

# Spatial Markers of Coastscape Engagement in Aegean prehistory

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—EST. 1837—

# Introduction

- Seafaring people identified across Mediterranean:
  - Early Cyclades (Broodbank 2000)
  - Cyprus (Knapp 2010)
  - Sardinia (Knapp et al. 2022)
  - Balearic Islands (Waldren 2003)
  - “Coastscape” can be defined as:
    - “*Territorial coastal zone; passes to interior; inshore waters and the visual seascape*” (Tartaron 2013, 186)

BUT

Consideration of *just* the coastal zone generates only a confirmation or rejection of coastal activity

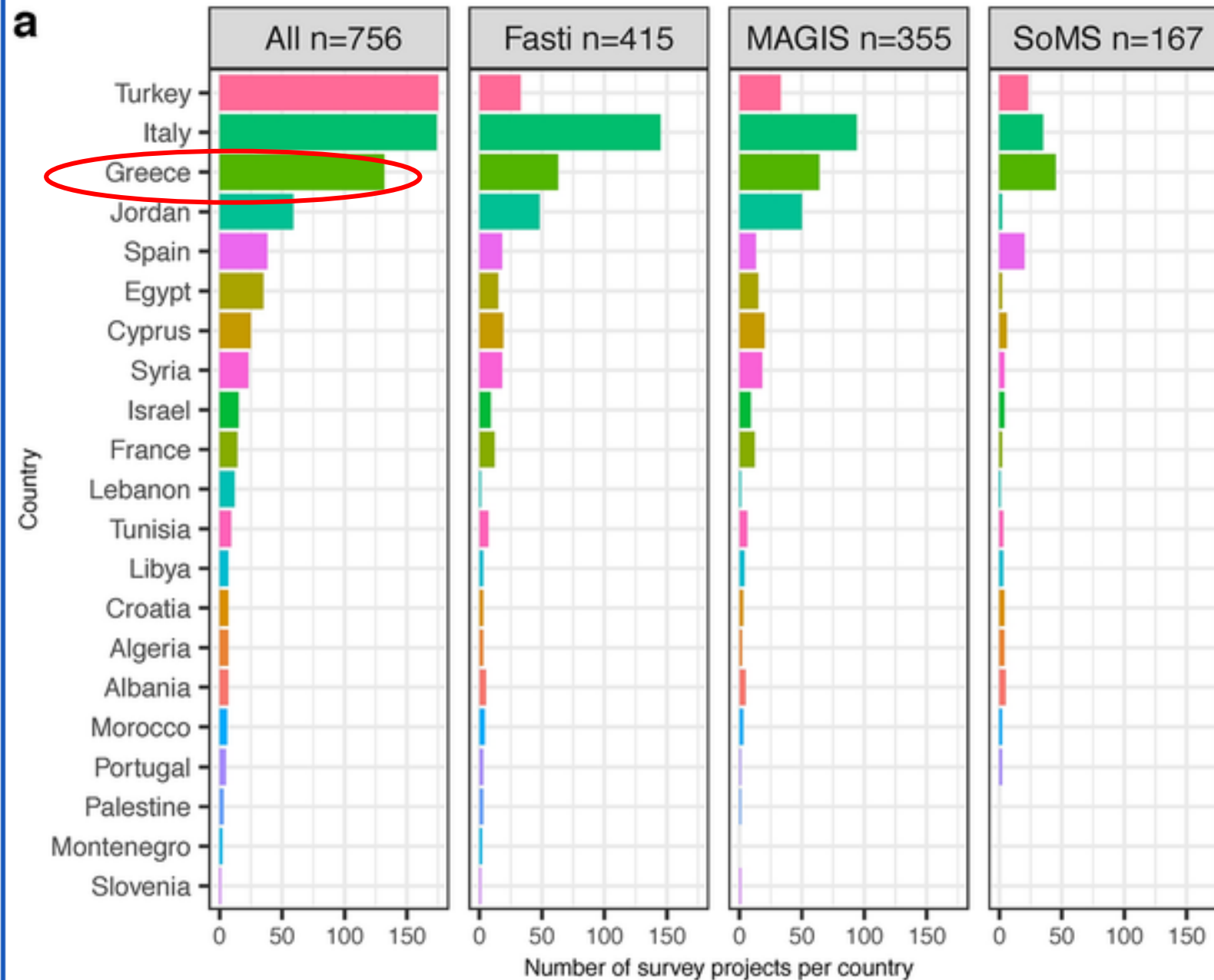
Sea	Approximate Coastline (km)	Approximate Surface (km2)	Ratio
Mediterranean Sea	46,000	2,500,000	54.35
Philippine Sea	36,289	5,695,000	156.93
South China Sea	13,000	3,685,000	283.46
Caribbean Sea	8,000	2,754,000	344.25
Gulf of Mexico	4,250	1,550,000	364.71
Gulf of Guinea	6,000	2,350,000	391.67
Wedell Sea	3,750	2,800,000	746.67
Coral Sea	3,095	4,791,000	1547.98
Arabia Sea	890	3,862,000	4339.33
Sargasso Sea	-	4,163,499	NA

<b>Mediterranean Region</b>	<b>Approximate Coastline (km)</b>	<b>Approximate Surface (km2)</b>	<b>Ratio</b>
<b>Aegean Sea</b>	17,000	215,000	<b>12.65</b>
<b>Sea of Marmara</b>	874	11,500	13.16
<b>Tyrrhenian Sea</b>	11,800	275,000	23.31
<b>Adriatic Sea</b>	3,739	138,000	36.91
<b>Levantine Sea</b>	8,000	320,000	40.00
<b>Alboran Sea</b>	898	53,000	59.02
<b>Ionian Sea</b>	2,197	169,000	76.92
<b>Balearic Sea</b>	1,195	150,000	125.52
<b>Libyan Sea</b>	2,044	350,000	171.23
<b>Ligurian Sea</b>	430	80,000	186.05



# The Aegean: Coastscares, Islandscapes and Seascapes





Adapted from Knodell *et al.*  
2022, fig. 4

# Previous Literature: Coastal Configurations

## Examples

- **Karpathos** in FN (Klys 2018, 46)
- **Euboia** in EH II (Wickens *et al.* 2018, 48; Tankosić & Katsianis 2017, 243-244)
- **Chania** region (Crete) in EM II (Moody 1987, 298)
- **Messenia** in EH II (Davis & Bennet 2017, 87, 100)
- **Kommos** region (Crete) in MM (Hope Simpson *et al.* 1995, 396)
- **Vrokastro** region (Crete) in LM I (Hayden *et al.* 1992, 325)

## Interpretations

- Interest in external trade/Maritime movement (Blackman & Branigan 1977, 69; Wickens *et al.* 2018, 48; Cherry *et al.* 1991, 4; McDonald & Hope Simpson 1969, 174)
- Marine subsistence (Klys 2018, 45)
- Occupation of coast to free up fertile inland areas (Tankosić & Katsianis 2017, 243-244)
- Intrinsic link between seafaring and society (Tankosić 2011)

# Previous Literature: Inland Configurations

## Examples

- Neolithic and Bronze Age Kefalonia (Randsborg 2001, 159; Souyoudzoglou-Haywood 2008, 248)
- **Sphakia** (Crete) in prehistory (Nixon *et al.* 1989, 201)
- **Kommos** region (Crete) in EM II (Hope Simpson *et al.* 1995, 394–5)
- Afiartis (**Karpathos**) in EBA (Klys 2018, 46)
- **Messenia** in MH period (McDonald & Hope Simpson 1969, 174)
- **Chania** region (Crete) in MM III-LM I (Moody 1987, 306)
- **Vrokastro** region (Crete) in LM III (Hayden *et al.* 1992, 326)

## Interpretations

- Piracy/risk of attack (Renfrew 1972, p. 262–4)
- Geomorphological change/obscuring of data (Hayden *et al.* 1992, 325; Moody 1987, 306; Souyoudzoglou-Haywood 2008, 248)
- Change in subsistence patterns (McDonald & Hope Simpson 1969, 174)

Otherwise, discussion of coastal proximity in settlement patterns is generally omitted.



# Exceptions:

## Antikythera Survey

- Euclidean ‘distance from coast’ incorporated as one of the “covariates” in a regression model for survey area
- General shift away from the coast in MM I-LM IA:

*“the only continuing association is a positive one with increasing distance from the coastline... there does not appear to be any strong preference for coastal connection to the outside world” (Bevan & Conolly 2013, 126)*

## Vrokastro (Crete) Survey

- Coastal zone (Zone 1) clearly defined:  
*“Coastal strip area within 0.5 kilometres of the sea”... with an elevation of up to 260 m above sea level (Hayden et al. 1992, 303, fig. 5)*
- Used to show a strong pattern of coastal habitation between EM I and LM I

# Perceptions of Space

Pendlebury, Money-Coutts and Eccles 1932/33. “Journeys in Crete 1934”, p.100

*“Twenty **minutes** South of the village, by the church of Hagios Nikolaos, is the site known as Hellenika... Here L.M. I vases have been found and L.M. I sherds lie fairly thick. There is a small patch of Greco-Roman sherds in a field just to the North of the church.”*

Hope Simpson and Lazenby 1962. “Notes from the Dodecanese”, p.166

*“Ten **minutes** farther south, after a rough climb, is the wide-open area of Lifkos, extending about 2 kilometres north to south and east to west, from which is visible the Frankish castle of Esokastro, on the small island off the west tip. At Rizes, in the low cliffs facing west (inland) opposite Esokastro, are the rock-cut tombs mentioned by Della Seta.”*

Sackett *et al.* 1966. “Prehistoric Euboea: Contributions toward a survey”, p.50.

*“At Panayia itself no prehistoric finds have been made, but there is a L.H. IIIA tomb at Phasoula in the hillside facing the sea ten **minutes**’ walk beyond Panayia and down into the valley...The valley looks a promising area for more tombs.”*

Building on the work of early geographers/travellers:

- Edgar Quinet (1830), *De la Grèce moderne, et de ses rapports avec l'antiquité*
- James Theodore Bent (1885), *The Cyclades or Life among the insular Greeks*
- Fritz Geyer (1903), *Topographie Und Geschichte Der Insel Euböia.*

# Spatial Perceptions

MacDonald and Hope Simpson 1961. “Prehistoric habitation in Southwestern Peloponnese”, p. 240.

*“There are at least three other mounds...in the same general area:*

- 1. ca. **150 m.** S-W of the excavated tholoi and slightly west of the route to Myrsinochori...*
- 2. A stony mound ca. 12 m. by 10 m. by 4 m. high in the same peripharia (Routsi) and near the west tip of the ridge overlooking the Pispisaiko gorge... (**ca. 500 m.** distant)...*
- 3. A mound ca. half-way (i.e. **500 m.**) along the (downhill) road between Routsi and Myrsinochori...”*

- Shift towards a more scientific and systematic agenda for fieldwalking survey. Top-down, aerial and cartographic view of landscape
- Absolute vs. Relative concepts of Space
  - Absolute: Space as a ‘container’ for things, existing by itself (Kantian)
  - Relative: Space as ‘relational’, existing in the relationship between objects (Leibniz)
- Absolutist perspective of coastal proximity informed by cartographic or Euclidean models of space: such perspectives not present in prehistory

# Limitations of Coastscape discussion

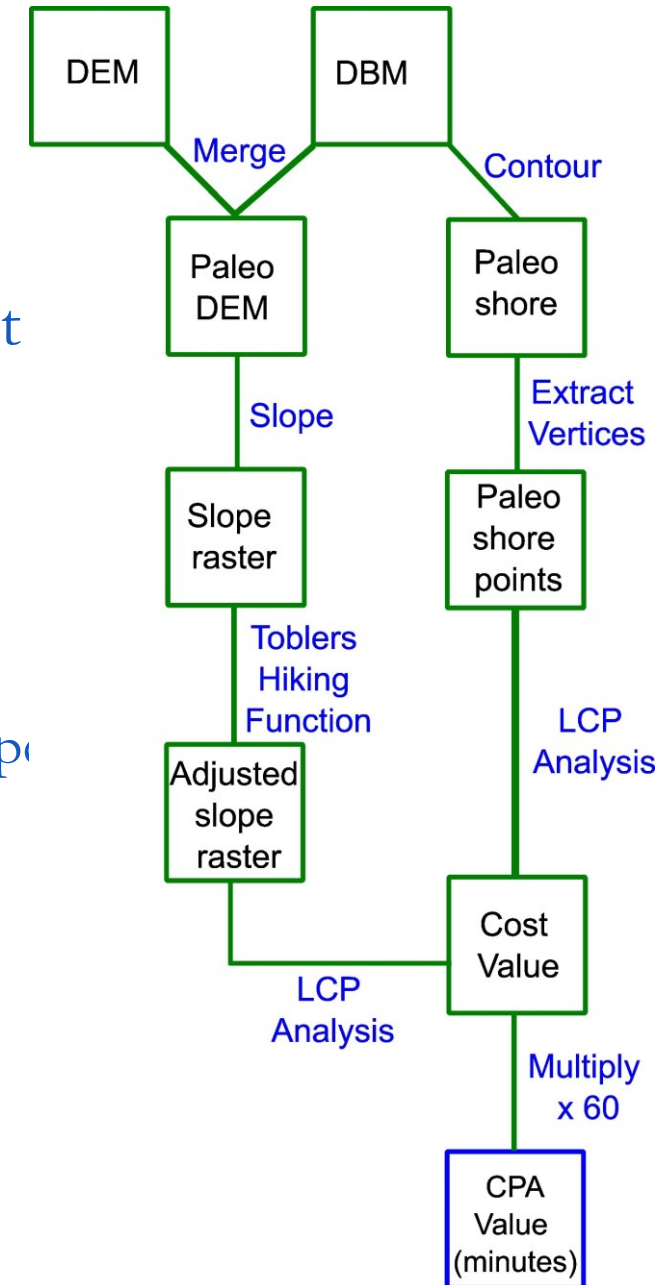
- Coastal zone is rarely defined as a clear analytical unit
- Anthropocentric/embodied perspective is missing, as is the temporal element
- Christopher Tilley 1994, *A Phenomenology of Landscape, Paths, Places and Monuments*, p. 10;

*“space cannot exist apart from the events and activities within which it is implicated”.*

- Implementation of cost surfaces (embodied movement and time) (**Marker 1**) and incorporation of activities (**Marker 2**) mediated temporally

# Coastal Proximity Analysis 1 (CPA)

- Focus on ‘cost’ of movement between site and paleocoast
- GIS-led reconstruction of paleotopography
- Digital Elevation Model (DEM) & Digital Bathymetric Model (DBM)
- General sea-level (Aegean) estimates:
  - Lambeck (1996), -7 m in LN, increasing at a rate of 0.7-1 mm per year:
    - Late Neolithic: 7 m below present
    - Final Neolithic–Early Bronze Age: 6 m below Present
    - Middle Bronze Age: 5 m below present
    - Late Bronze Age: 4 m below present
- Conversion of shoreline into series of points



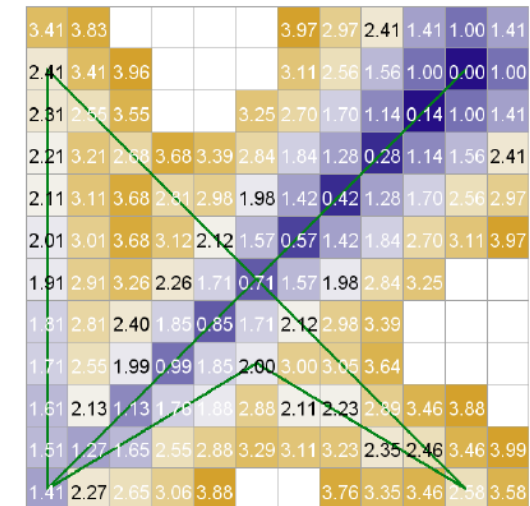
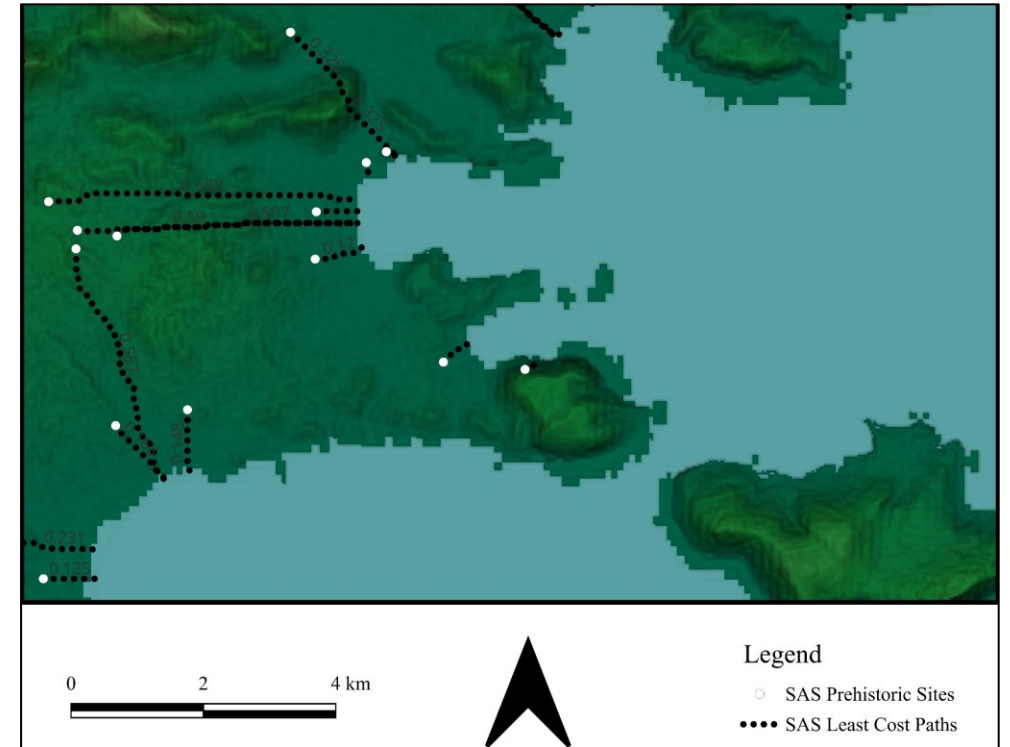


# Coastal Proximity Analysis 2 (CPA)

- Tobler's Hiking function (1993):

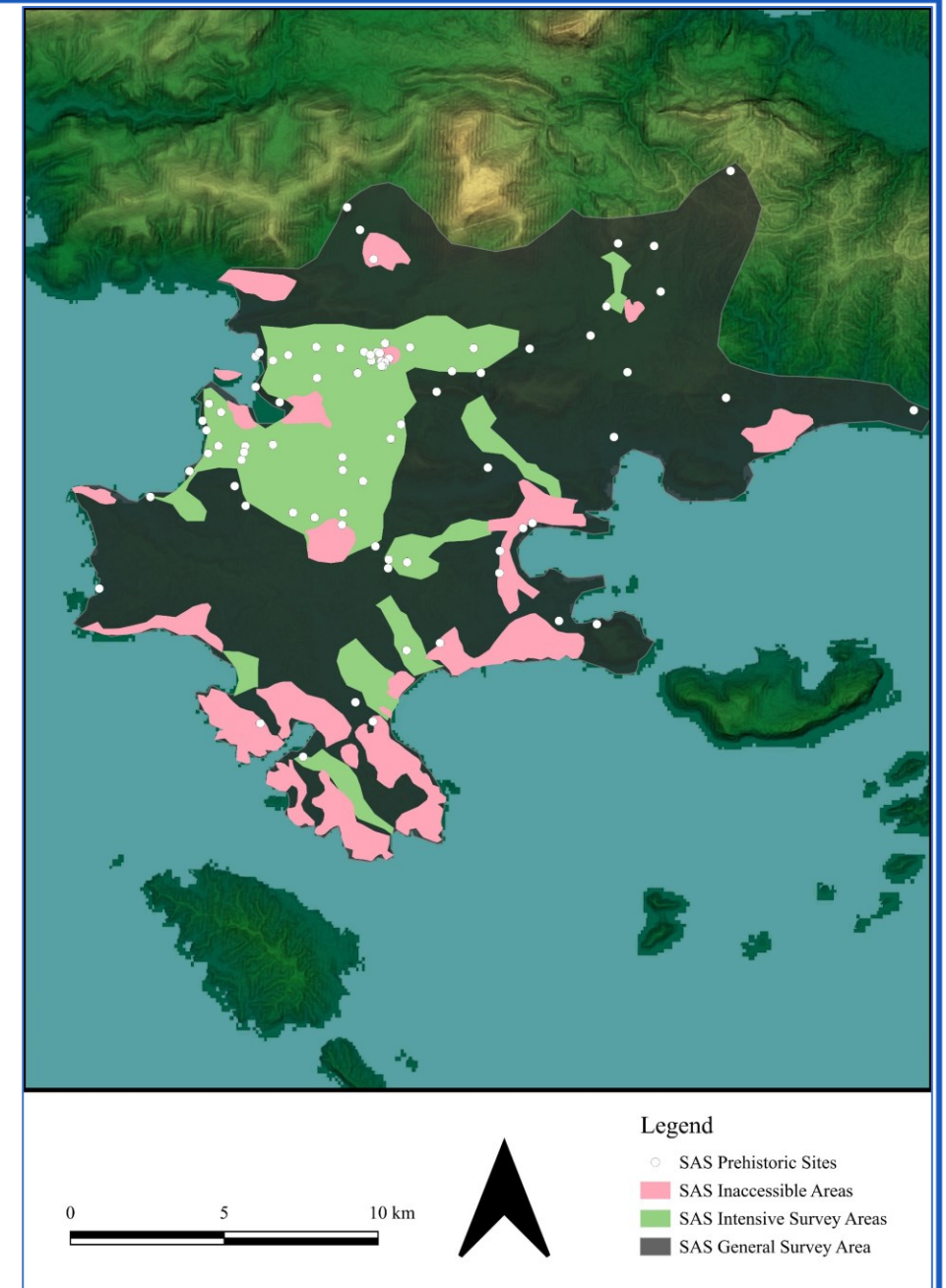
$$[(30/1000)/(6 * 2.71828 ^ {(\text{ABS}(\tan(("Slope@1" * 3.14159)/180) + 0.05))})].$$

- Least cost path analysis
- Resulting value multiplied by 60 to generate a value in minutes
- Coastal Proximity Value (CPV)
  - Hiking time (embodiment)
  - Landscape (embedment)
  - Time (relative space)



# CPA Case Study: Southern Argolid Survey

- Fieldwalking undertaken between 1972 and 1983, published in 1994.
- *A Greek Countryside. The Southern Argolid from Prehistory to the Present Day*
- 83 sites with evidence of prehistoric activity
- Classification of sites according to authors' own system:
  - 1 ha – Villages/Habitation centres
  - 0.3-0.9 ha – Hamlets
  - >0.3 ha – Farmstead or other use site (e.g. cemetery or lithic scatter)



# CPA Results

EN–LN (Neolithic):	6850–4900 B.C	MH (Middle Helladic):	2000–1600 B.C
FN (Final Neolithic):	4900–3600 B.C	MH III–LH I:	?1600–?1500 B.C
EH I (Early Helladic):	3600–2900 B.C	LH II (Late Helladic):	?1500–?1400 B.C
EH IIA:	2900–?2650 B.C	LH IIIA:	?1400–?1300 B.C
EH IIB:	?2650–2500 B.C	LH IIIB:	?1300–?1190 B.C
EH III:	2500–2000 B.C	LH IIIC:	?1190–?1100 B.C

? = *chronological periods used but dates not defined by authors*

N		FN		EH I		EH IIA		EH IIB		EH III	
Count	Median	Count	Median	Count	Median	Count	Median	Count	Median	Count	Median
4	15.90	20	22.08	36	14.55	40	23.85	4	18.09	4	18.09

MH		MH III-LH I		LH II		LH IIIA		LH IIIB		LH IIIC	
Count	Median	Count	Median	Count	Median	Count	Median	Count	Median	Count	Median
16	7.2	4	6.69	4	6.69	11	28.8	12	29.61	3	37.56

“Median” is in minutes from the coast. “Count” denotes how many sites belong to each specific period.

# CPA Results by site type

By Type	EN-LN		FN		EH I		EH IIA		EH IIB		EH III	
	Count	Median	Count	Median	Count	Median	Count	Median	Count	Median	Count	Median
Habitation centre	0	-	1	<b>3.96</b>	5	<b>13.86</b>	6	<b>8.91</b>	0	-	0	-
Hamlet	0	-	5	<b>11.46</b>	17	<b>10.92</b>	19	<b>11.88</b>	3	<b>7.74</b>	3	<b>7.74</b>
Farmstead	0	-	4	<b>2.97</b>	7	<b>30.12</b>	12	<b>29.34</b>	0	-	0	-
Cave	3	<b>1.38</b>	3	<b>30.42</b>	1	<b>1.38</b>	1	<b>56.34</b>	1	<b>56.34</b>	1	<b>56.34</b>
Burial	0	-	0	-	1	<b>5.76</b>	1	<b>5.76</b>	0	-	0	-
Industrial	1	<b>36.42</b>	7	<b>34.74</b>	5	<b>34.74</b>	1	<b>37.68</b>	0	-	0	-

By Type	MH		MH III/LH I		LH II		LH IIIA		LH IIIB		LH IIIC	
	Count	Median	Count	Median	Count	Median	Count	Median	Count	Median	Count	Median
Habitation centre	3	<b>1.50</b>	2	<b>3.99</b>	2	<b>3.99</b>	3	<b>1.50</b>	3	<b>1.50</b>	0	-
Hamlet	9	<b>28.44</b>	2	<b>17.82</b>	2	<b>17.82</b>	6	<b>31.02</b>	6	<b>31.02</b>	1	<b>28.74</b>
Farmstead	2	<b>15.9</b>	0	-	0	-	2	<b>31.11</b>	2	<b>31.11</b>	0	-
Cave	0	-	0	-	0	-	0	-	0	-	1	<b>56.34</b>
Burial	1	<b>23.7</b>	0	-	0	-	0	-	0	-	0	-
Industrial	0	-	0	-	0	-	0	-	0	-	0	-

“Median” is in minutes from the coast. “Count” denotes how many sites belong to each specific period.

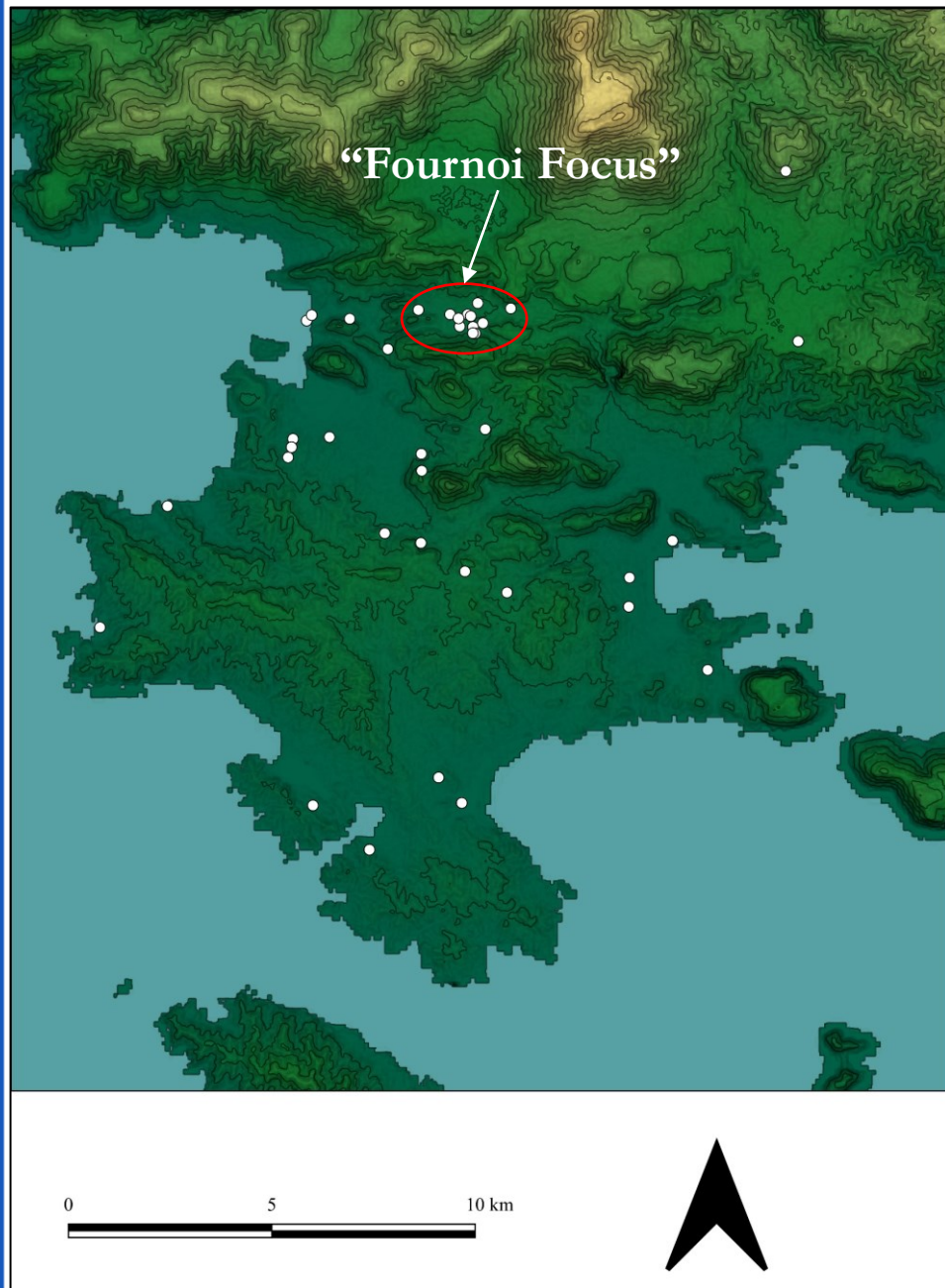


# Interpreting the results

“International Spirit”

EB II (2900–2650 B.C)

- S. Argolid a “home base” and food source for merchant sailors of the EH (Jameson *et al.* 1994, 356)
- Lower coastal proximity due to a focus on food production inland?
- Main EH settlement at Fournoi Focus, a little further inland



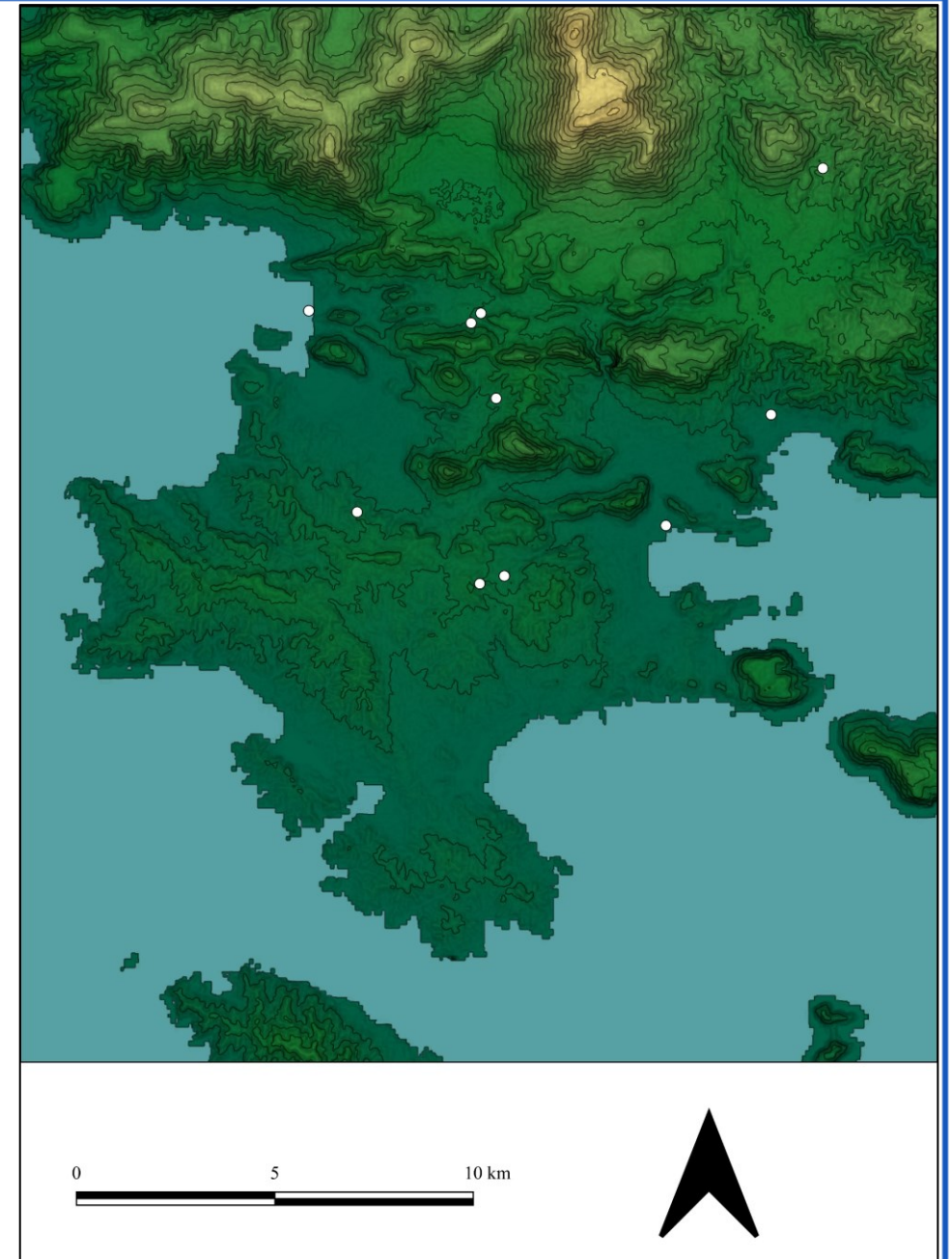
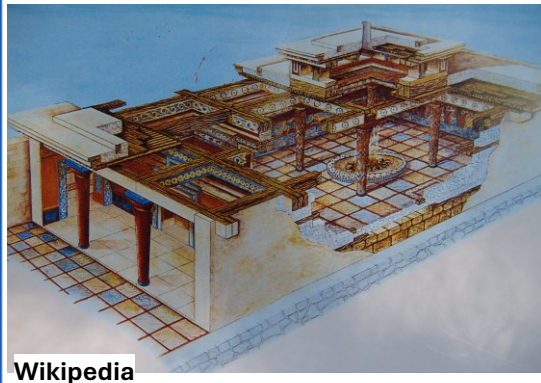


# Interpreting the results

“Mycenaean *koine*” LH III (1400–1200 B.C)

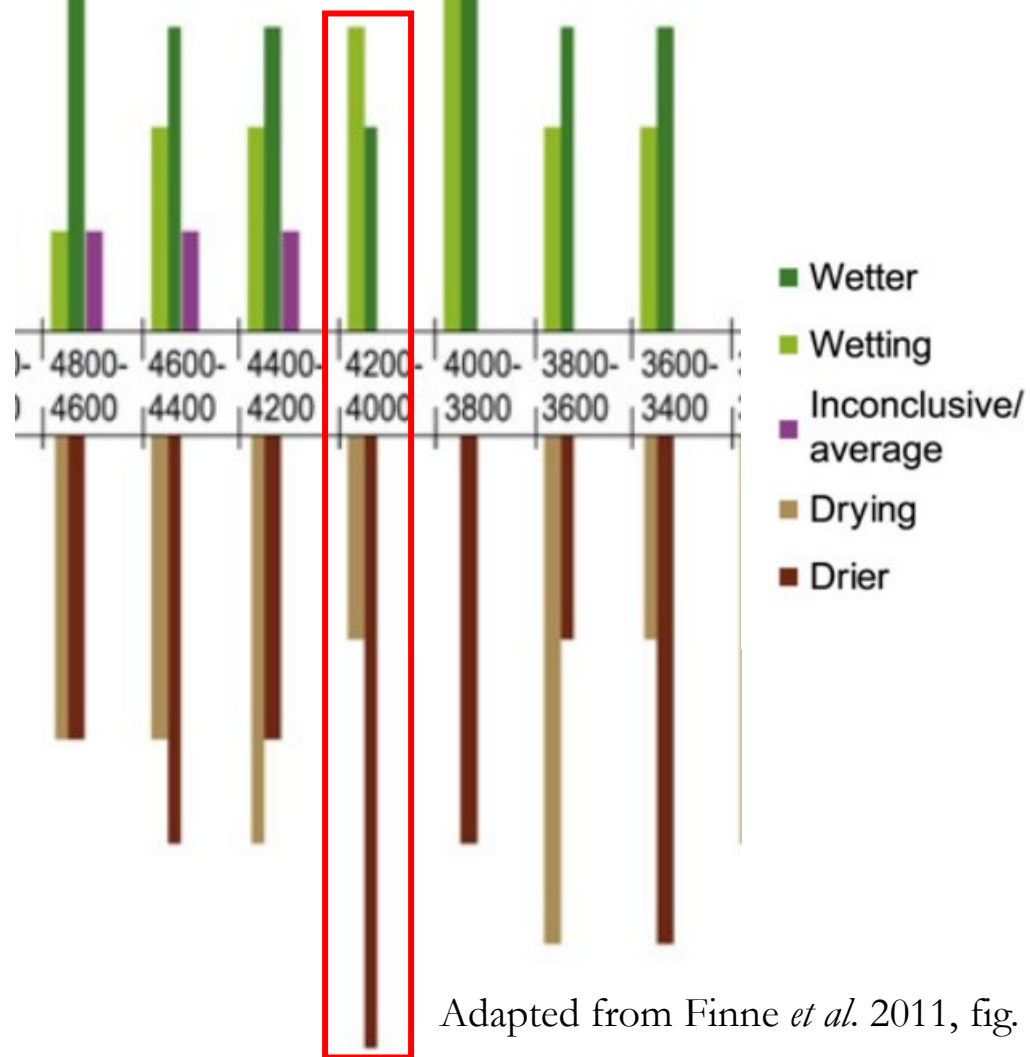


- Main coastal sites situated to take advantage of best soils (Jameson *et al.* 1994, 370)
- Greater use of interior landscape for agriculture



## EH IIB–III

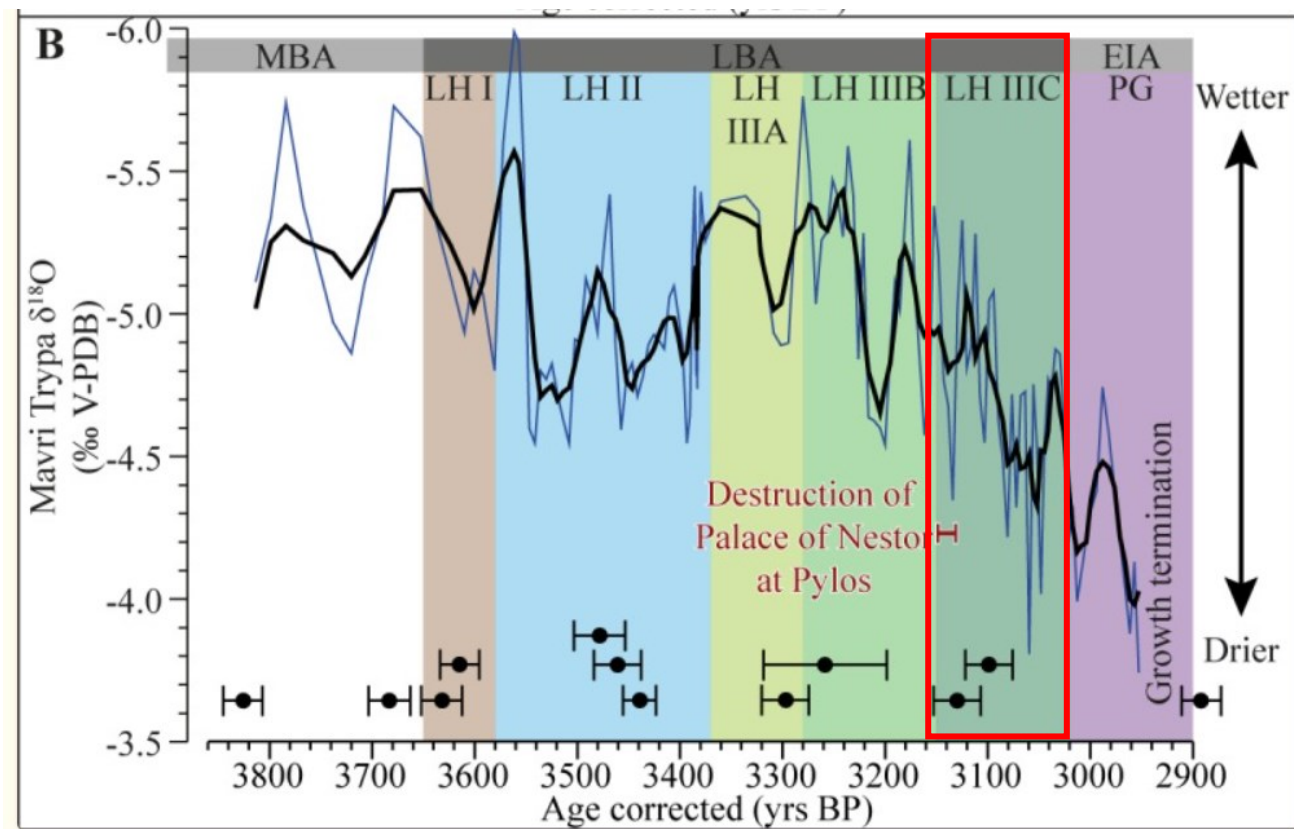
(2650–2000 B.C)



Adapted from Finne *et al.* 2011, fig. 6

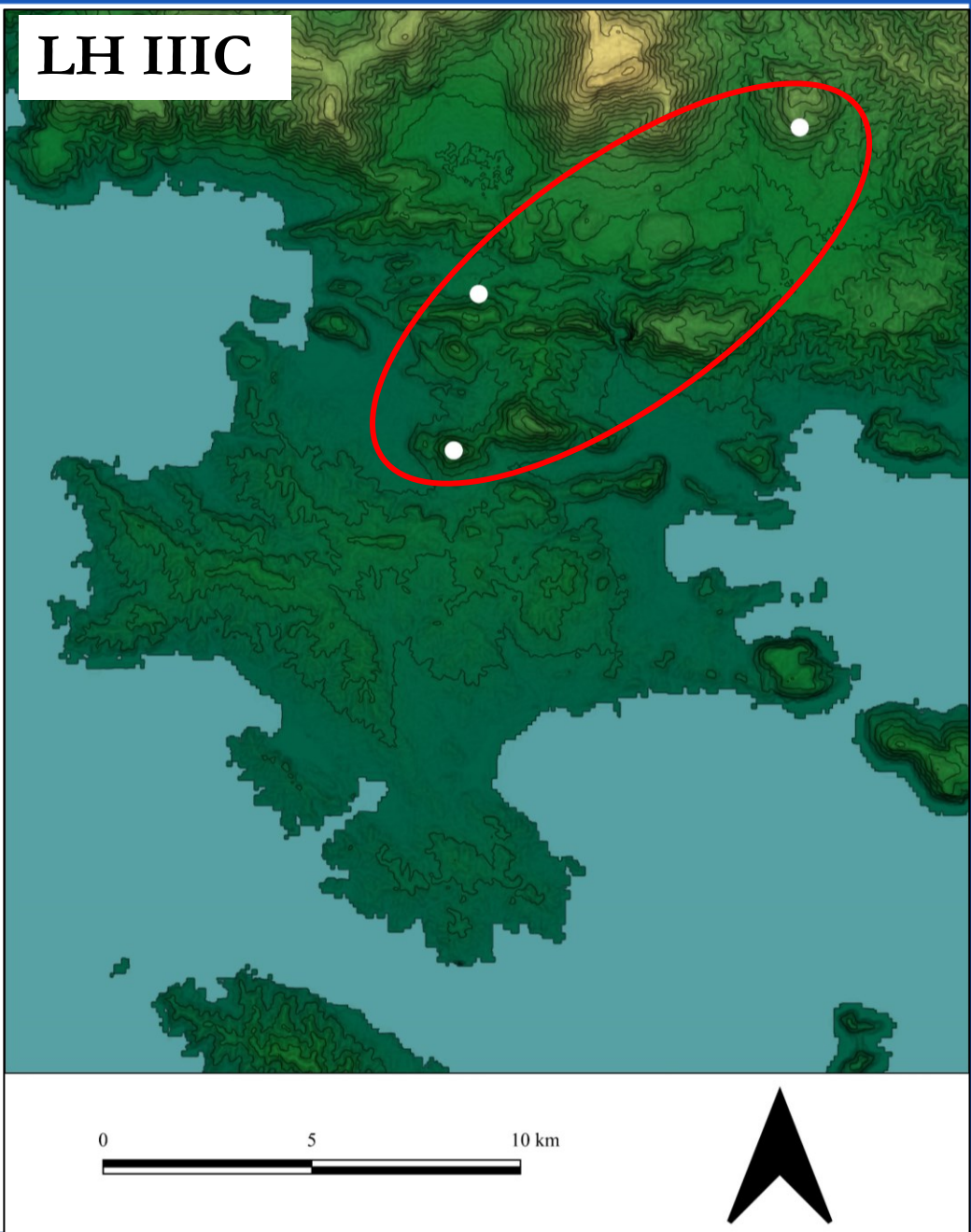
## LH IIIC

(1190–1100 B.C)



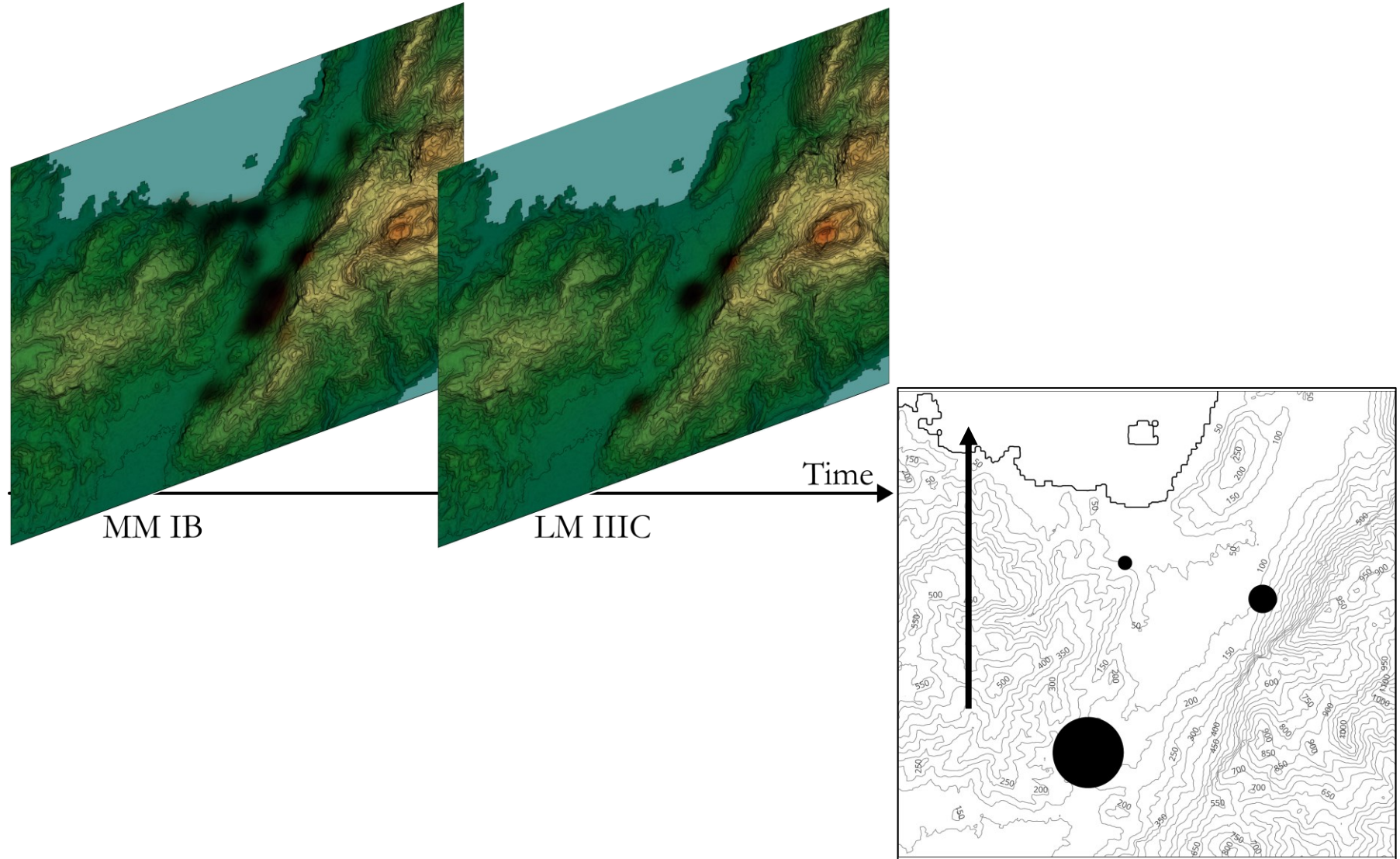
Adapted from Finne *et al.* 2017, fig. 4





# Marker 2. *Coastscape Engagement Index* (CEI) 1

- Intensity of coastal space engagement
- Incorporates surface area (activity)
- Requires higher resolution data
  - Site sizes
  - Clear site locations
- Coastal and inland zones required





# Marker 2. *Coastscape Engagement Index* (CEI) 2

- Weighted regression model
- Higher scores for land use proximal to the coast
- Lower score for land use further from the coast
- Uses the values generated in the CPA
- Determines periods of greater anthropogenic activity in coastal areas

$$\frac{A(x)}{B} = C$$

A=recorded land use

$\chi$ = weighted regression coefficient

B= total survey area

C= CEI/Coastscape Engagement Index

<i>Band</i>	<i>Time cost (CPA Value)</i>	<i>M<sup>2</sup> coefficient contribution</i>
1	0 to 6 minutes	100%
2	6 to 12 minutes	90%
3	12 to 18 minutes	80%
4	18 to 24 minutes	70%
5	24 to 30 minutes	60%
6	30 to 36 minutes	50%
7	36 to 42 minutes	40%
8	42 to 48 minutes	30%
9	48 to 54 minutes	20%
10	54 to 60 minutes	10%
11	60+ minutes	0%



# CEI Case Study: Gournia Survey Project

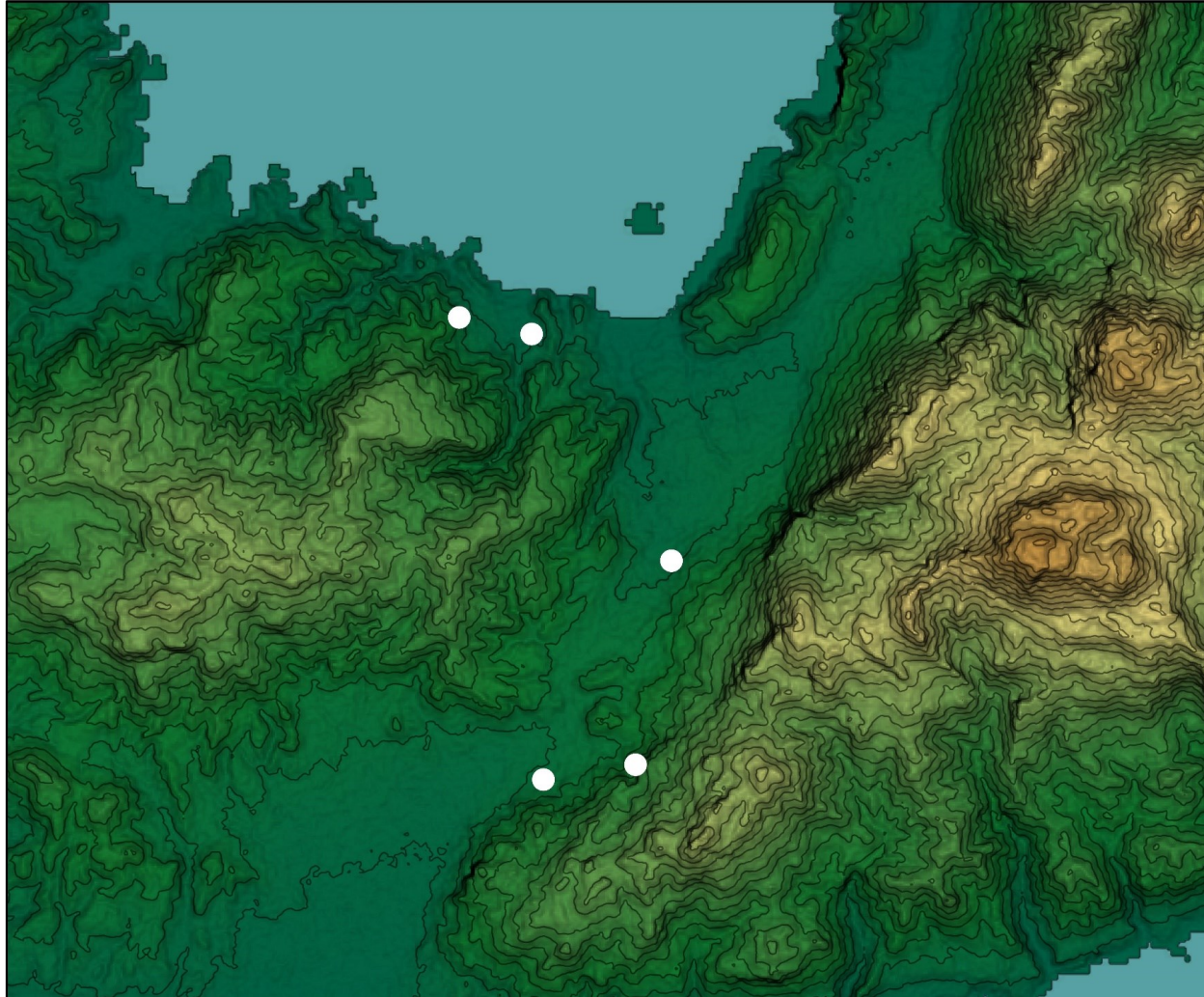
Chronology (as assigned in original survey publication):

FN (Final Neolithic):	(4000–3500 B.C)	MM II:	(1850–1775 B.C)
EM I (Early Minoan):	(3500–2900 BC)	MM III:	(1775–1700 B.C)
EM IIA:	(2900–?2400 B.C)	LM IA (Late Minoan):	(1700–?1600 B.C)
EM IIB:	(?2400–2200 B.C)	LM IB:	(?1600–1540 B.C)
EM III	(2200–2100 B.C)	LM II:	(1540–1450 B.C)
MM IA (Middle Minoan):	(2100–1900 B.C)	LM IIIA:	(1450–1360 B.C)
MM IB:	(1900–1850 B.C)	LM IIIB:	(1360–1200 B.C)
? = <i>chronological periods used but dates not defined by authors</i>		LM IIIC:	(1200–1100 B.C)

	FN	EM I	EM IIA	EM IIB	EM III	MM IA	MM IB
<i>Coastscape Engagement Index</i>	0.09%	0.56%	0.72%	0.29%	0.47%	0.74%	1.36%
<i>Change</i>	-	+522.22%	+29.30%	-59.95%	+62.83%	+57.41%	+82.92%
<i>Percentage of Highest Extent</i>	6.43%	40.00%	51.43%	20.71%	33.57%	52.86%	97.00%

	MM II	MM III	LM IA	LM IB	LM II	LM IIIA	LM IIIB	LM IIIC
<i>Coastscape Engagement Index</i>	1.40%	1.17%	1.02%	0.14%	0.12%	0.18%	0.16%	0.13%
<i>Change</i>	+3.28%	-16.99%	-12.09%	-86.31%	-15.37%	+51.58%	-11.79%	-18.59%
<i>Percentage of Highest Extent</i>	100%	83.57%	72.86%	10.00%	8.57%	12.86%	11.43%	9.29%

# Interpreting the results: Final Neolithic



	FN
<i>Coastscape Engagement Index</i>	0.09%
<i>Change from previous</i>	-
<i>Percentage of Highest Extent</i>	6.43%

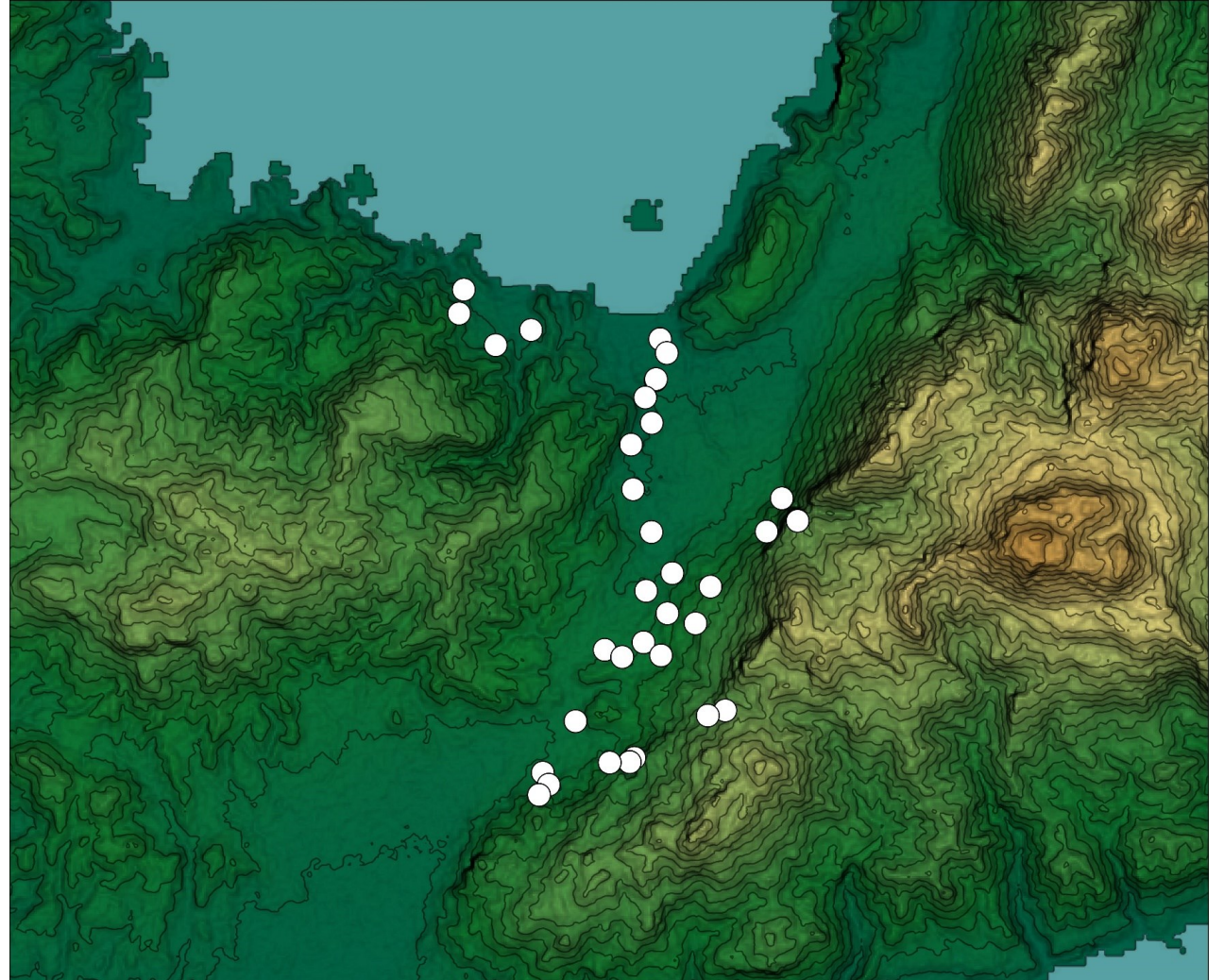
- Preference for low slopes inland (Watrous & Schultz 2012, p. 19)
- Arrival of newcomers from the sea? (Nowicki 1999, p. 579)
- Evident to some extent in survey area: e.g. Vasiliki Kephala (inland) and Sphoungaras (coastal)



# Interpreting the results: Early Minoan IIA

	EM IIA
<i>Coastscape Engagement Index</i>	0.72%
<i>Change from previous</i>	+29.30%
<i>Percentage of Highest Extent</i>	51.43%

- Start of higher coastscape engagement
- Mirrored elsewhere on Crete (e.g. Mochlos, Pseira, Kommos)
- Participation in external trade networks initiating a ‘pull’ to the coast?





# Interpreting the results: Early Minoan IIB



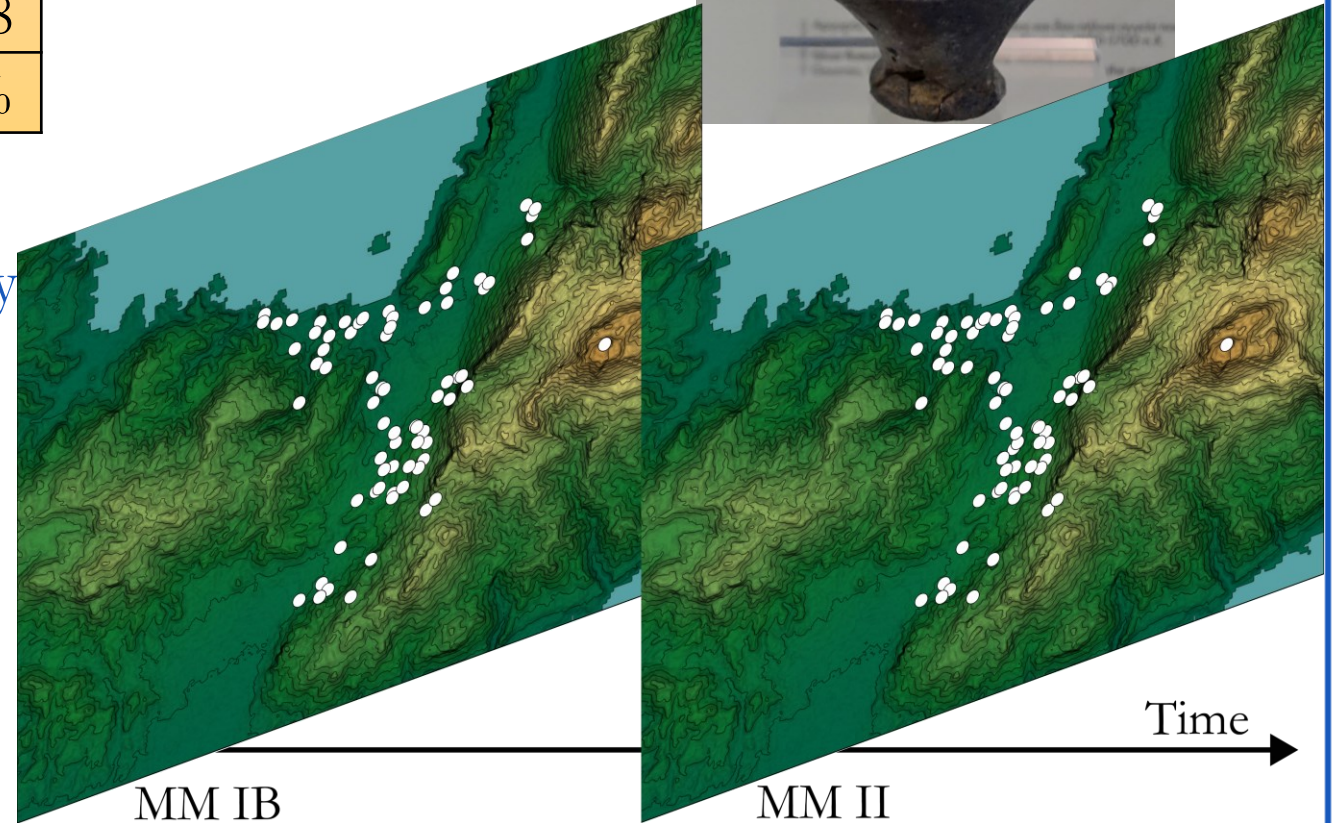
	EM IIB
<i>Coastscape Engagement Index</i>	0.29%
<i>Change from previous</i>	-59.95%
<i>Percentage of Highest Extent</i>	20.71%

- Aegean network collapse
- EM IIB destructions - competition?
- Little sign of disruption at Gournia
- Reorientation of external contacts – Near East/Anatolia?
- Reduction in site number – nucleation?

# Interpreting CEI results: Middle Minoan IB–II

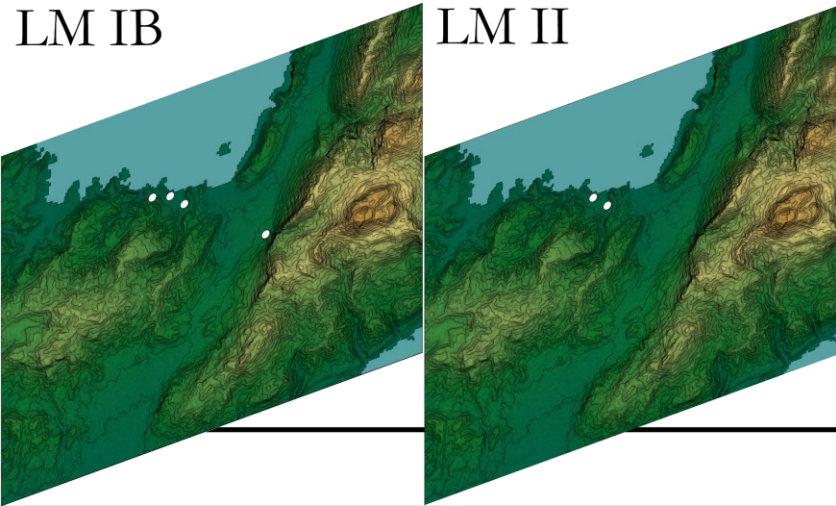
	MM IB	MM II
<i>Coastscape Engagement Index</i>	1.36%	1.40%
<i>Change from previous</i>	+82.92%	+3.28
<i>Percentage of Highest Extent</i>	97.00%	100%

- Most intensive coastal engagement
- Demographic explosion: 75 sites in study area
- Gournia-Pera Alatzomouri-Pacheia Ammos – “site constellations” (Watrous & Schultz 2012, 48)
- Coincides with First Minoan Palaces though no palace in survey area
- Stability and external contact?

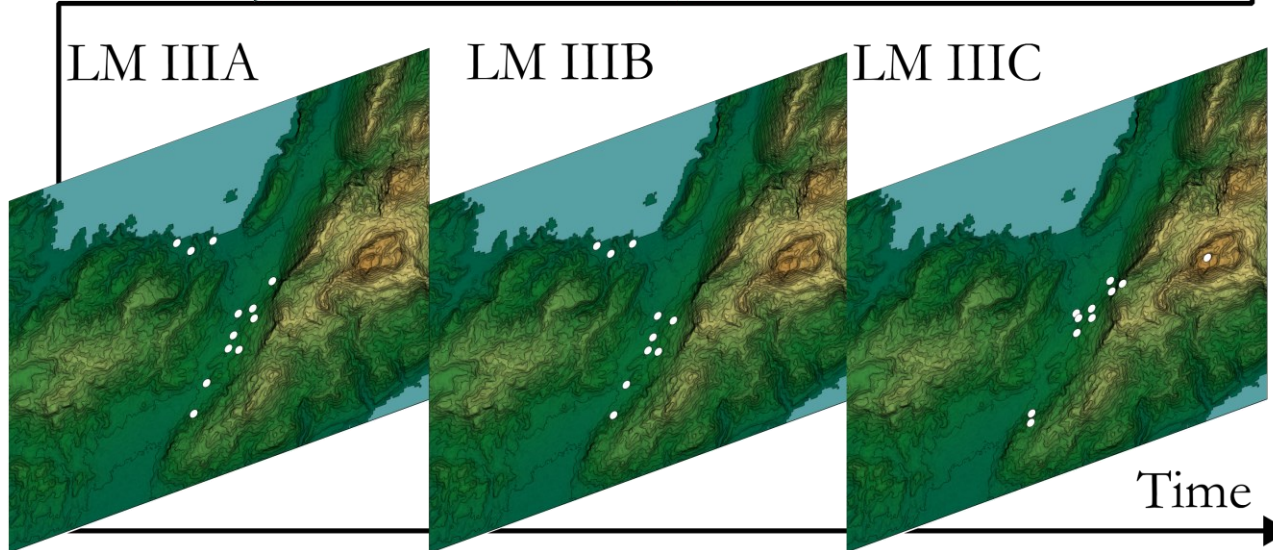




# Interpreting the results: Late Minoan IB and beyond



	LM IB	LM II	LM IIIA	LM IIIB	LM IIIC
<i>Coastscape Engagement Index</i>	0.14%	0.12%	0.18%	0.16%	0.13%
<i>Change from previous</i>	-86.31%	-15.37%	+51.58%	-11.79%	-18.59%
<i>Percentage of Highest Extent</i>	10%	8.57%	12.86%	11.43%	9.29%



- LM IB sees the largest decline in the data (86.31% drop) but LM II has lowest coverage other than FN
- LM IB destructions – variety of interpretations
- Knossian control & Mycenaean invasion (Watrous & Schultz 2012, 63)
- Not reorientation but depopulation – Gournia abandoned in LM III
- Generally avoidance of coastal after LM IIIA but especially in LM IIIC

# Final thoughts

- Spatial analysis of coastal landscapes can be repeated in different places/chronologies
- Classification and quantification of human agency
- Moving beyond cartographic and Euclidean models of space
- Embodied spatial interpretation—inclusive of temporality and landscape
- Highlights differing societal approaches to coastscape activity—socially derived
- New perspectives from legacy survey data

# Thank you for your attention!

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Special thanks to:



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