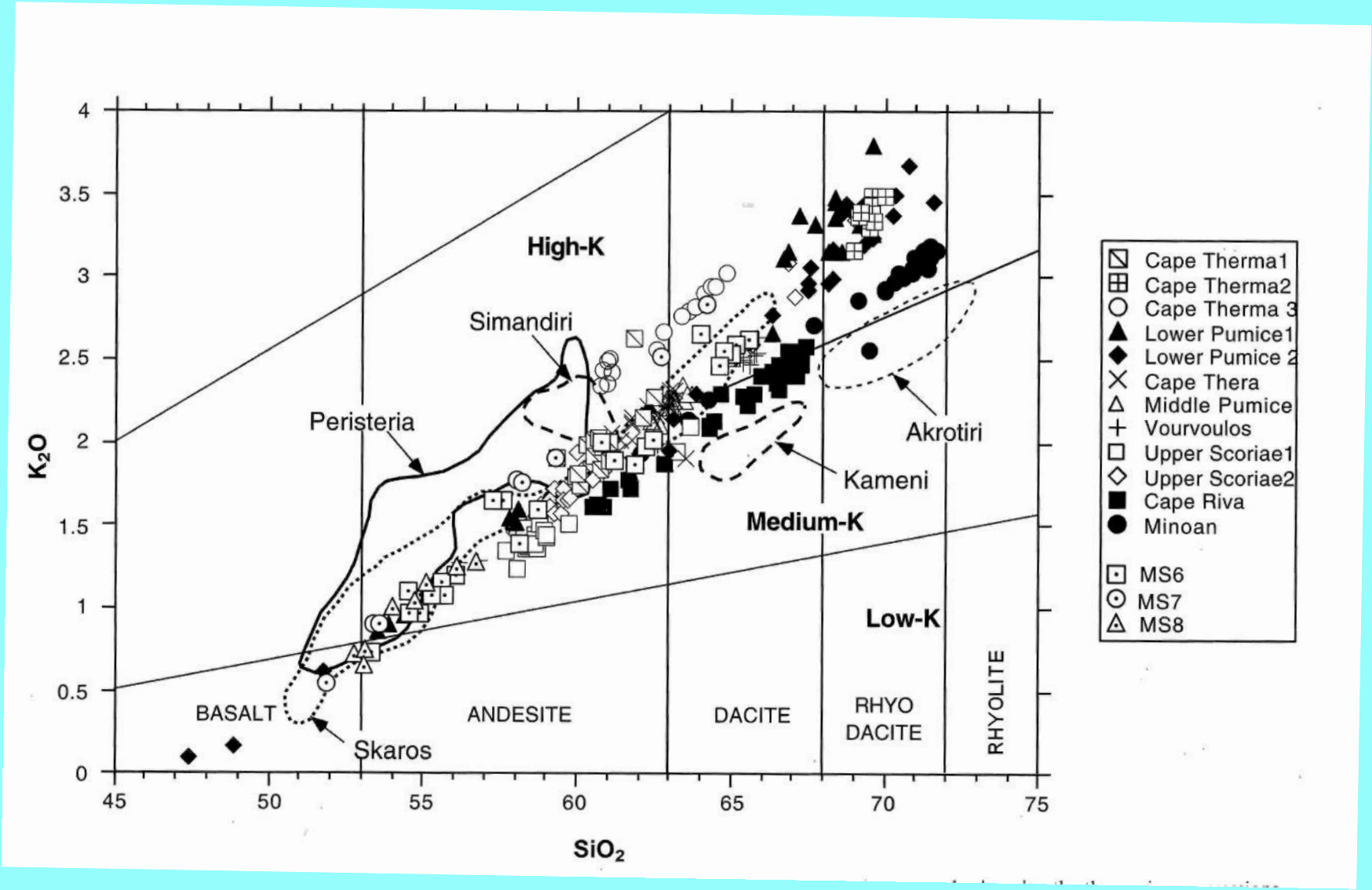

25°00′
25°10′
25°20′
25°30′
25°40′
36°40
36°30
36°20
36°10
IOS
SIKINOS
-200 -400 -600 -800 -1000 -1200
Depth (m)
Ios. F.Z.
Anydhros basin
Santorini-Amorgos Ridge
A′
Ios F.Z.
Kolumbo
Sikinos F.Z
Minoan Caldera
Santorini-Anafi valley
ANAFI
Santorini
Christiana basin
Kameni isl.
Chr.Sant. F.Z
Chr.Sant ridge
Santorini-Anafi F.Z
Christiana
Anafi F.Z
Christiana F.Z
10 km

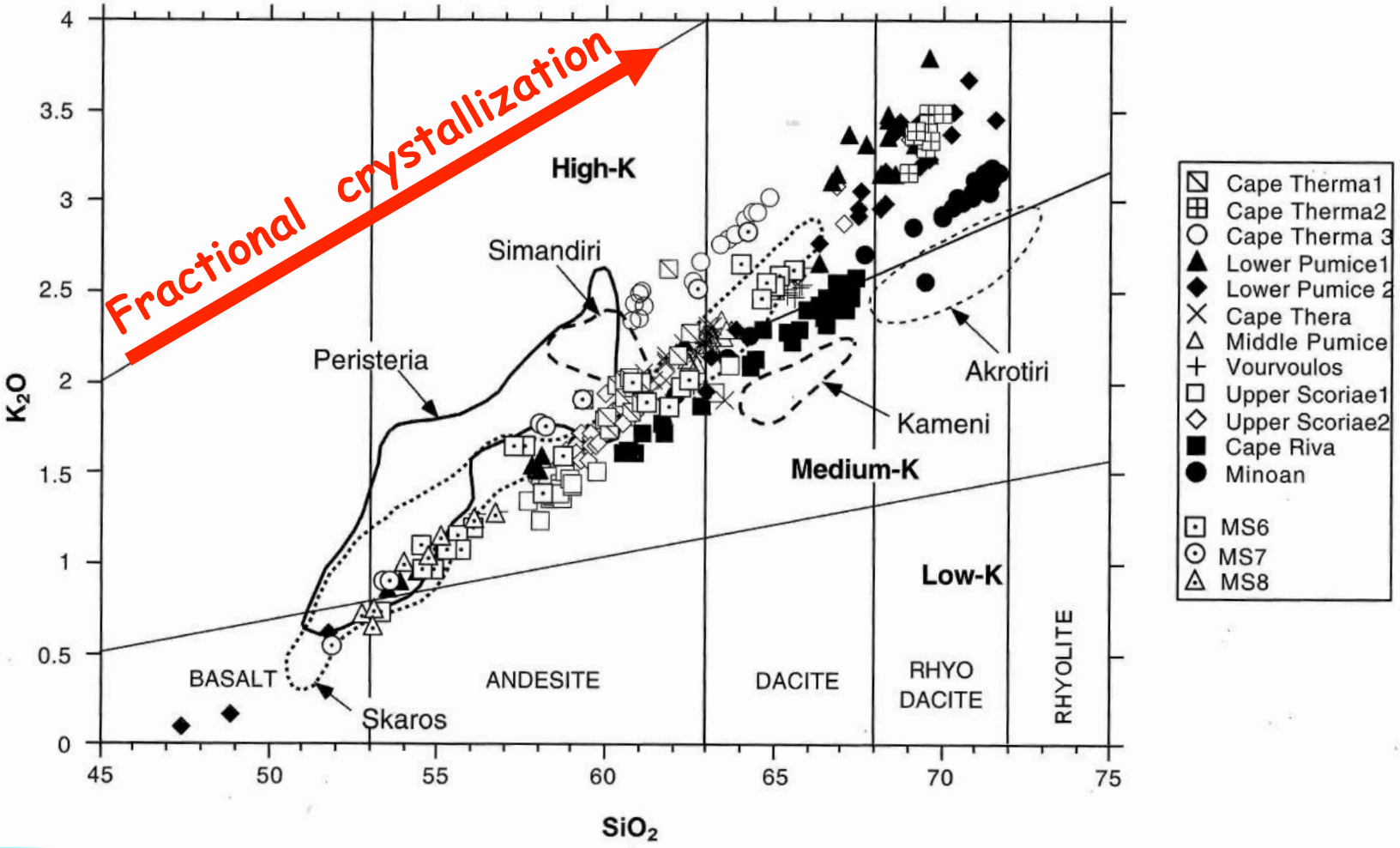

300-500 Ka
Granitic basement
600 Ka

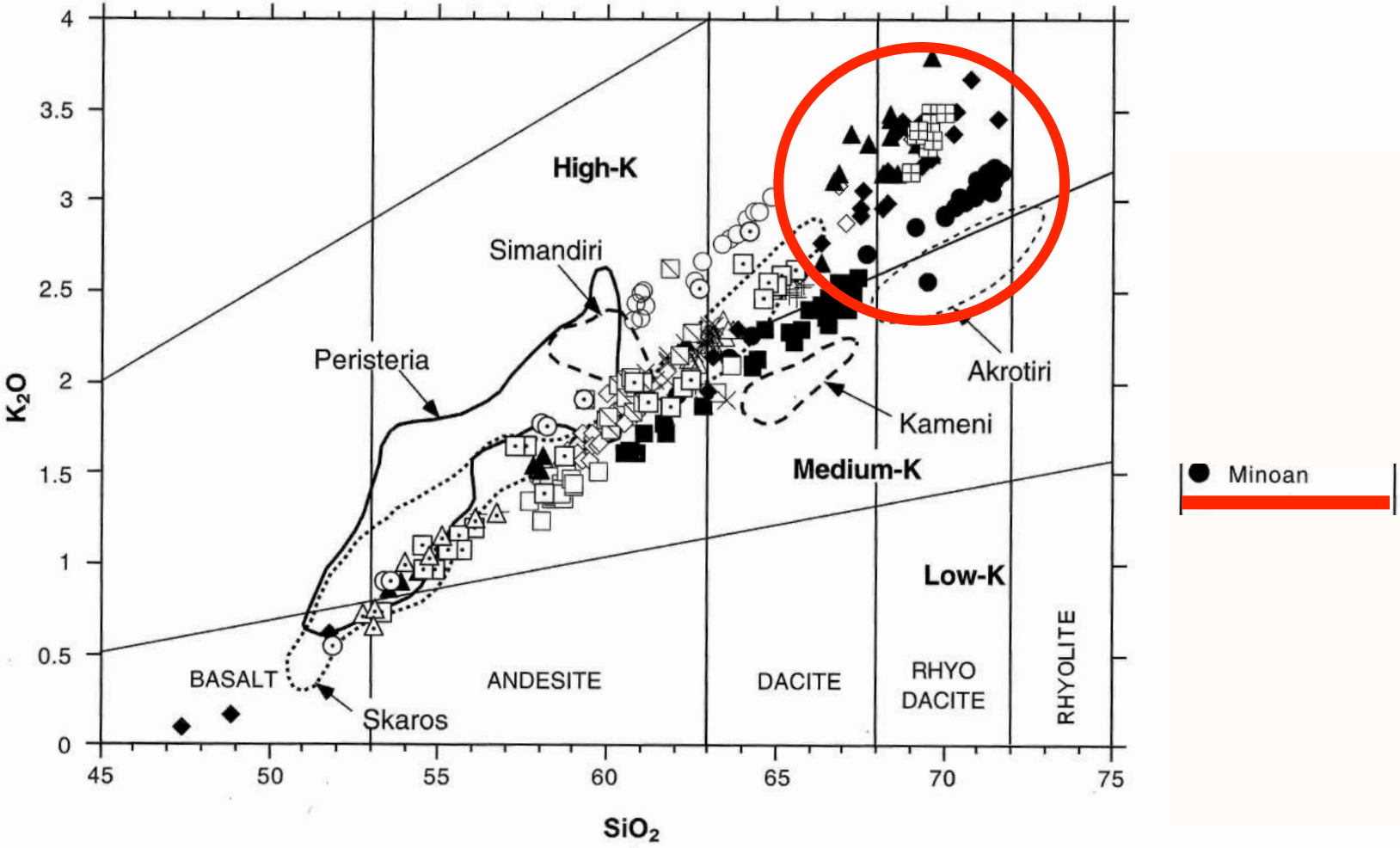

Skaros shield
~ 75 Ka


Skaros shield
~ 75 Ka


K-Ar
40Ar/39Ar
Age by other methods
dk
rp7
rp6
ap5
ds1
ap4b
ap4b
ap4 (MP)
as
rp3 (LP2)
rp3 (LP1)
ra
ra
av3
aa
apa
av3
apa
av3
av3
av2
av1
rl
rl
rl
dpm
Kameni Volcano
Second explosive cycle
First explosive cycle
Peristeria Volcano (av1-3) and Cinder Cones of Akrotiri Peninsula (apa)
Early centres of Akrotiri Peninsula
700
600
500
400
300
200
100
0 ka

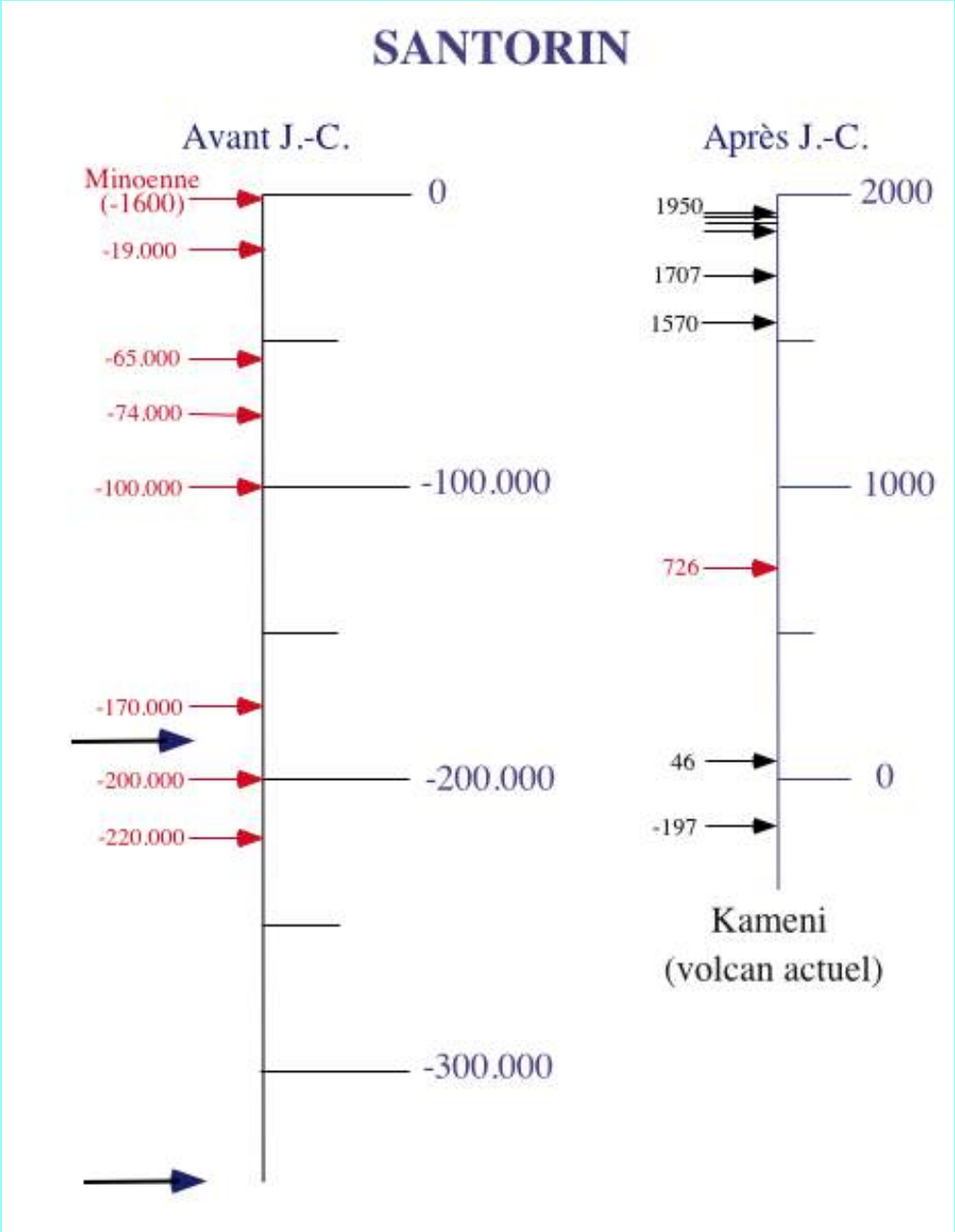

High-K
Medium-K
Low-K
Simandiri
Peristeria
Akrotiri
Kameni
Skaros
BASALT
ANDESITE
DACITE
RHYO DACITE
RHYOLITE
K_2O
SiO_2
0
0.5
1
1.5
2
2.5
3
3.5
4
45
50
55
60
65
70
75
Cape Therma1
Cape Therma2
Cape Therma 3
Lower Pumice1
Lower Pumice 2
Cape Thera
Middle Pumice
Vourvoulos
Upper Scoriae1
Upper Scoriae2
Cape Riva
Minoan
MS6
MS7
MS8


Fractional crystallization
High-K
Medium-K
Low-K
Simandiri
Peristeria
Akrotiri
Kameni
Skaros
BASALT
ANDESITE
DACITE
RHYO DACITE
RHYOLITE
K_2O
SiO_2
0
0.5
1
1.5
2
2.5
3
3.5
4
45
50
55
60
65
70
75
Cape Therma1
Cape Therma2
Cape Therma 3
Lower Pumice1
Lower Pumice 2
Cape Thera
Middle Pumice
Vourvoulos
Upper Scoriae1
Upper Scoriae2
Cape Riva
Minoan
MS6
MS7
MS8


High-K
Medium-K
Low-K
Simandiri
Peristeria
Akrotiri
Kameni
Skaros
BASALT
ANDESITE
DACITE
RHYO DACITE
RHYOLITE
Minoan
K_2O
SiO_2
0
0.5
1
1.5
2
2.5
3
3.5
4
45
50
55
60
65
70
75

Caldera collapse
≈ 30.000 years

Two "long" cycles
(defined by
chemical variations)
≈ 180.000 years



Santorin eruptive cycles

(1) ≈ 20.000 - 30.000 years : shallow magmatic reservoir
(filling it up,
crystallizing and differentiating its magma
and emptying it)

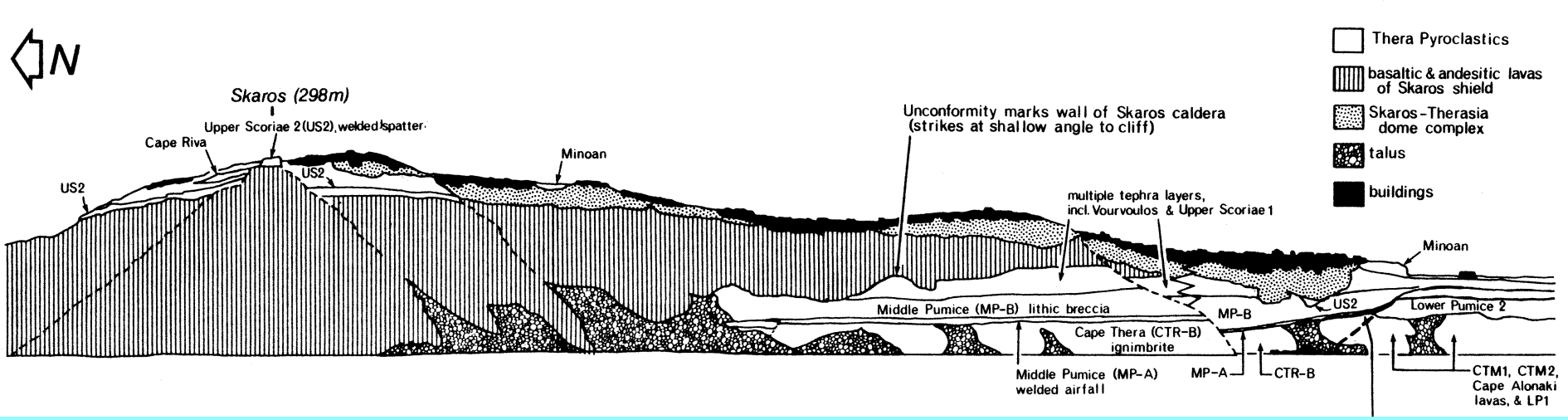
(2) ≈ 150.000 years : deeper plumbing system

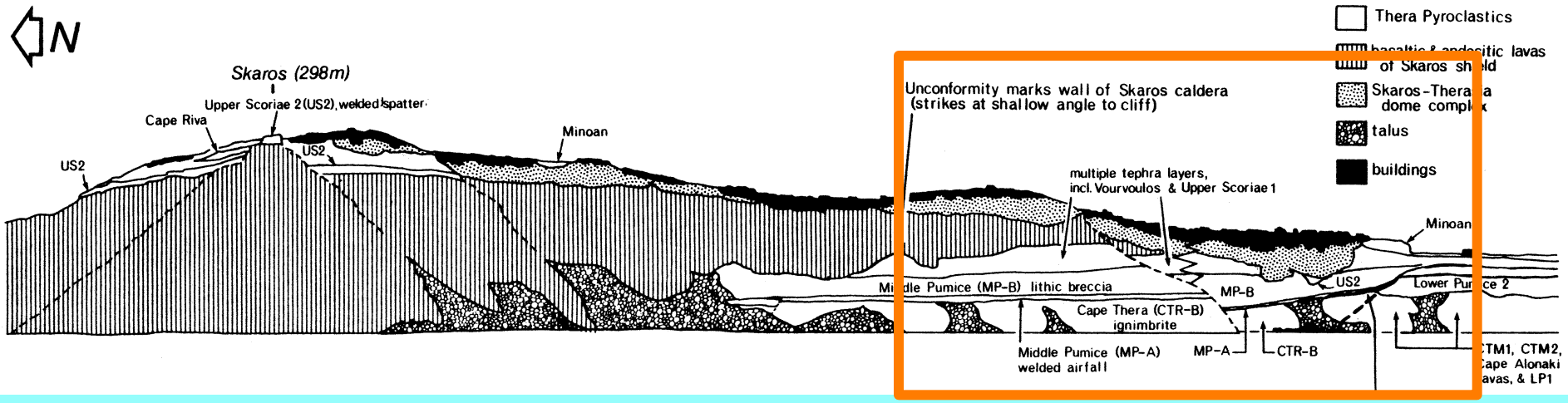
The volcano has been fed from the same deep source
for **≈ 650.000 years**

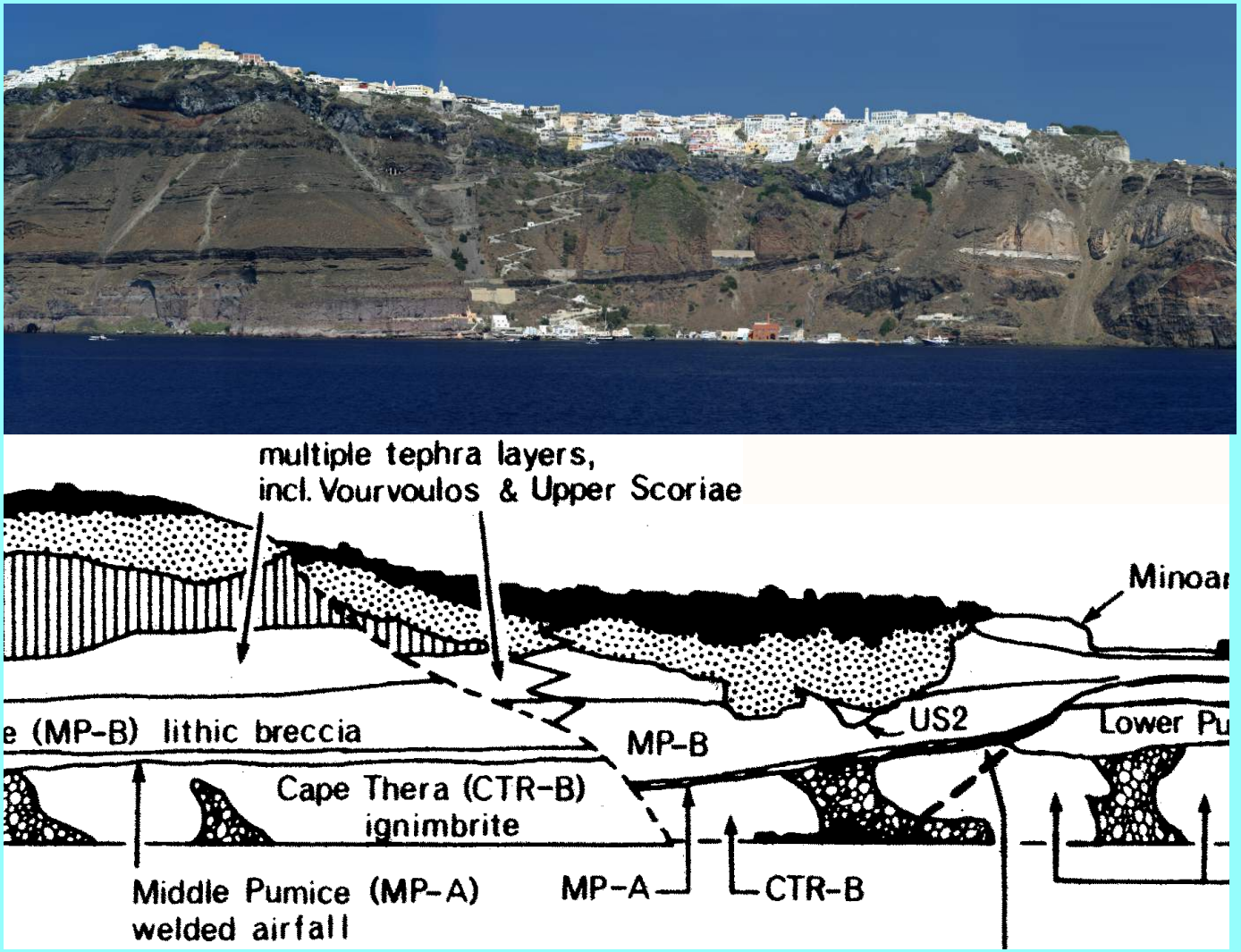
MAGMA PRODUCTION RATE

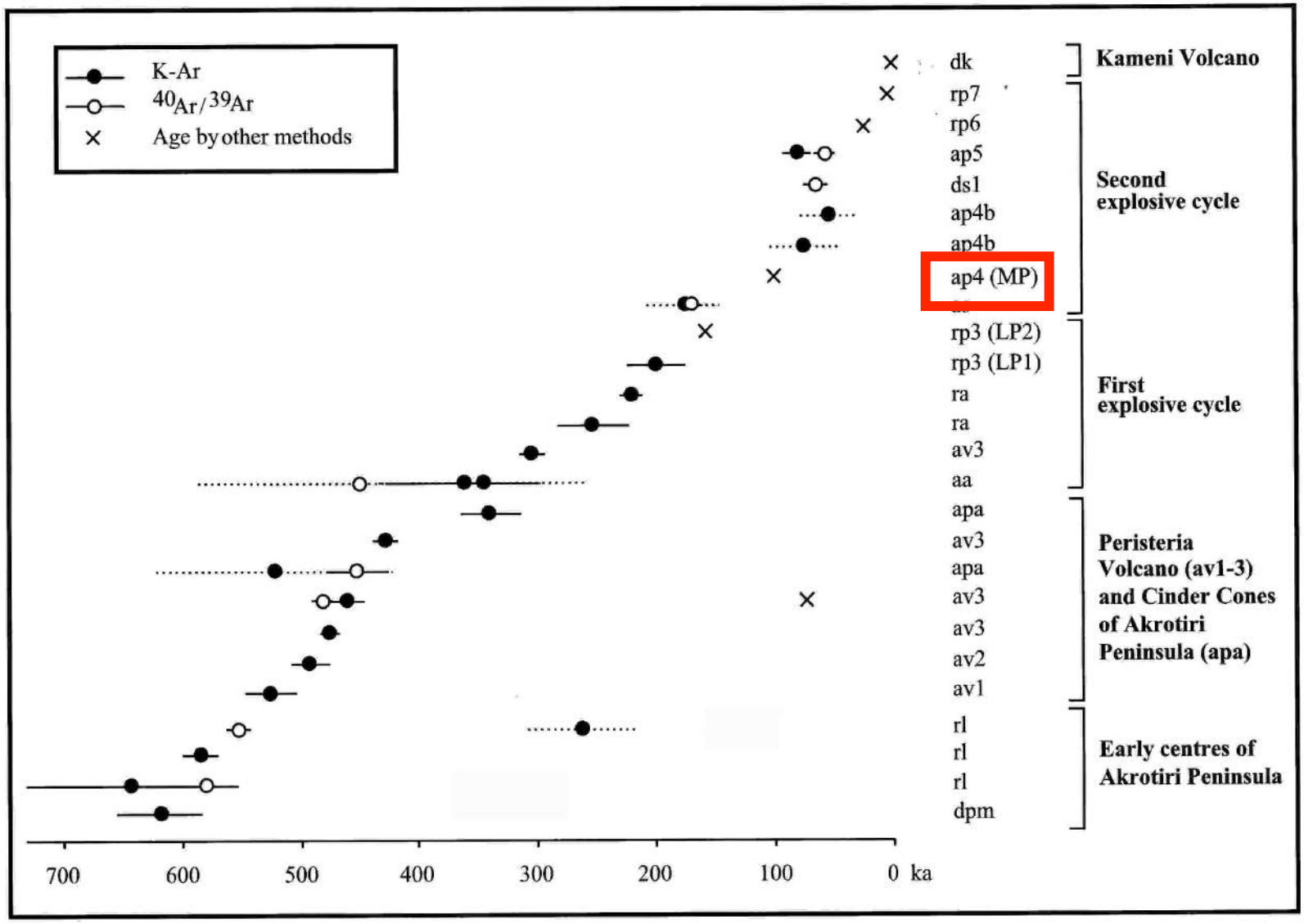
Total time	≈ 650 000 years		
Nea Kameni island (current cycle)	≈ 3500 years	≈ 2.5 km^3	**0.7 km^3/ky**
Minoan reservoir	≈ 17500 years	≈ 30 km^3	**1.7 km^3/ky**
Skaros shield	≈ 12000 years	≈ 10 km^3	**0.8 km^3/ky**

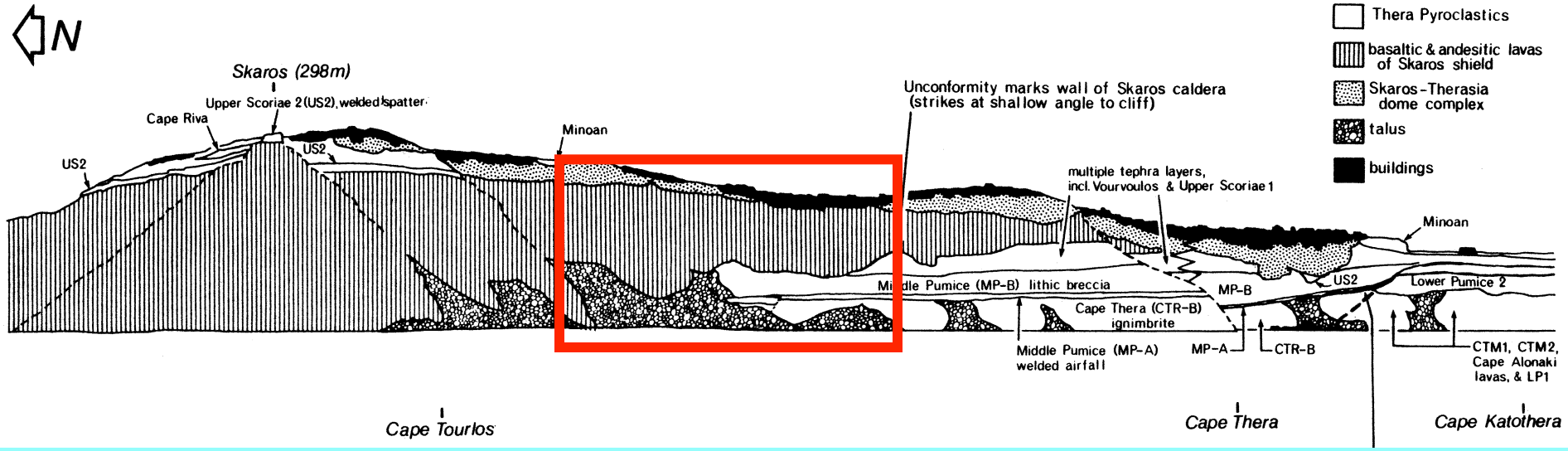
Total erupted volume	≈ 650 km^3		
Total volume of intrusives	≈ 650 km^3		
Island area	≈ 60 km^2		
Mean thickness of plutonic rocks (intrusives)		≈ 10 km	
Total crustal thickness beneath Santorini		≈ 30 km	(30% “juvenile”)


N
Skaros (298m)
Upper Scoriae 2 (US2), welded spatter
Cape Riva
US2
US2
Minoan
Unconformity marks wall of Skaros caldera
(strikes at shallow angle to cliff)
multiple tephra layers,
incl. Vourvoulos & Upper Scoriae 1
Minoan
Middle Pumice (MP-B) lithic breccia
MP-B
US2
Lower Pumice 2
Cape Thera (CTR-B)
ignimbrite
Middle Pumice (MP-A)
welded airfall
MP-A
CTR-B
CTM1, CTM2,
Cape Alonaki
lavas, & LP1
Thera Pyroclastics
basaltic & andesitic lavas
of Skaros shield
Skaros-Therasia
dome complex
talus
buildings

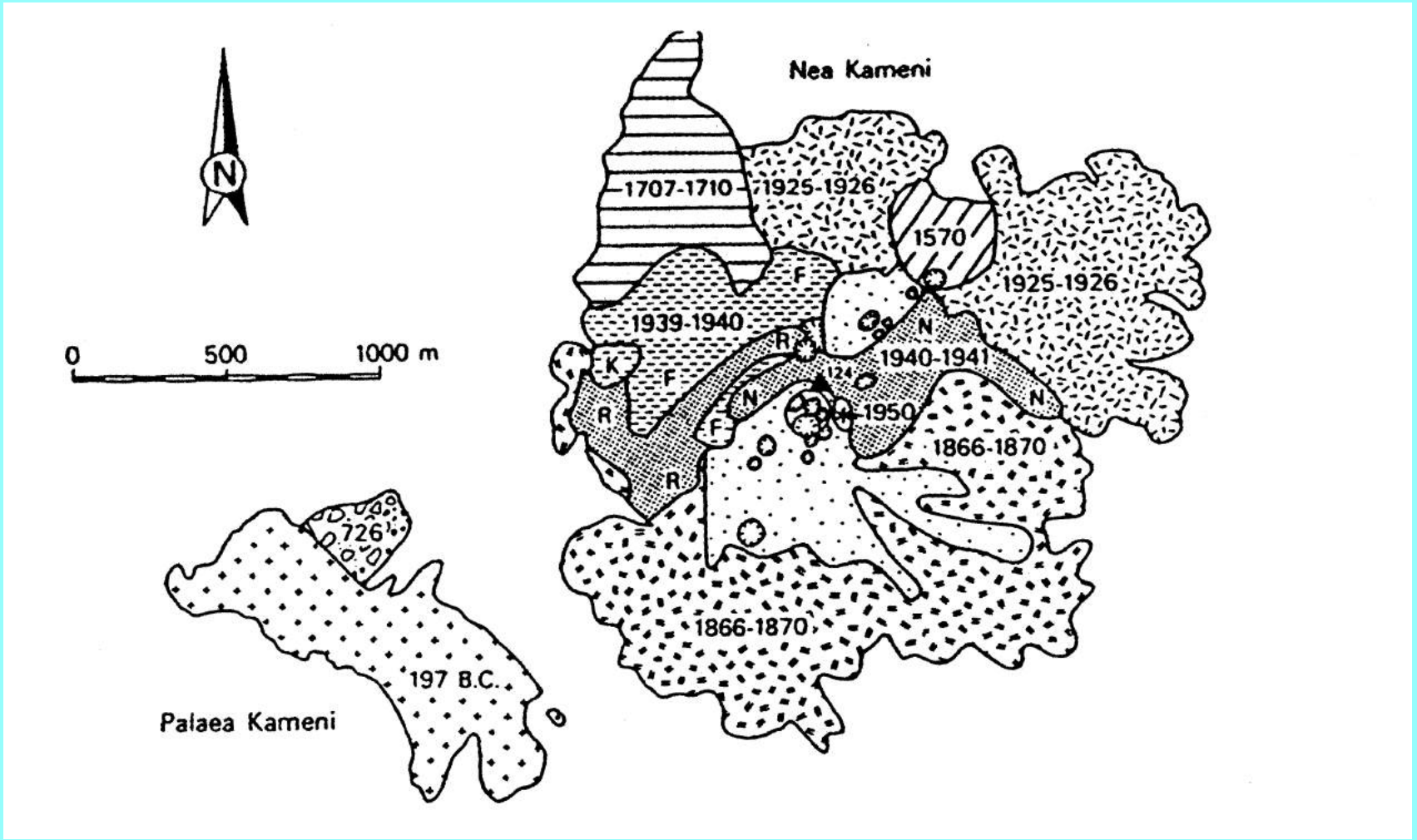

N
Skaros (298m)
Upper Scoriae 2 (US2), welded spatter
Cape Riva
US2
US2
Minoan
Thera Pyroclastics
basaltic & andesitic lavas of Skaros shield
Skaros-Thera dacite dome complex
talus
buildings
Unconformity marks wall of Skaros caldera (strikes at shallow angle to cliff)
multiple tephra layers, incl. Vourvoulos & Upper Scoriae 1
Minoan
Middle Pumice (MP-B) lithic breccia
MP-B
US2
Lower Pumice 2
Cape Thera (CTR-B) ignimbrite
Middle Pumice (MP-A) welded airfall
MP-A
CTR-B
CTM1, CTM2, Cape Alonaki lavas, & LP1


multiple tephra layers,
incl. Vourvoulos & Upper Scoriae
Minoan
e (MP-B) lithic breccia
MP-B
US2
Lower Pu
Cape Thera (CTR-B)
ignimbrite
Middle Pumice (MP-A)
welded airfall
MP-A
CTR-B

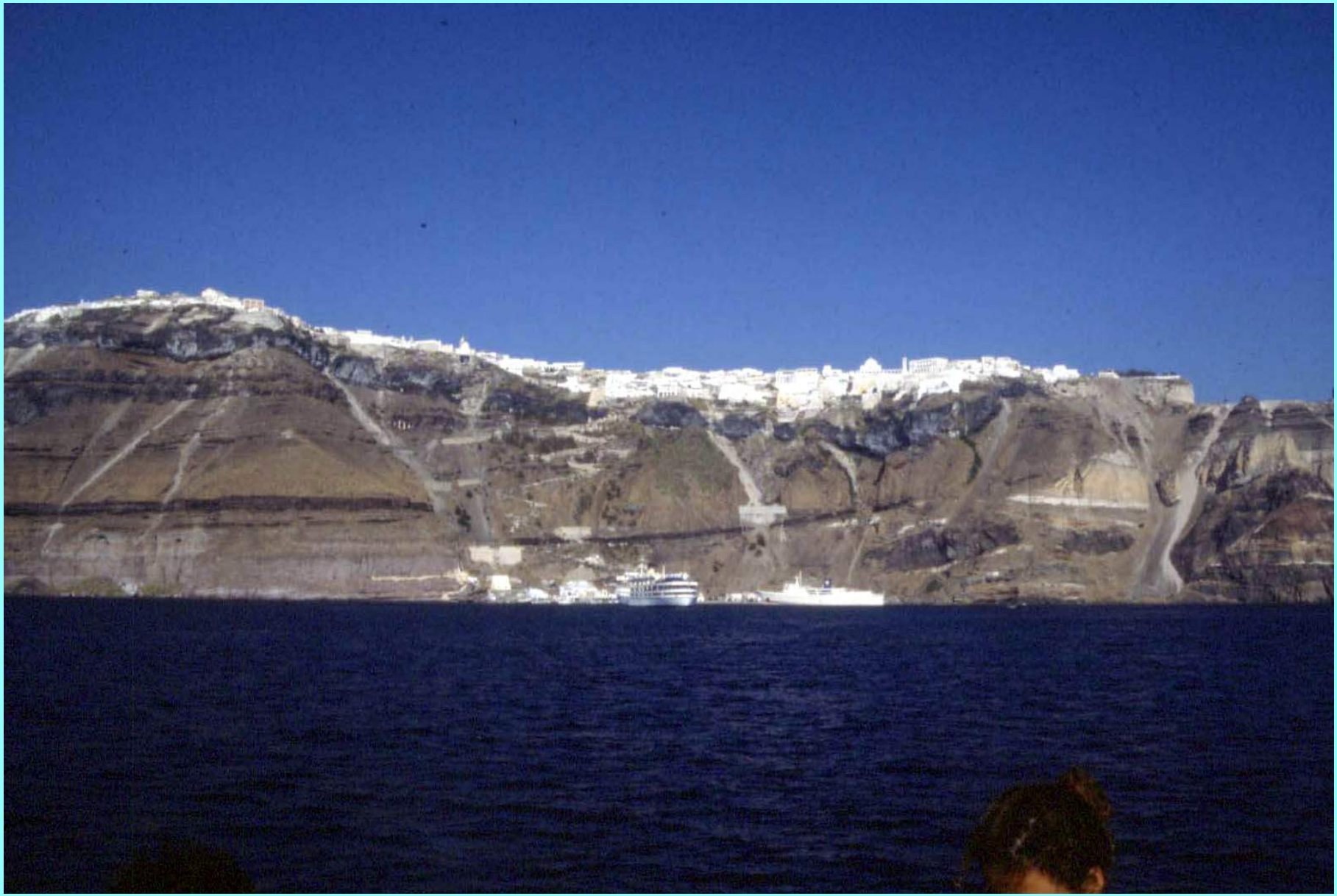

K-Ar
40Ar/39Ar
Age by other methods
dk
rp7
rp6
ap5
ds1
ap4b
ap4b
ap4 (MP)
rp3 (LP2)
rp3 (LP1)
ra
ra
av3
aa
apa
av3
apa
av3
av3
av2
av1
rl
rl
rl
dpm
Kameni Volcano
Second explosive cycle
First explosive cycle
Peristeria Volcano (av1-3) and Cinder Cones of Akrotiri Peninsula (apa)
Early centres of Akrotiri Peninsula
700
600
500
400
300
200
100
0 ka

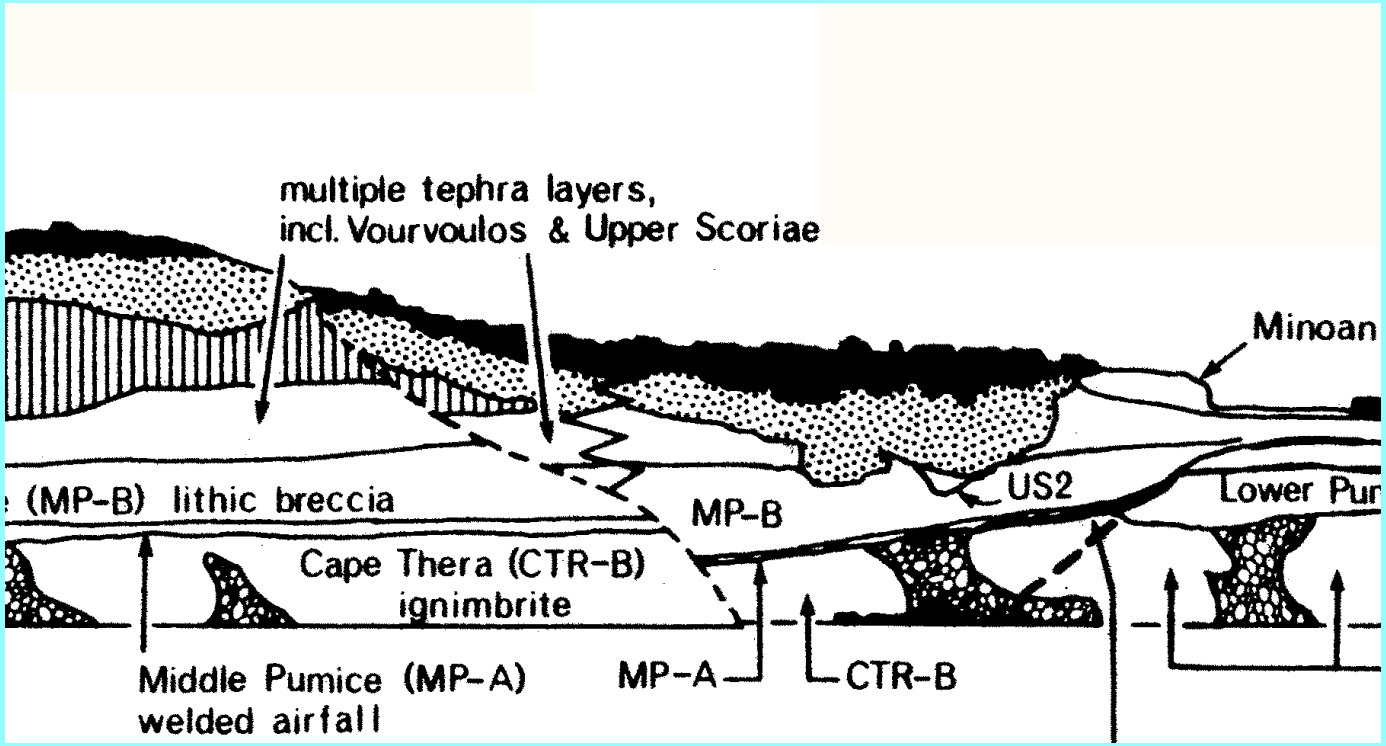

N
Skaros (298m)
Upper Scoriae 2 (US2), welded spatter
Cape Riva
US2
US2
Minoan
Unconformity marks wall of Skaros caldera
(strikes at shallow angle to cliff)
multiple tephra layers,
incl. Vourvoulos & Upper Scoriae 1
Minoan
Middle Pumice (MP-B) lithic breccia
MP-B
US2
Lower Pumice 2
Cape Thera (CTR-B)
ignimbrite
Middle Pumice (MP-A)
welded airfall
MP-A
CTR-B
CTM1, CTM2,
Cape Alonaki
lavas, & LP1
Thera Pyroclastics
basaltic & andesitic lavas
of Skaros shield
Skaros-Therasia
dome complex
talus
buildings
Cape Tourlos
Cape Thera
Cape Katothera


Middle pumice, ~100Ka

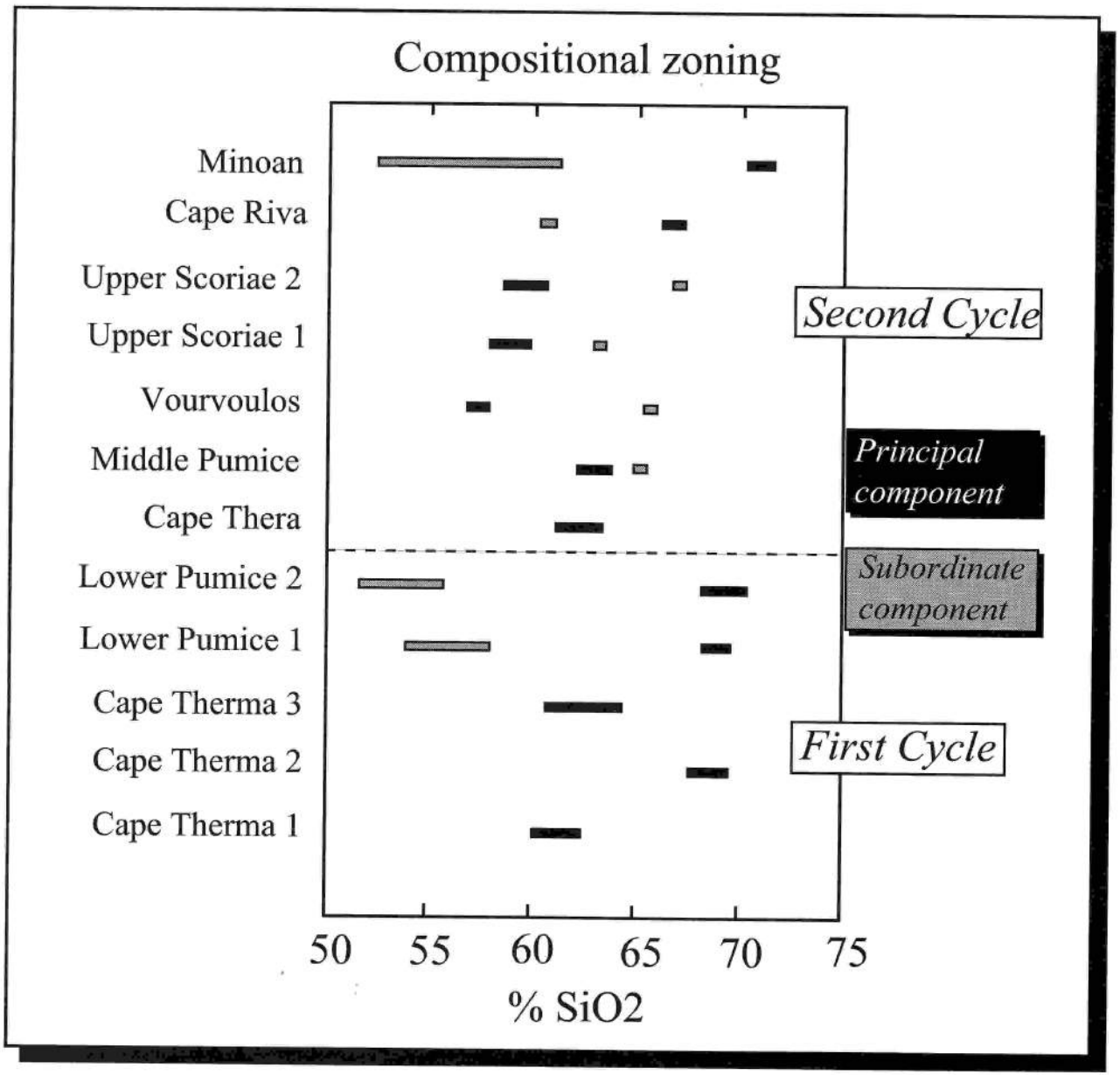

N
0
500
1000 m
Nea Kameni
1707-1710
1925-1926
1570
1925-1926
1939-1940
1940-1941
1950
1866-1870
1866-1870
726
197 B.C.
Palaea Kameni
F
N
R
K
F
N
R
F
N
R
124

Bring water and sun screen




multiple tephra layers,
incl. Vourvoulos & Upper Scoriae
Minoan
(MP-B) lithic breccia
MP-B
US2
Lower Pur
Cape Thera (CTR-B)
ignimbrite
Middle Pumice (MP-A)
welded airfall
MP-A
CTR-B

Middle Pumice, ~ 100 Ka


Compositional zoning
Minoan
Cape Riva
Upper Scoriae 2
Upper Scoriae 1
Vourvoulos
Middle Pumice
Cape Thera
Lower Pumice 2
Lower Pumice 1
Cape Therma 3
Cape Therma 2
Cape Therma 1
Second Cycle
Principal component
Subordinate component
First Cycle
50
55
60
65
70
75
% SiO2

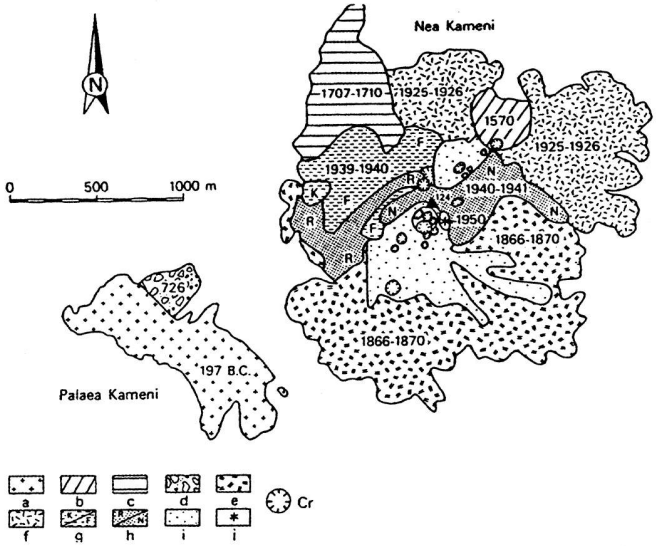


Fig. 30. Geological map of the Kameni Islands. The 197BC lavas of Palaea Kameni are now thought to be 46-47AD.

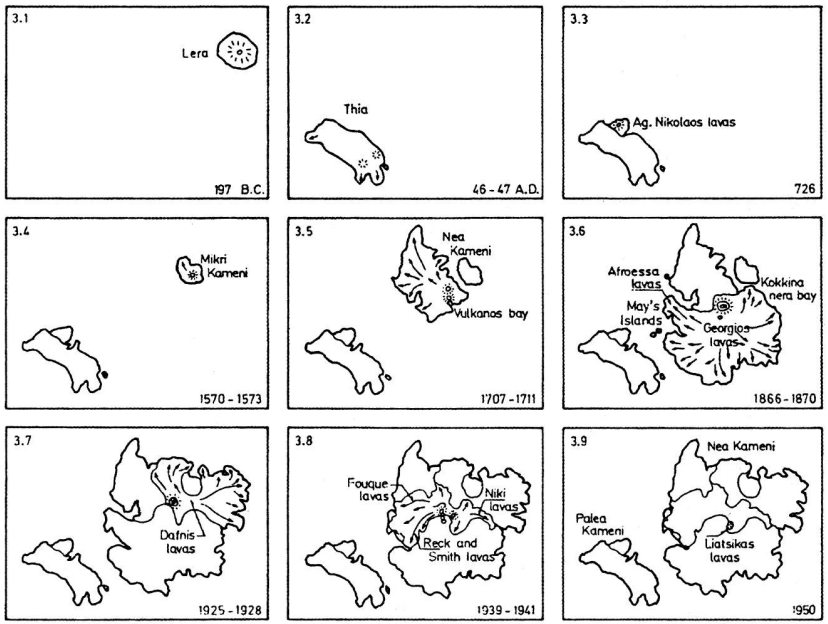


Fig. 31. Evolution of the Kameni Islands (Fytikas et al. 1990).

Cycle 1

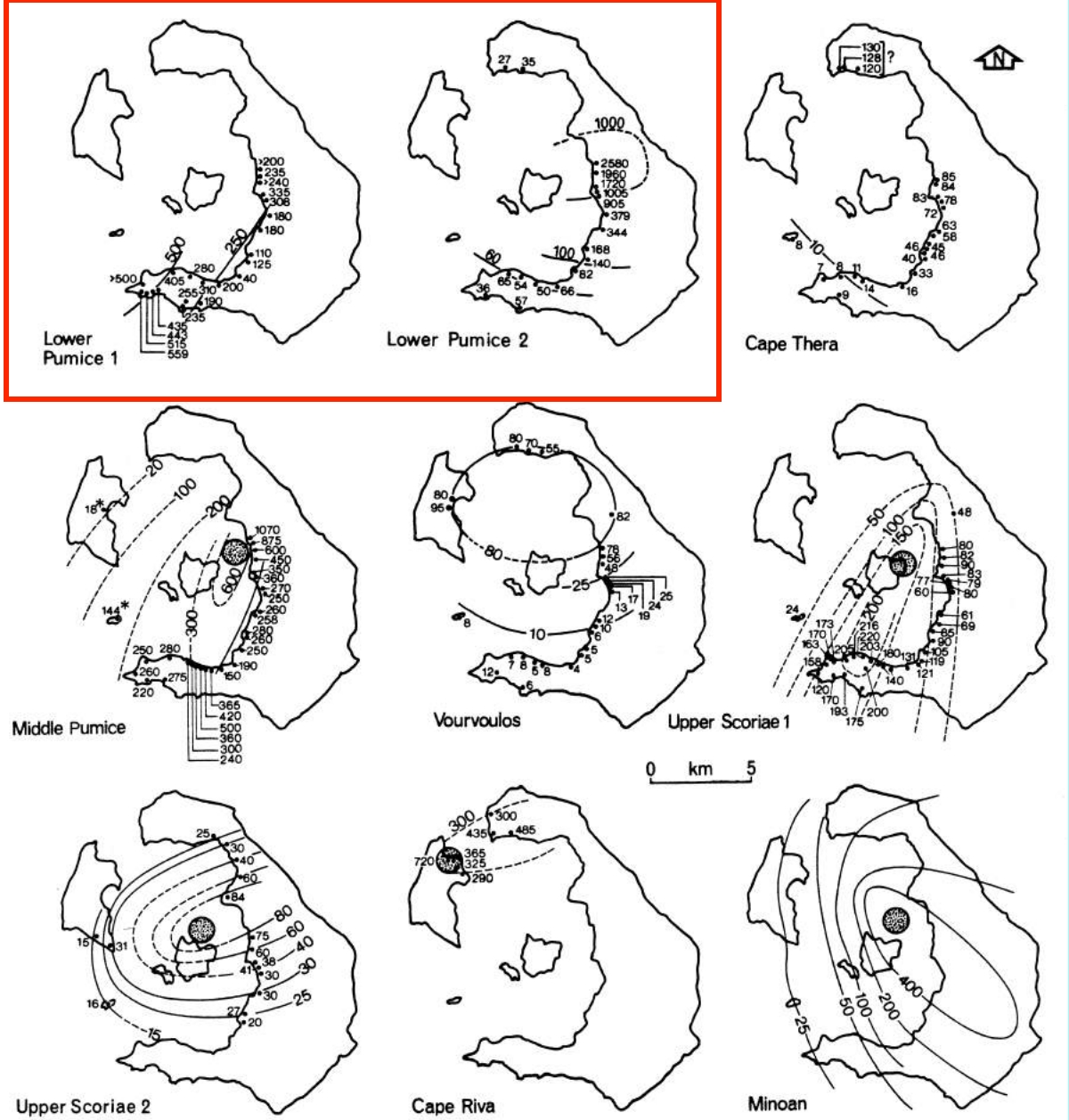


Figure 11. Thickness measurements and isopachs for pumice-fall deposits of nine eruptions. All thicknesses in centimetres. Most thickness measurements for the Middle Pumice fall deposit (MP-A) are taken from Sparks & Wright (1979), but two new data points (asterisks) have permitted refinement of isopach contours. The total thickness of MP-A on Aspronisi is 288 cm. However, the basal 144 cm is a fall unit not observed elsewhere on Santorini, and its thickness has therefore been subtracted from the total. Contours for the Minoan fall deposit are taken from Bond & Sparks (1976), and individual data points omitted for clarity. Stippled circles show the best estimate of vent position based on isopachs.

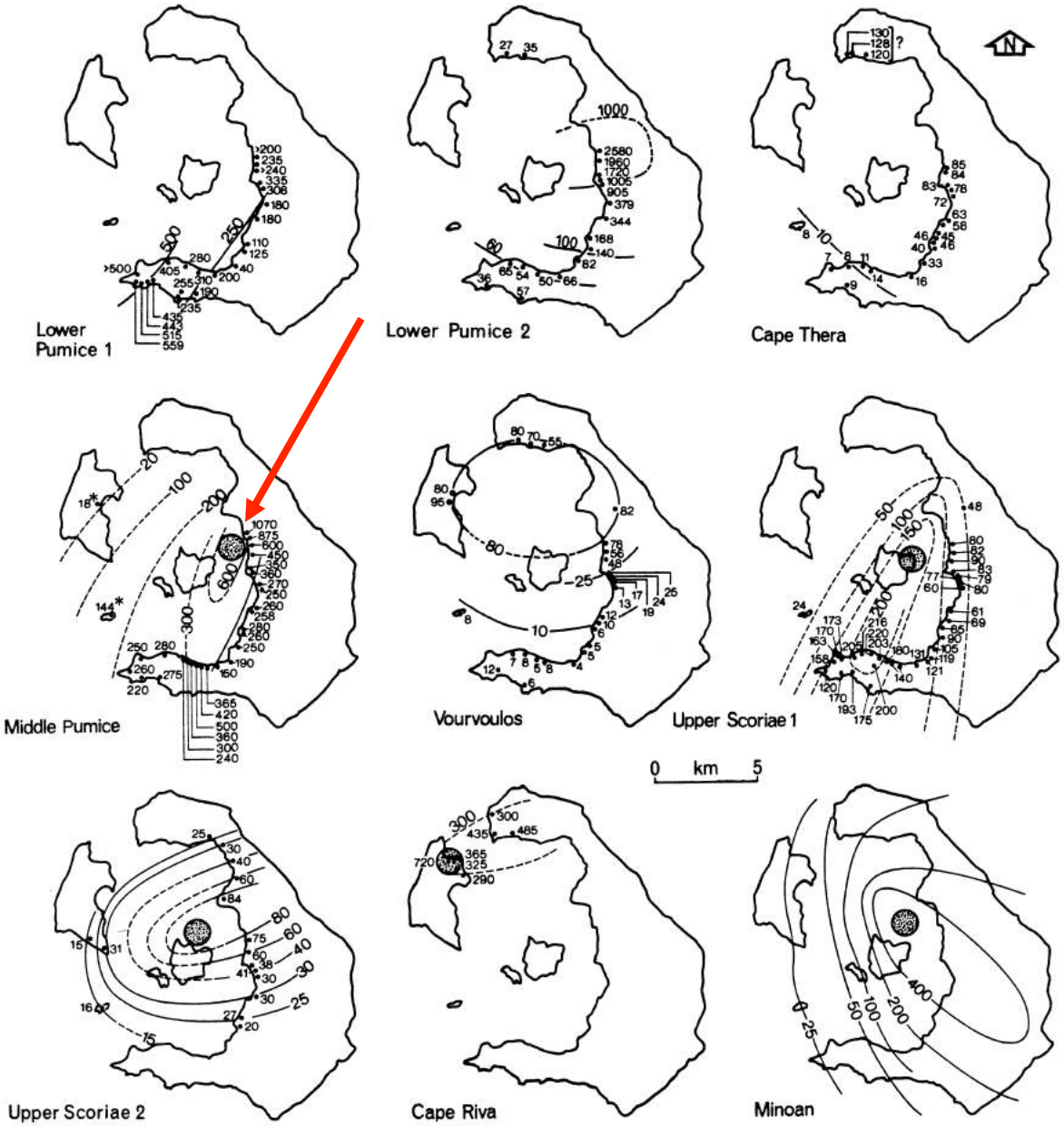


Figure 11. Thickness measurements and isopachs for pumice-fall deposits of nine eruptions. All thicknesses in centimetres. Most thickness measurements for the Middle Pumice fall deposit (MP-A) are taken from Sparks & Wright (1979), but two new data points (asterisks) have permitted refinement of isopach contours. The total thickness of MP-A on Aspronisi is 288 cm. However, the basal 144 cm is a fall unit not observed elsewhere on Santorini, and its thickness has therefore been subtracted from the total. Contours for the Minoan fall deposit are taken from Bond & Sparks (1976), and individual data points omitted for clarity. Stippled circles show the best estimate of vent position based on isopachs.

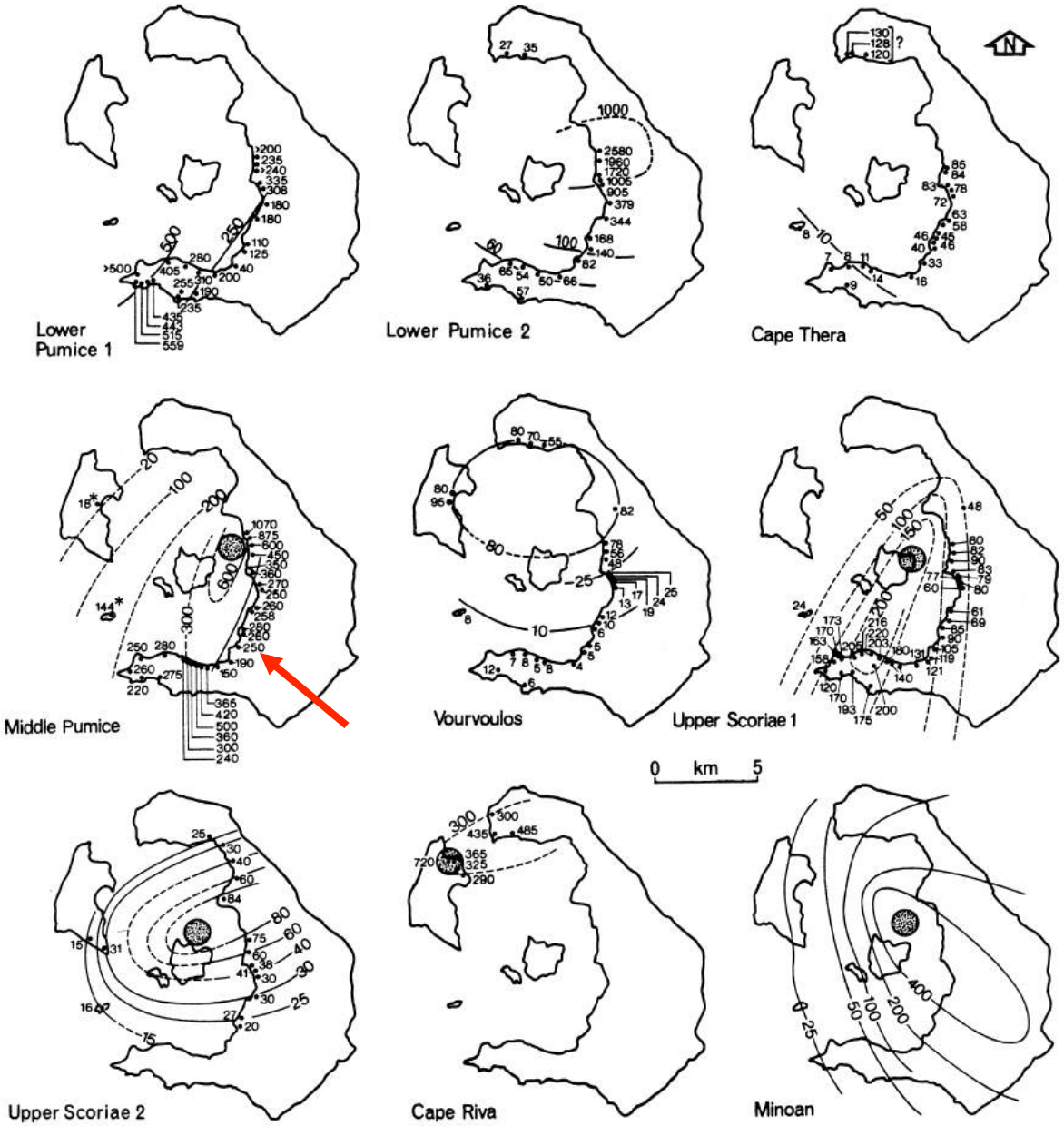


Figure 11. Thickness measurements and isopachs for pumice-fall deposits of nine eruptions. All thicknesses in centimetres. Most thickness measurements for the Middle Pumice fall deposit (MP-A) are taken from Sparks & Wright (1979), but two new data points (asterisks) have permitted refinement of isopach contours. The total thickness of MP-A on Aspronisi is 288 cm. However, the basal 144 cm is a fall unit not observed elsewhere on Santorini, and its thickness has therefore been subtracted from the total. Contours for the Minoan fall deposit are taken from Bond & Sparks (1976), and individual data points omitted for clarity. Stippled circles show the best estimate of vent position based on isopachs.