Problematising coastal landscapes. Spatial markers of coastscape engagement and the application of GIS-based methods in Aegean Prehistory

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Christopher Nuttall, Postdoctoral Researcher

Swedish Institute at Athens & National and Kapodistrian University of Athens

Swedish Research Council

SWEDISH INSTITUTE at ATHENS

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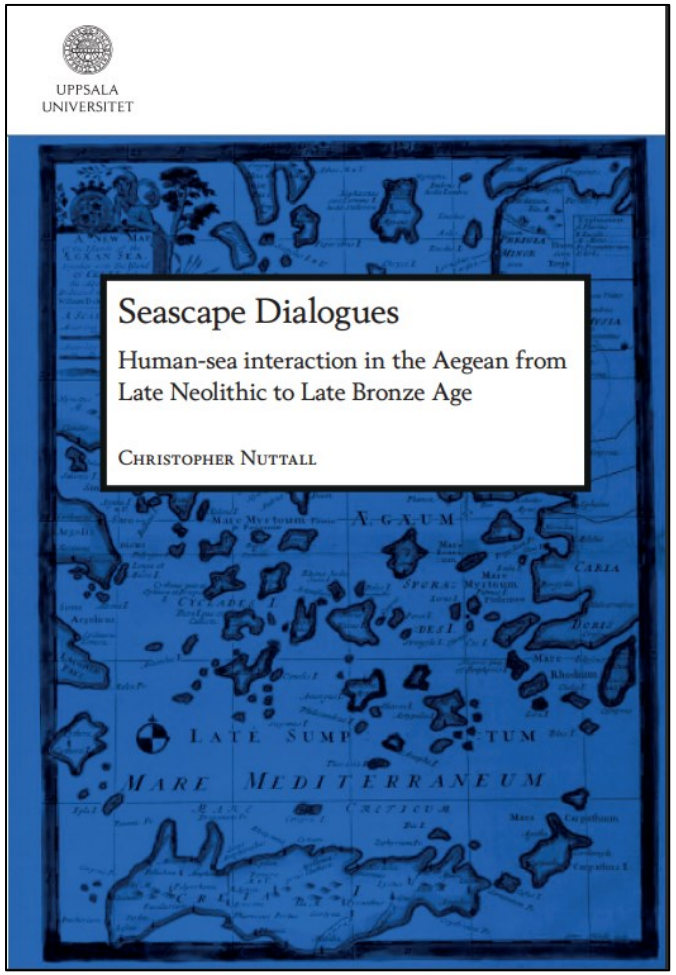
Seascape Dialogues

- Human-sea interaction from LN (c. 4900 BC) to LB I (c. 1600 BC)
- "*…the sea, which is not just the space in-between different lands, but a textured and knowledgeable place that facilitates a specific way of life.*" Vavouranakis 2011, *Seascapes in Aegean Prehistory*, p. 22.
- Built on concepts in maritime and island archaeology:
  - Westerdahl 1992, *The maritime cultural landscape*
  - Gosden & Pavlidies 1995, '*Are Islands Insular? Landscape vs. Seascape in the Case of the Arawe Islands, Papua New Guinea*'; Broodbank 2000, *An island archaeology of the early Cyclades*
- Seascape perspective:
  - Berg 2013, '*Marine Creatures and the Sea in Bronze Age Greece: Ambiguities of Meaning*'
  - Vavouranakis 2011
  - Von Rüden 2015, '*Making the Way through the Sea Experiencing Mediterranean Seascapes in the Second Millennium BCE*'
  - Mylona 2020, '*Marine Resources and Coastal Communities in the Late Bronze Age Southern Aegean: A Seascape Approach*'



Seascape Dialogues: Theoretical Approach

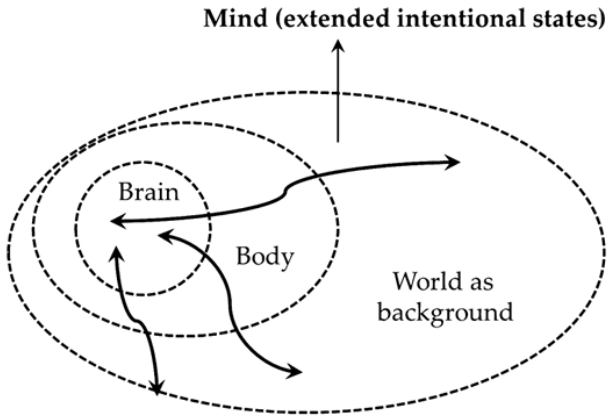
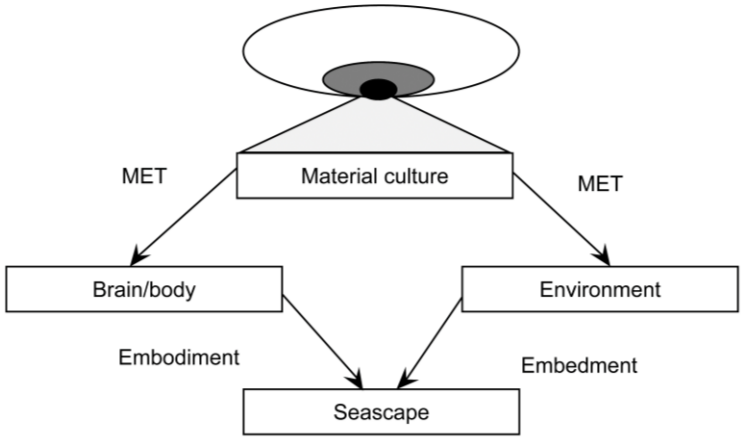


Figure 6.4
The background as an "extended intentional state."

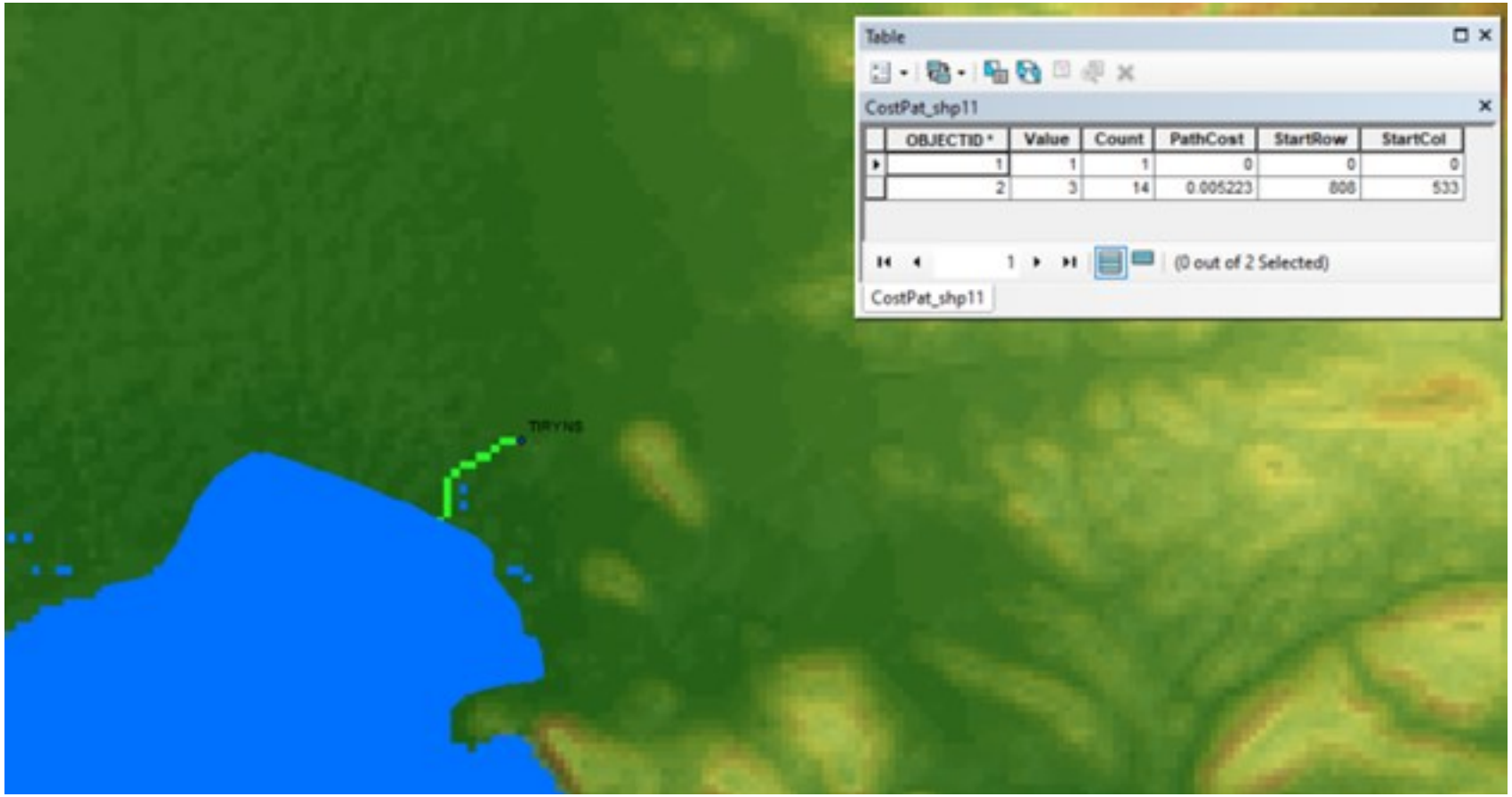
Malafouris 2013, Fig. 6.4



Nuttall 2021, Fig. 1.1

- Material Engagement Theory (Malafouris 2013, *How things Shape the Mind. A theory of Material Engagement*; Varela *et al.* 1991. *The Embodied Mind: Cognitive Science and Human Experience*)
- What constitutes the world? Social or physical?
- Space vs. Place (Tuan 1977, *Space and Place: The Perspective of Experience*)
- Creation of a seascape: "*The very act of giving meaning to the sea, converting it from space to place.*"
- Multi-scalar approach
  - **Macro: "being-in-place" (Spatial)**
  - Meso: embodied praxis (food, material culture)
  - Micro: metarepresentation (iconography)

First attempts at modelling coastal proximity (2018-2021)



- Euclidean measurement does not consider role of landscape or embodied movement
- Least Cost Path (LCP) from sea to site
- Abstract value initially – divorced from time

Populating Coastal Landscapes - Postdoc

Image generated by AI (Dall-E)

- Continue work on the spatial relationship between centres of human agency and the sea
- Early Neolithic – Late Helladic IIIC – long-term perspective
- Focus on regional data – published fieldwalking surveys
- Introduction of spatial analytical markers to quantify and classify integration of the maritime into ancient people

Introduction

"Coastscape" can be defined as:

"*Territorial coastal zone; passes to interior; inshore waters and the visual seascape*"

(Tartaron 2013, *Maritime Networks in the Mycenaean World*, p. 186)

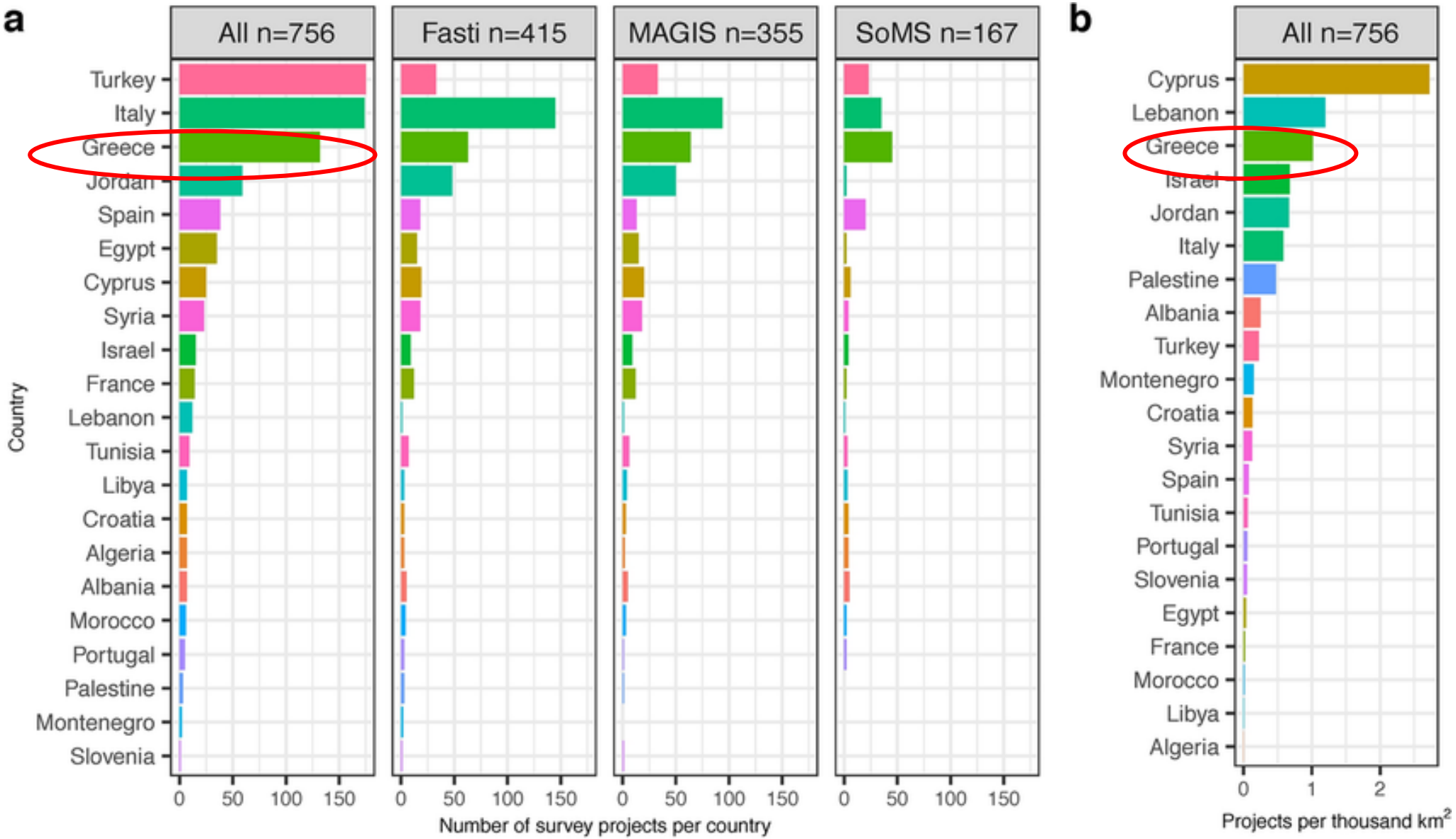
BUT

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	46,000.00	2,500,000.00	**54.35**
Philippine Sea	36,289.00	5,695,000.00	156.93
South China Sea	13,000.00	3,685,000.00	283.46
Caribbean Sea	8,000.00	2,754,000.00	344.25
Gulf of Mexico	4,250.00	1,550,000.00	364.71
Gulf of Guinea	6,000.00	2,350,000.00	391.67
Wedell Sea	3,750.00	2,800,000.00	746.67
Coral Sea	3,095.00	4,791,000.00	1547.98
Arabia Sea	890.00	3,862,000.00	4339.33
Sargasso Sea	-	4,163,499.00	NA

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

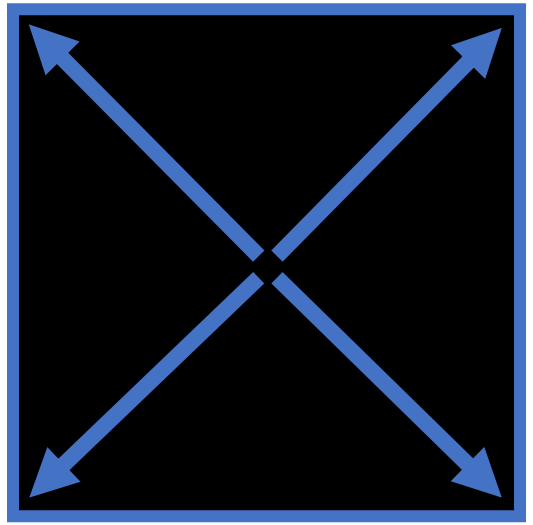
Greece:
Coastscapes, islandscapes and seascapes



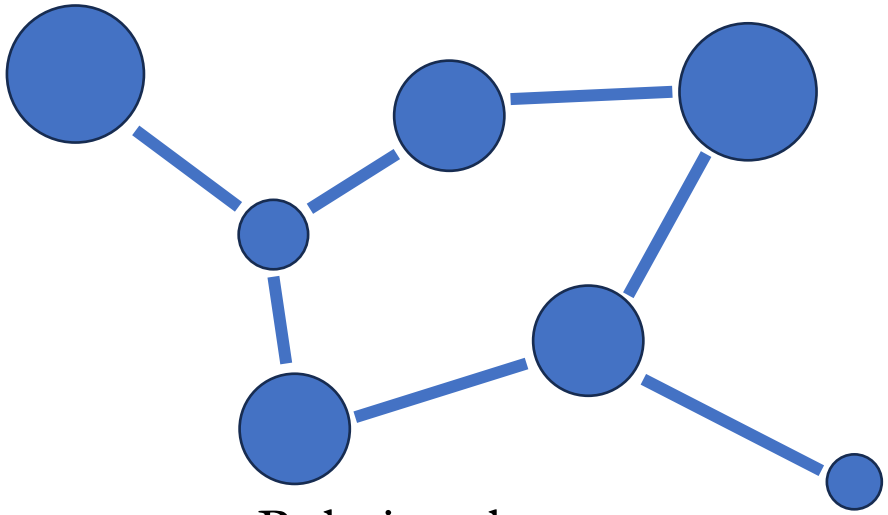
Adapted from Knodell *et al.* 2022: *Survey Archaeology in the Mediterranean World: Regional Traditions and Contributions to Long-Term History* fig. 4

Defining Space

- Singular definition is impossible
- Space as a 'container' for things and events (Emmanuel Kant)
- Space as relational (Gottfried Wilhelm Leibniz) – positional quality of the world of things
- Space an undercurrent of Aegean prehistory but not theorised until recently



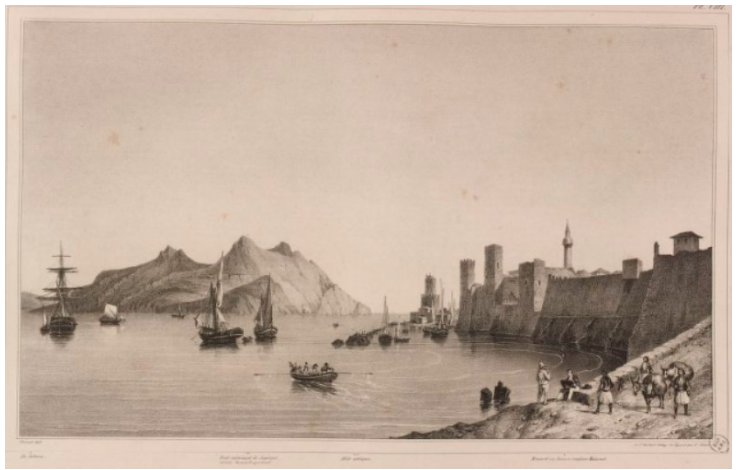
Absolute space



Relational space

Space in Greek archaeology: Antiquarians

- 'Grand Tour' tradition and interest in Hellenic culture– artefact/inscription focus
- Morea Expedition (1820-30s) introduced an early spatial approach
- Systematic recording of topography and landscape features
- Placement of ancient monuments within a cartographic tradition



Expédition scientifique de Morée. Section des sciences physiques: Atlas

Space in Greek archaeology: early archaeologists 1

- 'Opening-up' of the Greek landscape
- Greater appreciation of the topographical significance of the Greek landscape:

"I have already now found that one gains a surprisingly clear insight into the life and history of old Hellas from such topographical studies; and I cannot understand how, in our day in age, it is possible to treat the Greek past at universities without studying in the country itself."

—Samuel Wide, Swedish archaeologist (Kalaureia, Aphidna)

9 October 1893; translation after Berg 2016, *Kalaureia 1894: A Cultural History of the First Swedish Excavation in Greece*, pp. 72-73

Space in Greek archaeology: early archaeologists 2

Mackenzie 1896/1897. "Ancient Sites on Melos", p. 84

> *"**Half-an-hour's walk** in a westerly direction, through rough country, brings us to the stony little bay of Bourlidia. Taking the left side of the bay and ascending a little, we come upon the site of 'sta Glastria, so-called from the fragments of late Roman pottery strewn about."*

Wace and Hasluck *1908/1909*. "Laconia II: Topography", pp. 164-5.

> *"Leake suggested it should be looked for near Zaraphon, and Curtius that it might be near the ruined monastery of Daphni on the road to Zaraphon. In the narrow valley below Daphni, and **one hour** from Geraki, is a place called Nerotrivi: here there are many Greek walls of large cut limestone blocks laid in rough courses, and some still stand to a height of about two metres."*

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."*

Space in Greek archaeology: Culture-history

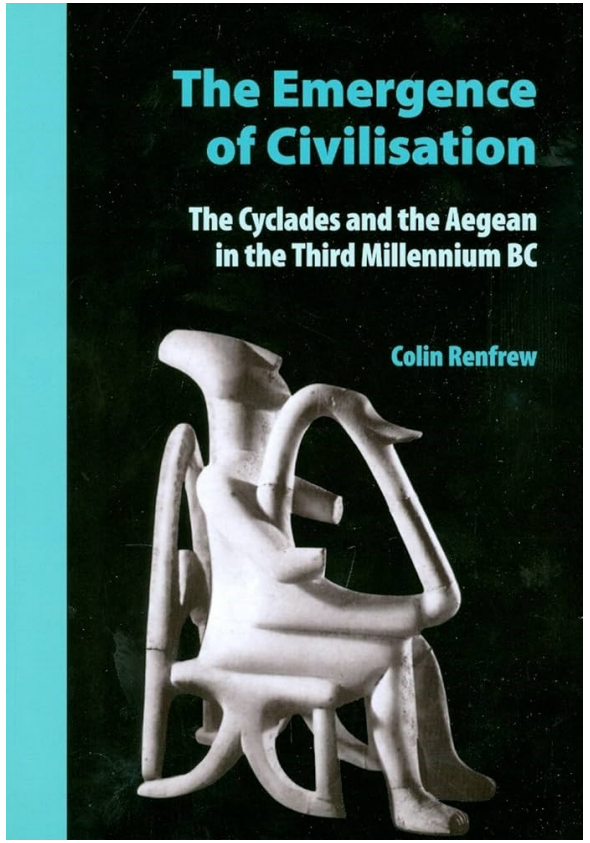
- Need to prove links between ancient societies and modern nation states
- Childe (1929. *The Danube in Prehistory*,) and Kossinna (1921. *Die Indogermanen, ein abriss*)
- Enduring impact: **Cycladic**, **Minoan**, **Helladic** and **Mycenaean**
- Culture-groups delimited space overlying a landscape to which it had no link
- *"a response to growing awareness of geographical variability in the archaeological record"*
  (Trigger 2007, *A History of Archaeological Thought* (2nd ed.), p. 211)
- 'What' happened 'where'

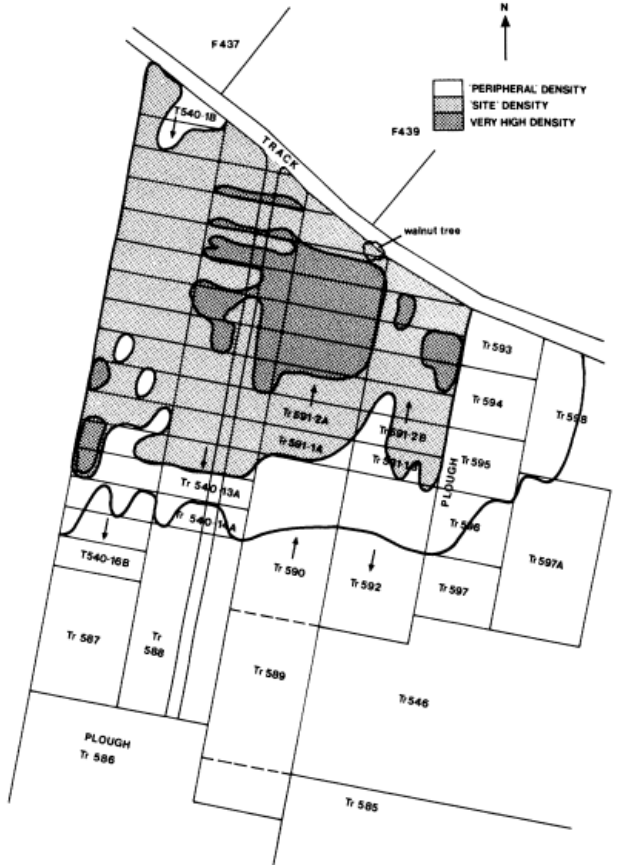
"We find certain types of remains – pots, implements, ornaments, burial rites, house forms – constantly recurring together. Such a complex of regularly associated traits we shall term a 'cultural group' or just a 'culture'. We assume that such a complex is the material expression of what today would be called a people."

— Vere Gordon Childe 1929, v-vi.

Space in Greek archaeology: Processual Approach 1

- *The Emergence of Civilisation*, Renfrew 1972
- New technologies and adoption of systematic **fieldwalking survey**
- Cartographic and Euclidean perspectives on landscape needed in fieldwork – control over data
- Absolute spatial philosophy





Specimen plan of sampling method
Cambridge/Bradford Boeotian Expedition

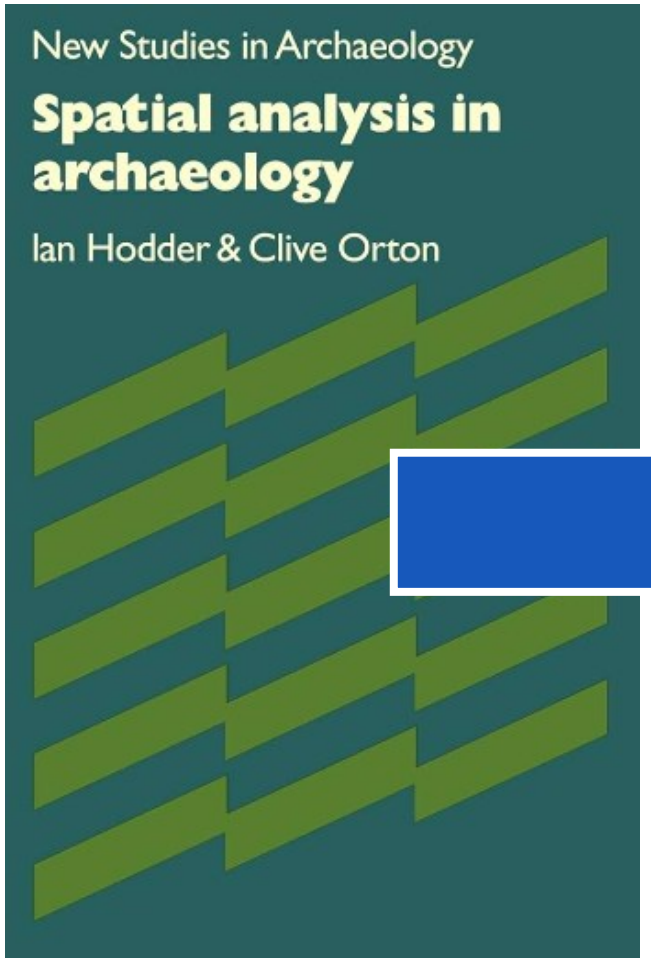
Space in Greek archaeology: Processual approach 2

- Beginning of a more spatial approach:

"*more detailed and systematic study of spatial patterning in archaeological data*"

(Hodder & Orton 1976, *Spatial analysis in archaeology*, p. 1).

- Positivism: statistical and mathematical approach
- Space had a neutral quality
- Introduction of GIS to archaeology



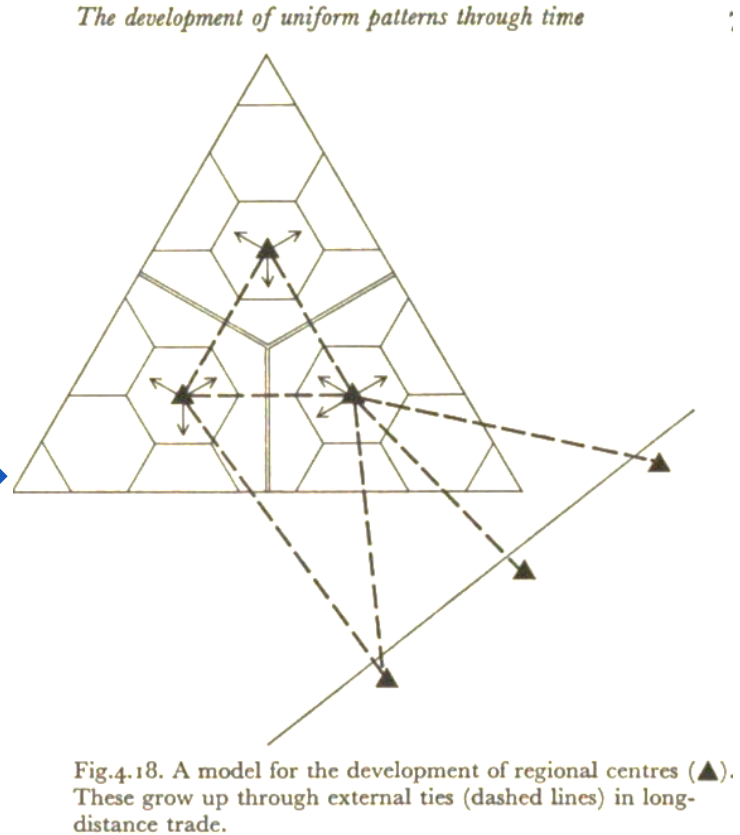
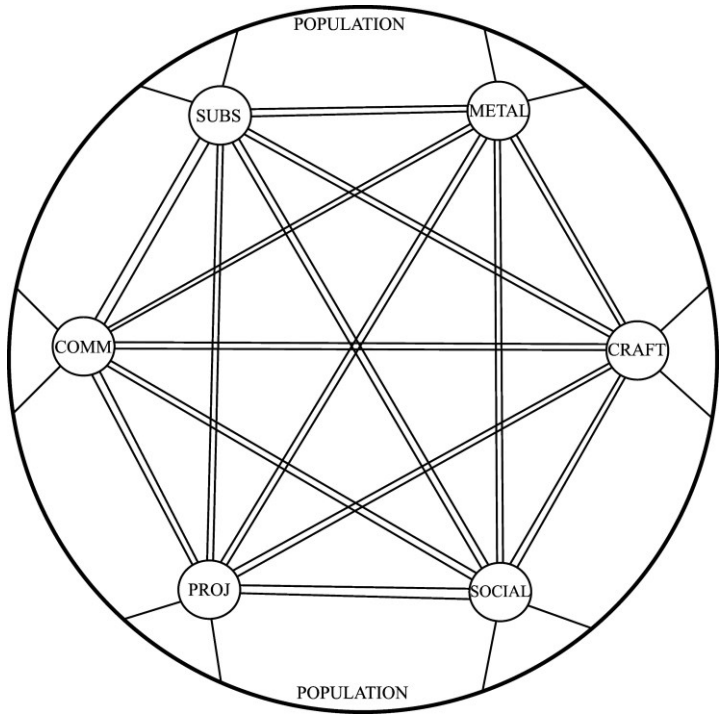


Fig.4.18. A model for the development of regional centres (▲). These grow up through external ties (dashed lines) in long-distance trade.

Space in Greek archaeology: Processual approach 3

- Big-picture view of society – 'god trick' (Haraway 1991, *Simians, Cyborgs, and Woman: The Reinvention of Nature*, p. 189)
- Space a 'container' and having a neutral quality – 'divorced' from action (Tilley 1994, *A Phenomenology of Landscape*, p. 10)
- Sub-systems of society delimited concepts that may have overlapped and intertwined (e.g. mortuary, cult and politics)
- Intention to identify:

  "…*regularities that are in a sense* ***spaceless*** *and* ***timeless***"
  (Willey & Phillips, 1958, *Method and Theory in American Archaeology*, p. 2, my emphasis)



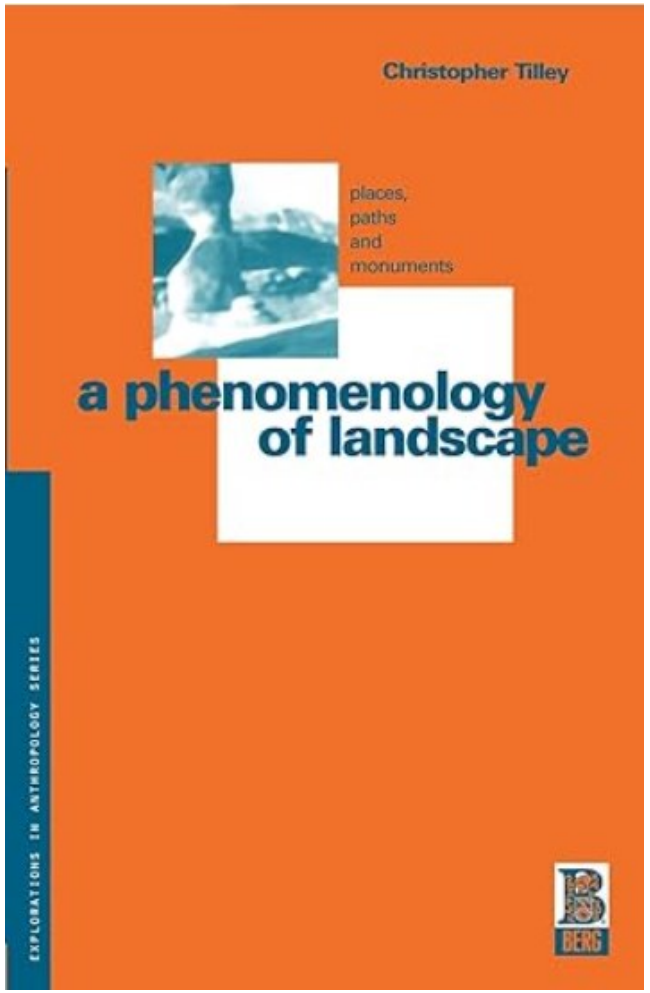
Adapted from Renfrew 1972, Fig 21.1

Space in Greek archaeology: Postprocessual critique

- Built upon positivist critique in other disciplines (e.g. Tuan 1977)
- 'Phenomenological' approach–how people experience space

  "*space cannot exist apart from the events and activities within which it is implicated*" (Tilley (1994, 10)
- Adopted quickly in Aegean prehistory
- Since the 2000s a proliferation of work on "'scapes"
  - **Deathscapes** (Gallou 2005, *The Mycenaean Cult of the Dead*)
  - **Islandscapes** (Broodbank 2000, *An island archaeology of the early Cyclades*)
  - **Taskscapes** (Brysbaert 2014, *Talking Shop: Multicraft Workshop Materials and Architecture in Prehistoric Tiryns, Greece*)
  - **Seascapes** (Vavouranakis 2011)
  - **Coastscapes** (Tartaron 2013)

  To name just a few…
- Experience and knowledge – No singular objective perspective



Previous Literature: Prehistoric Coastal Configurations

Examples

- **Karpathos** in Final Neolithic
  - Klys 2018, *'The Afiartis Project: Current Survey Results from Karpathos with Special Reference to Minoan Penetration'*, p. 46
- **Euboia** in Early Helladic II
  - Wickens *et al.* 2018, *Settlement and Land Use on the Perphery: The Bouros-Kastri Peninsula, Southern Euboia*, p. 48
  - Tankosić & Katsianis 2017, *'Cycladic or Mainland? The Prehistoric Landscapes of Southern Euboea'*, p. 243–4
- **Chania** region in Early Minoan II
  - Moody 1987, *The Environmental and Cultural Prehistory of the Khania Region of West Crete: Neolithic through Late Minoan III*, p. 298)
- **Messenia** in Early Helladic II
  - Davis & Bennet 2017, *The Pylos Regional Archaeological Project: A Retrospective*, pp. 87, 100)
- **Vrokastro** (Crete) in Late Minoan I
  - Hayden *et al.* 1992, *The Vrokastro Survey Project, 1986-1989: Research Design and Preliminary Results*, p. 325)

Interpretations

- **Trade/Exchange**
  - Blackman & Branigan 1977, *An Archaeological Survey of the Lower Catchment of the Ayiofarango Valley*, p. 69
  - Wickens *et al.* 2018, p. 48
  - Cherry *et al.* 1991, *Prehistoric Northern Keos: Analysis and Interpretation of the Survey Finds*, p. 4
- **Subsistence**
  - Klys 2018, p. 45
- **Avoidance of fertile areas**
  - Tankosić & Katsianis 2017, p. 244
- **Seascapes**
  - Tankosić 2011, *Southern Euboea – Northern Cyclades: An Integrated Analysis of Final Neolithic and Early. Bronze Age Interactions*

Previous Literature: Prehistoric Inland Configurations

Examples

- **Kefalonia:** Neolithic and Bronze Age
  - Souyoudzoglou-Haywood 2008, '*Interpreting the Bronze Age Landscape of Kephalonia. A (Preliminary) View from the Livatho Valley Survey*', p. 248
- **Sphakia** (Crete) through prehistory
  - Nixon *et al.* 1989, *Archaeological Survey in Sphakia, Crete*, p. 201
- **Kommos** in Early Minoan II
  - Hope Simpson *et al.* 1995, p. 394–5
- **Karpathos** in the Early Bronze Age
  - Klys 2018, p. 46
- **Messenia** in Middle Helladic period
  - McDonald & Hope Simpson 1969, *Further Explorations in Southwestern Peloponnese: 1964-1968*, p. 174
- **Chania** in Middle Minoan III-Late Minoan I
  - Moody 1987, p. 306
- **Vrokastro** region (Crete) in LM III
  - Hayden *et al.* 1992, p. 326

Interpretations

- **Piracy**
  - Renfrew 1972, p. 262–4
- **Geomorphological change**
  - Hayden *et al.* 1992, p. 325
  - Moody 1987, p. 306
  - Souyoudzoglou-Haywood 2008, p. 248
- **Subsistence change**
  - McDonald & Hope Simpson 1969, p. 174)

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

Exceptions:

Antikythera Survey

- Euclidean 'distance from coast' a "covariate" in a regression model for survey area
- 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, *Mediterranean Islands, Fragile Communities and Persistent Landscapes: Antikythera in Long-Term Perspective*, p. 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, p. 303, fig. 5)
- Used to show a strong pattern of coastal habitation between EM I and LM I

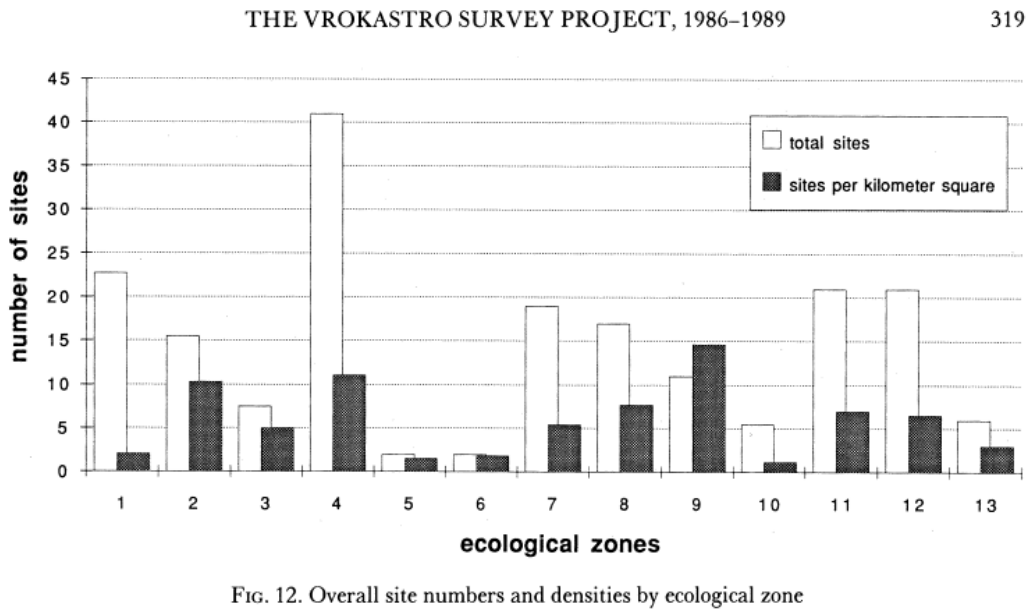


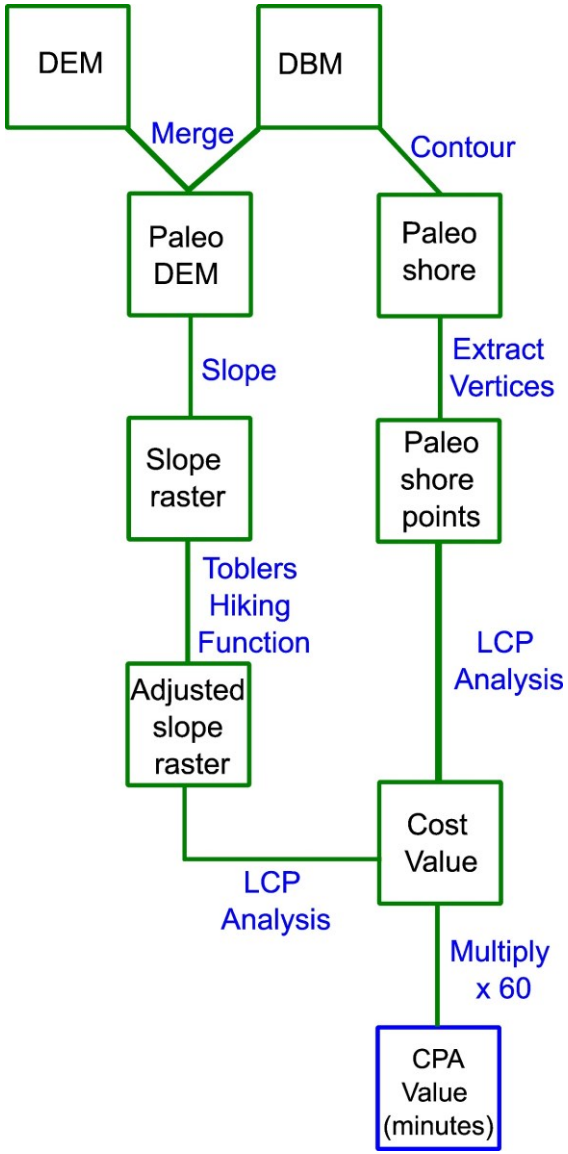
FIG. 12. Overall site numbers and densities by ecological zone

Limitations of Coastscape discussion

- Coastal zone is rarely defined as a clear analytical unit
- Absolutist perspective of coastal proximity informed by cartographic or Euclidean models of space: such perspectives not present in prehistoric thinking
- Anthropocentric/embodied perspective is missing, as is the temporal element
- *"space cannot exist apart from the events and activities within which it is implicated"* (Tilley 1994, 10)
- Implementation of cost surfaces (embodied movement and time) (**Marker 1**) and incorporation of activities and site size (**Marker 2**) and access to maritime areas in site territory/walking catchments (**Marker 3**)

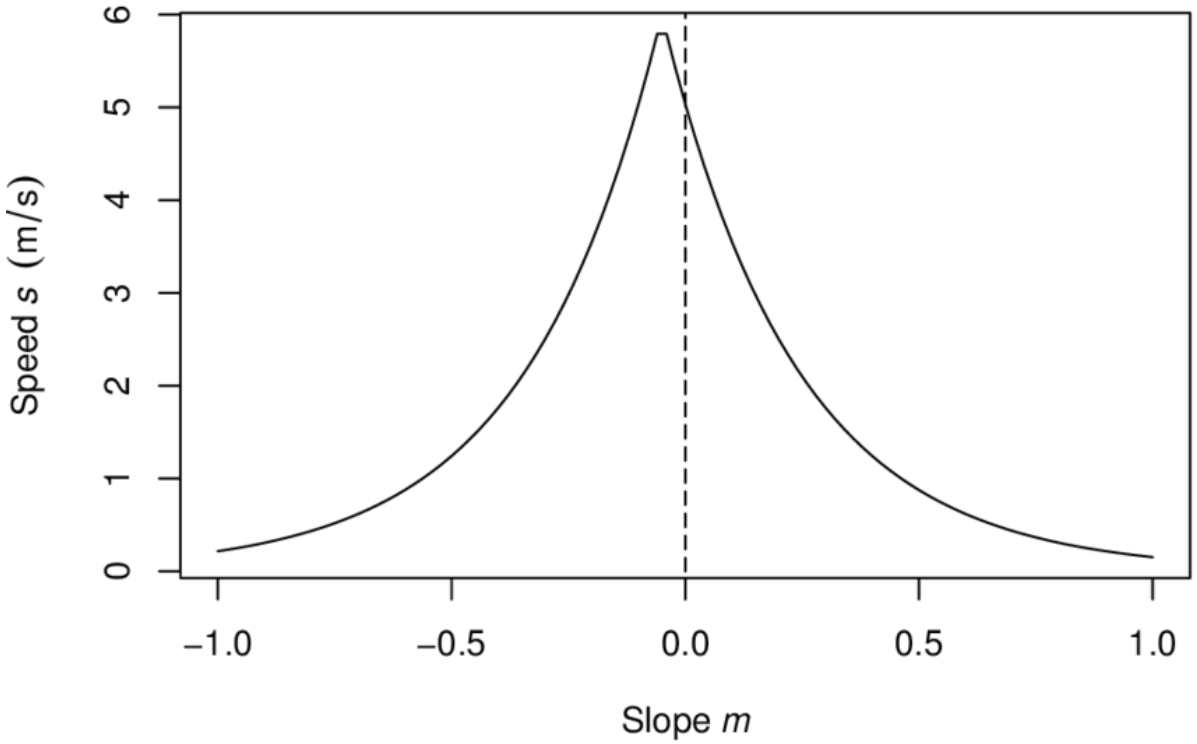
Marker 1. Coastal Proximity Analysis 1

- Focuses on 'cost' of movement between site and paleoshore
- Free-open access QGIS-led reconstruction of paleotopography
- Open-source data: 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 sea-level into series of points: *Extraction > Vectorisation*



Coastal Proximity Analysis 2 (CPA)

- Implementation of Tobler's Hiking function on slope generated through Horn's formula (GDAL)
- Hiking speed considers slope angle
- Removes the issue of least cost path analyses registering zero cost for cells with zero slope (Kantner 2012, *'Realism, reality, and routes'),* even though distance is being covered.
- Tobler's Hiking function can be expressed in QGIS with:

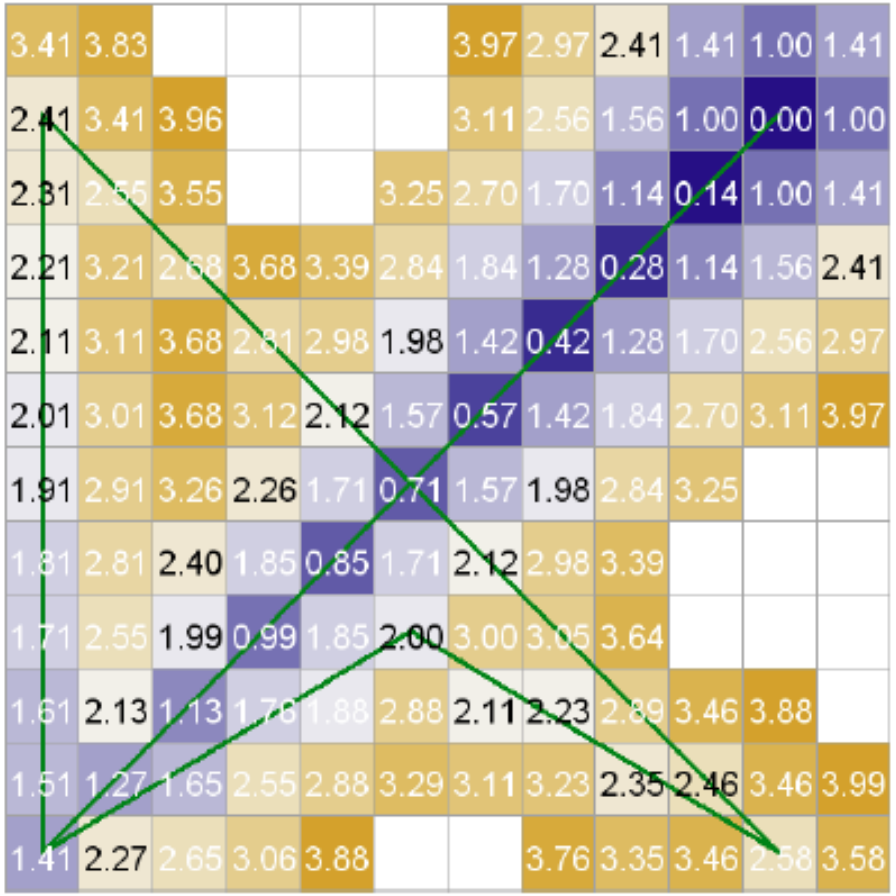


Tobler's Hiking Function: Walking speed vs. slope

```
[(30/1000)/ (6 * 2.71828 ^ (ABS (tan (("Slope@1" * 3.14159)/180) + 0.05)))].
```

Coastal Proximity Analysis 3 (CPA)

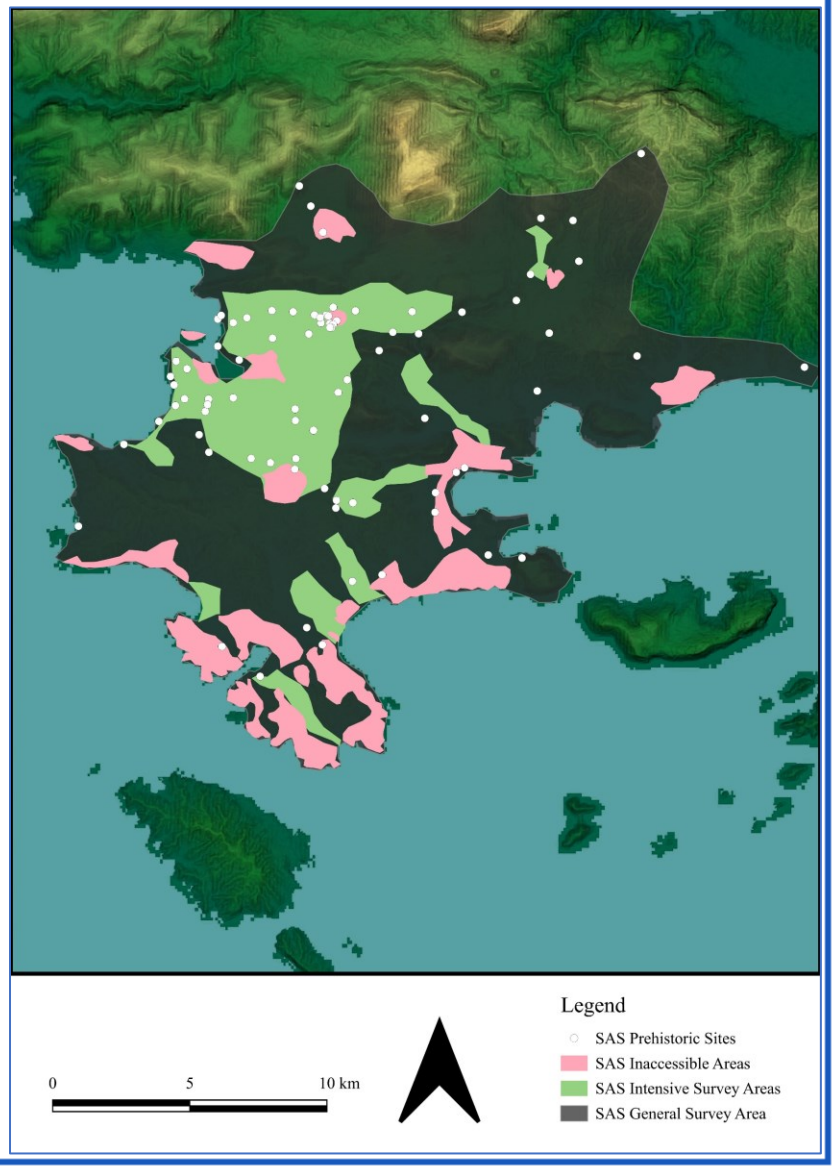
- Least cost path (LCP) – calculates most efficient route between two points
- Cost of travel between coast and site
- Resulting value in hours - multiply by 60 to generate value in minutes
- Coastal Proximity Value (CPV)
  - Hiking time (embodiment)
  - Landscape (embedment)
  - Time (relative space)



Least cost path and cell cost

Case Study: Southern Argolid Survey

- Fieldwalking undertaken between 1972 and 1983, published in 1994.
- 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)



Coastal Proximity Analysis 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 II early		EH II late		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.

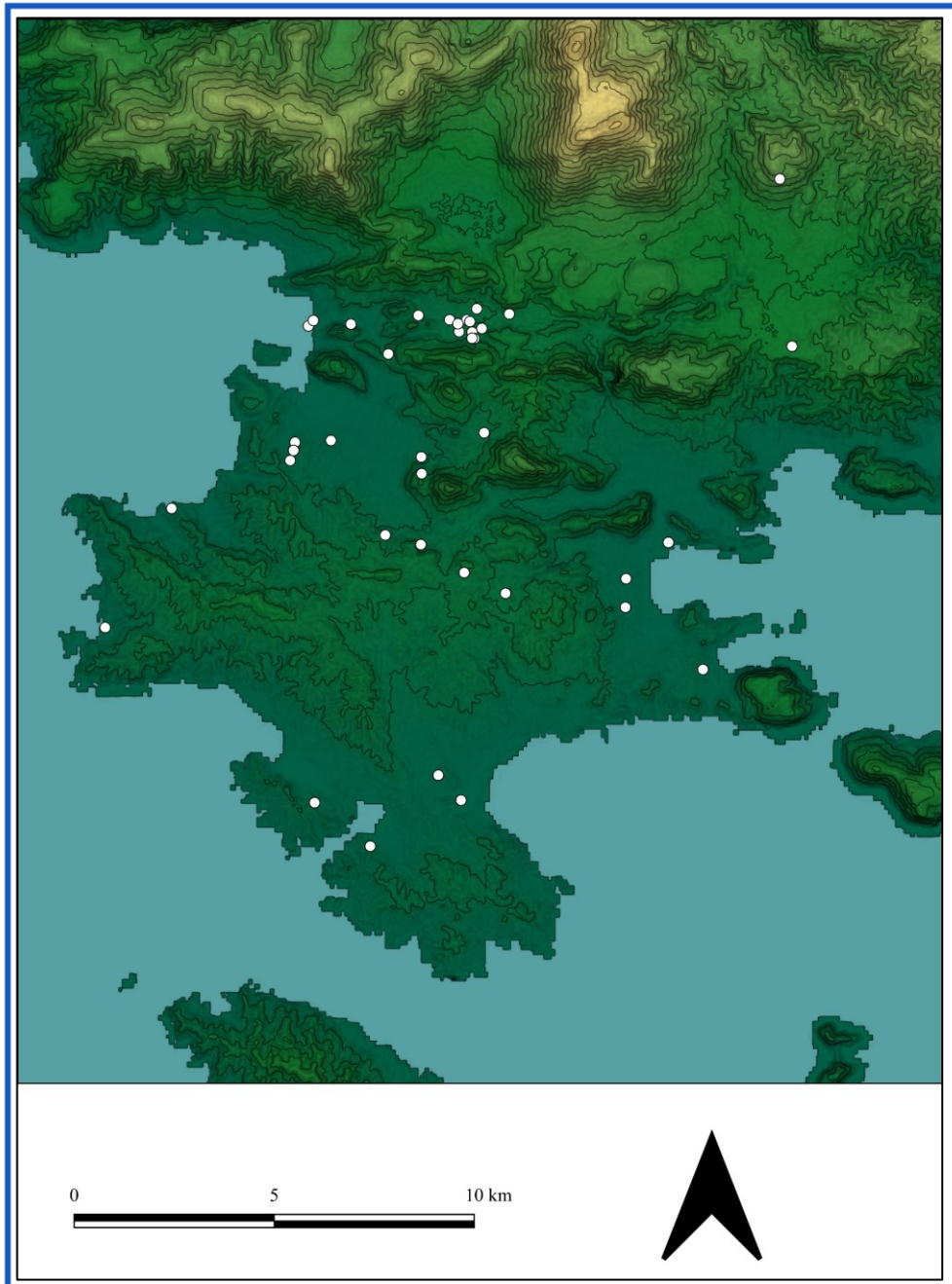
Coastal Proximity Analysis Results

By Type	EN–LN		FN		EH I		EH II early		EH II late		EH III	
	Count	Median	Count	Median	Count	Median	Count	Median	Count	Median	Count	Median
Habitation centre	0	-	1	**3.96**	5	**13.86**	6	**8.91**	0	-	0	-
Hamlet	0	-	5	**11.46**	17	**10.92**	19	**11.88**	3	**7.74**	3	**7.74**
Farmstead	0	-	4	**2.97**	7	**30.12**	12	**29.34**	0	-	0	-
Cave	3	**1.38**	3	**30.42**	1	**1.38**	1	**56.34**	1	**56.34**	1	**56.34**
Burial	0	-	0	-	1	**5.76**	1	**5.76**	0	-	0	-
Industrial	1	**36.42**	7	**34.74**	5	**34.74**	1	**37.68**	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	**1.50**	2	**3.99**	2	**3.99**	3	**1.50**	3	**1.50**	0	-
Hamlet	9	**28.44**	2	**17.82**	2	**17.82**	6	**31.02**	6	**31.02**	1	**28.74**
Farmstead	2	**15.9**	0	-	0	-	2	**31.11**	2	**31.11**	0	-
Cave	0	-	0	-	0	-	0	-	0	-	1	**56.34**
Burial	1	**23.7**	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.

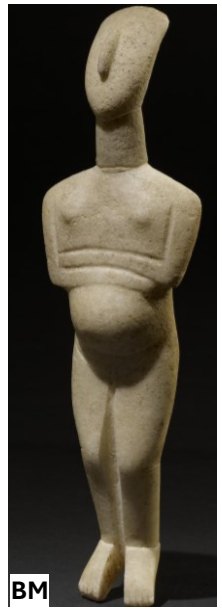
Interpreting the results



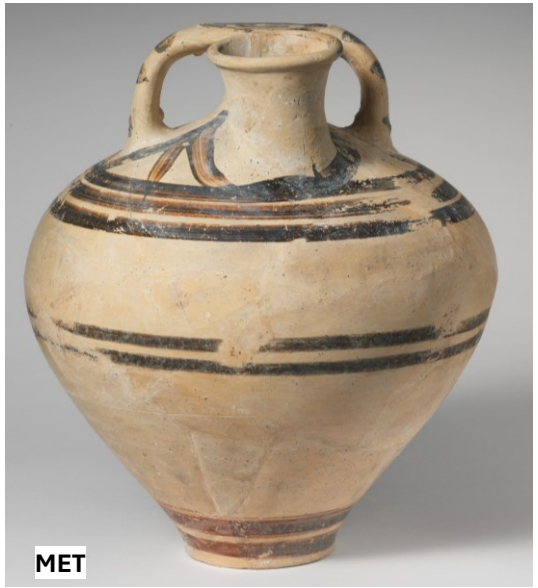
"International Spirit"

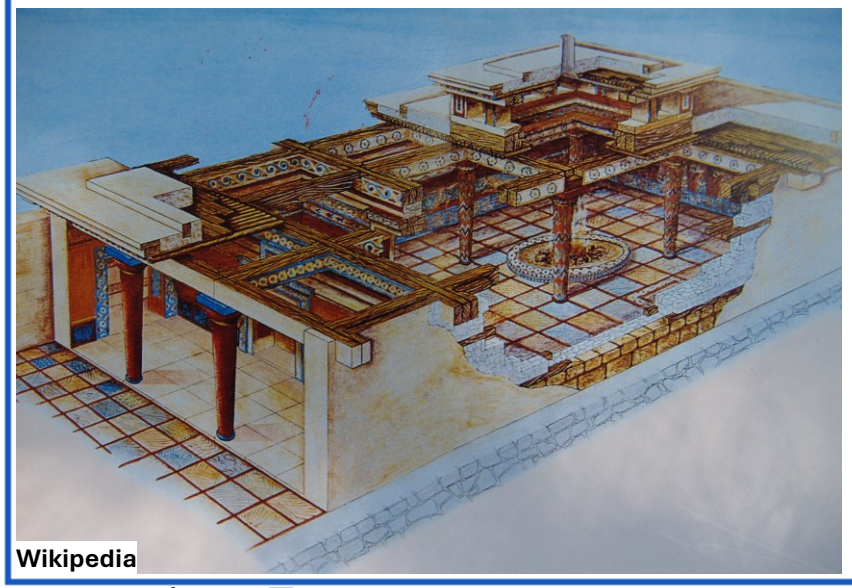
EB II early (2900–2650 B.C)


BM


BM

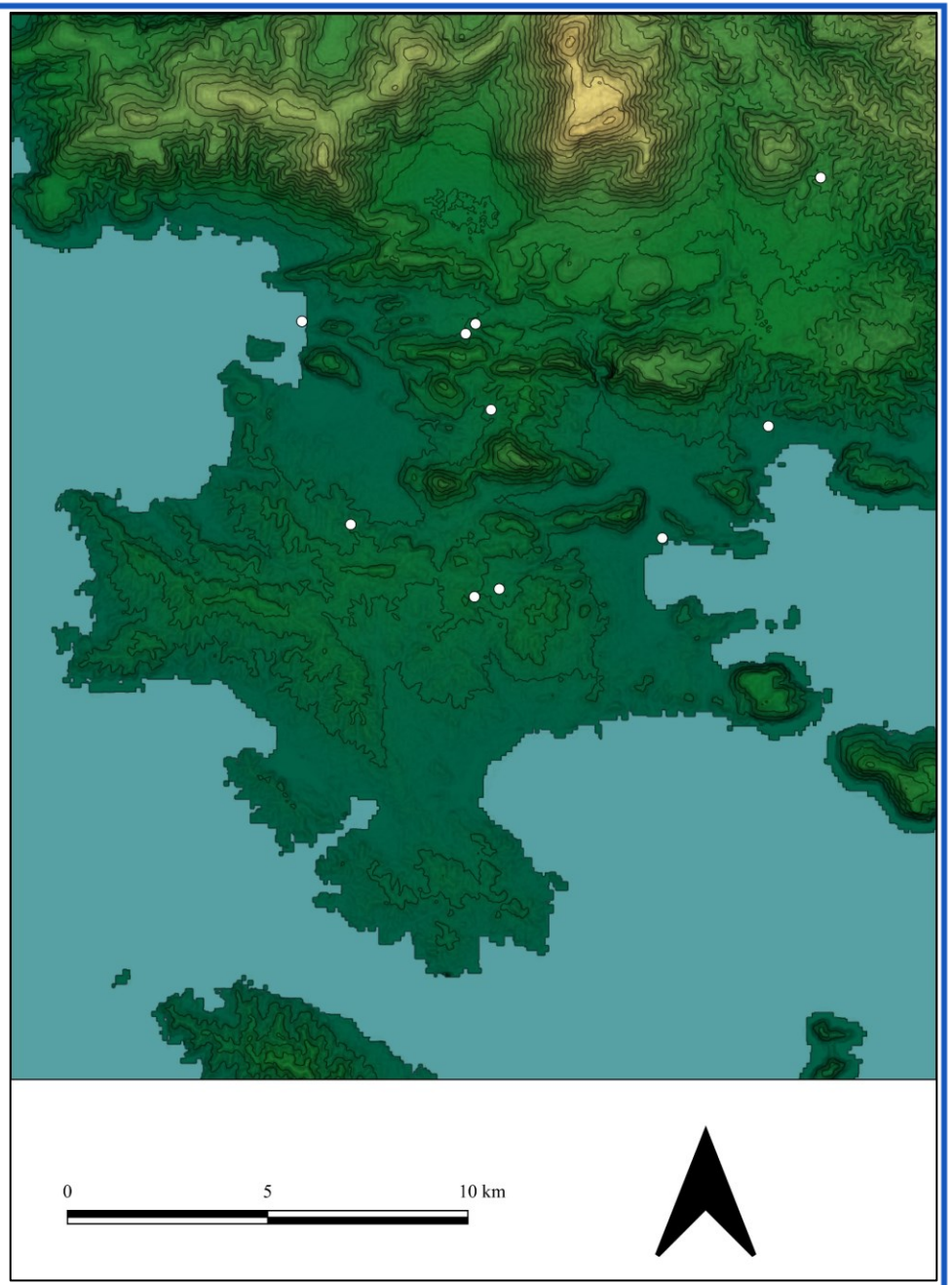
Interpreting the results





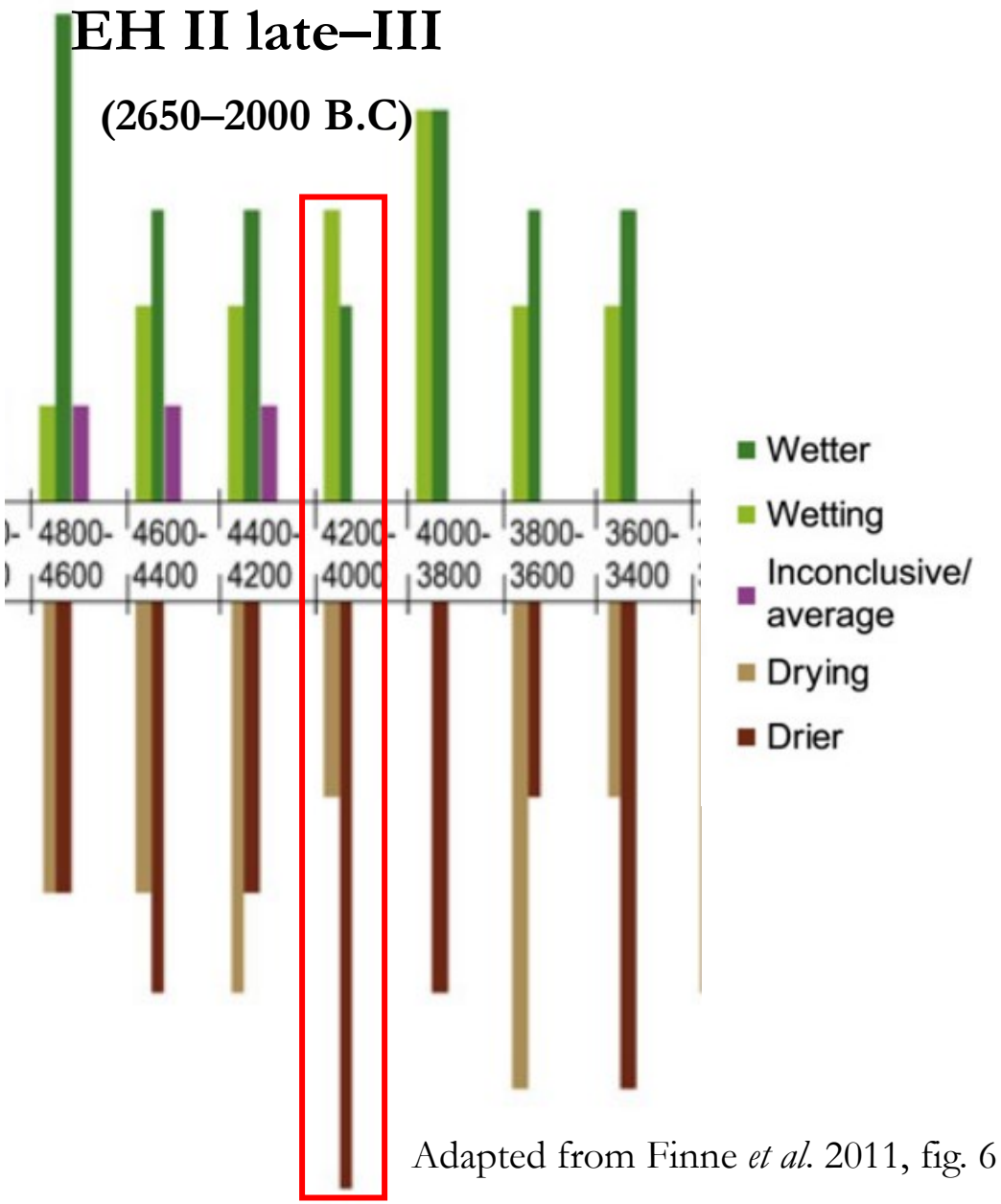
"Mycenaean *koine*"

LH III (1400–1200 B.C)



EH II late–III

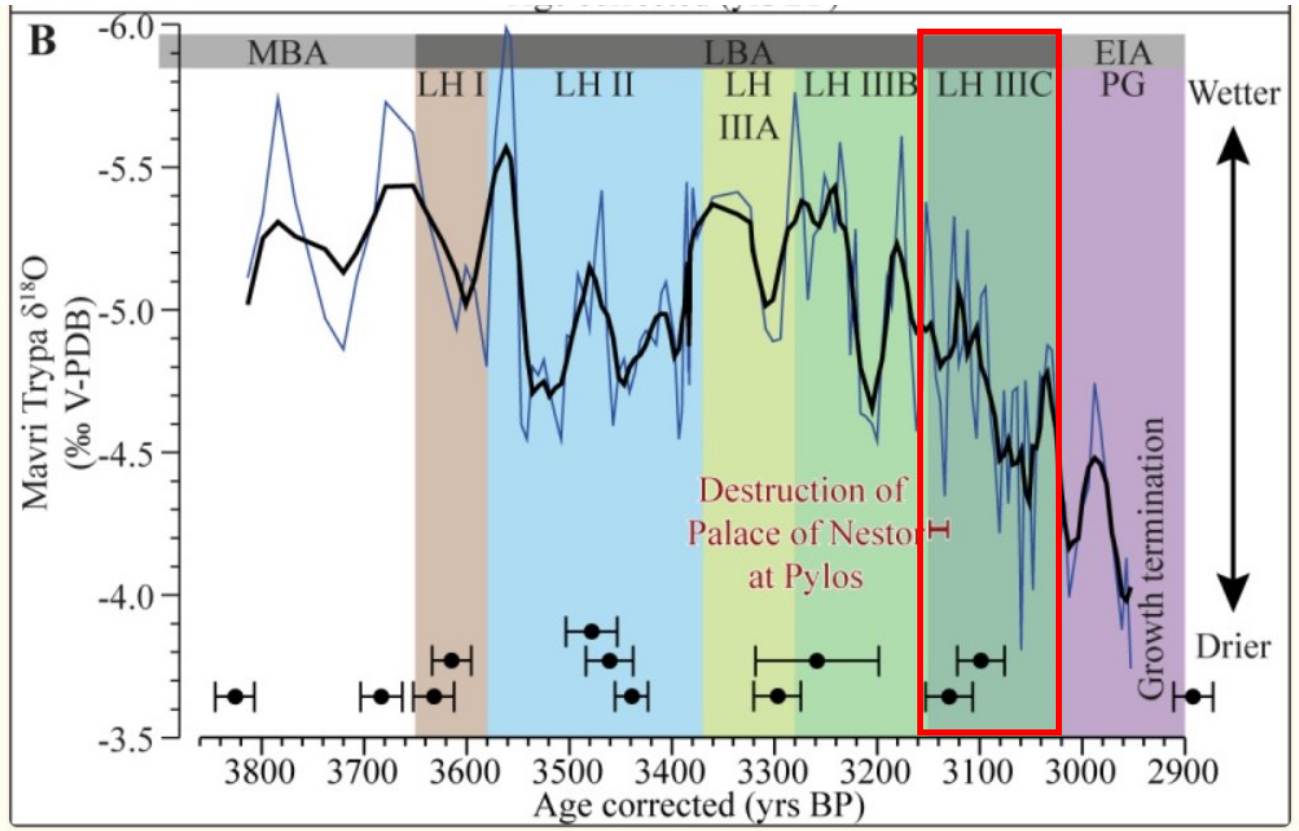
(2650–2000 B.C)



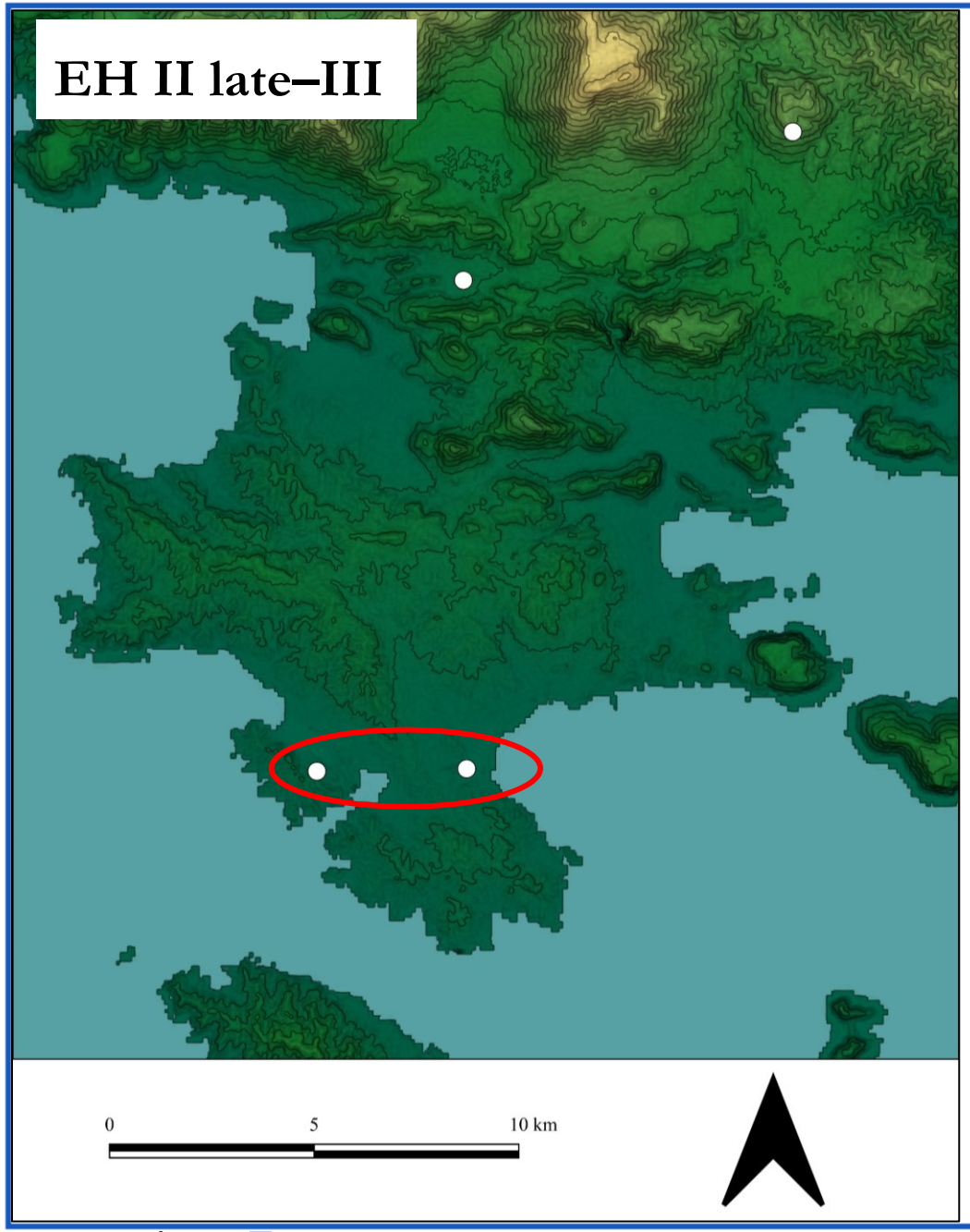
Adapted from Finne *et al.* 2011, fig. 6

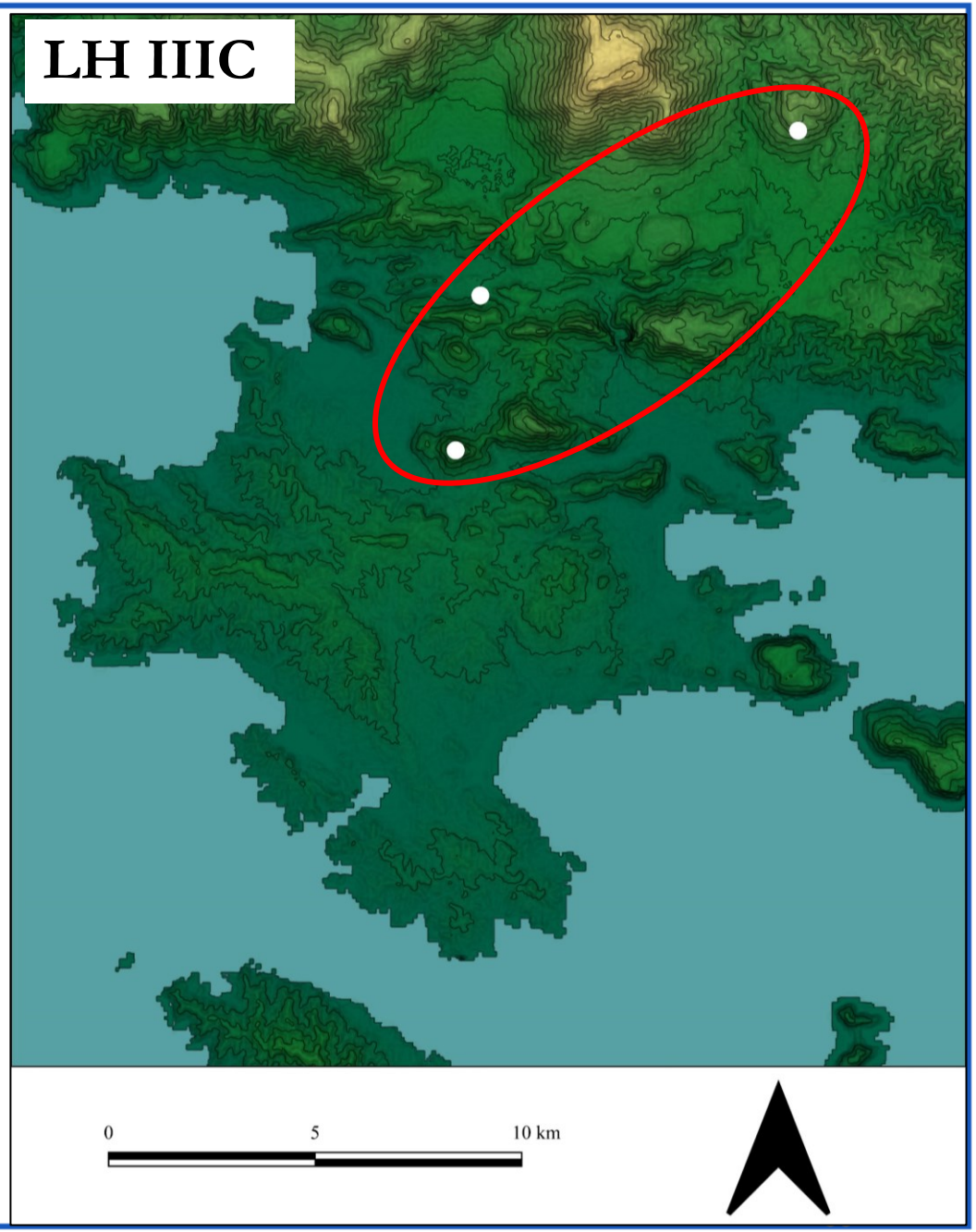
LH IIIC

(1190–1100 B.C)



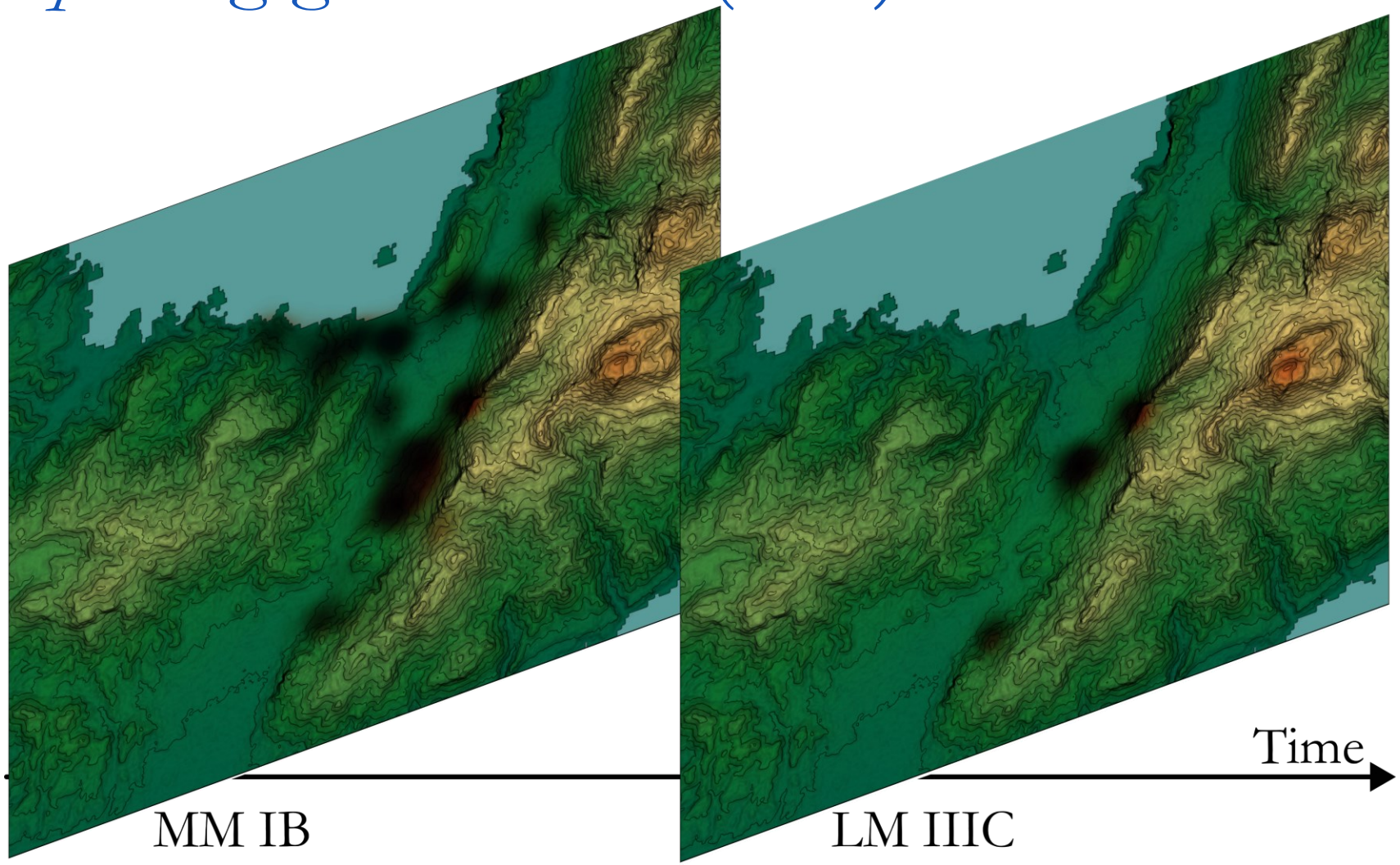
Adapted from Finne *et al.* 2017, fig. 4


EH II late–III
0
5
10 km


LH IIIC
0
5
10 km

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

- Simple weighted regression model
- Higher scores for land use proximal to the coast
- Lower score for land use more distant from the coast
- Uses the values generated in the CPA
- Determines where the population is clustered in specific chronological periods

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

A=recorded land use

χ= weighted regression coefficient

B= total survey area

C= CEI/Coastscape Engagement Index

Band	*Time cost (CPA Value)*	*M^2 coefficient contribution*
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

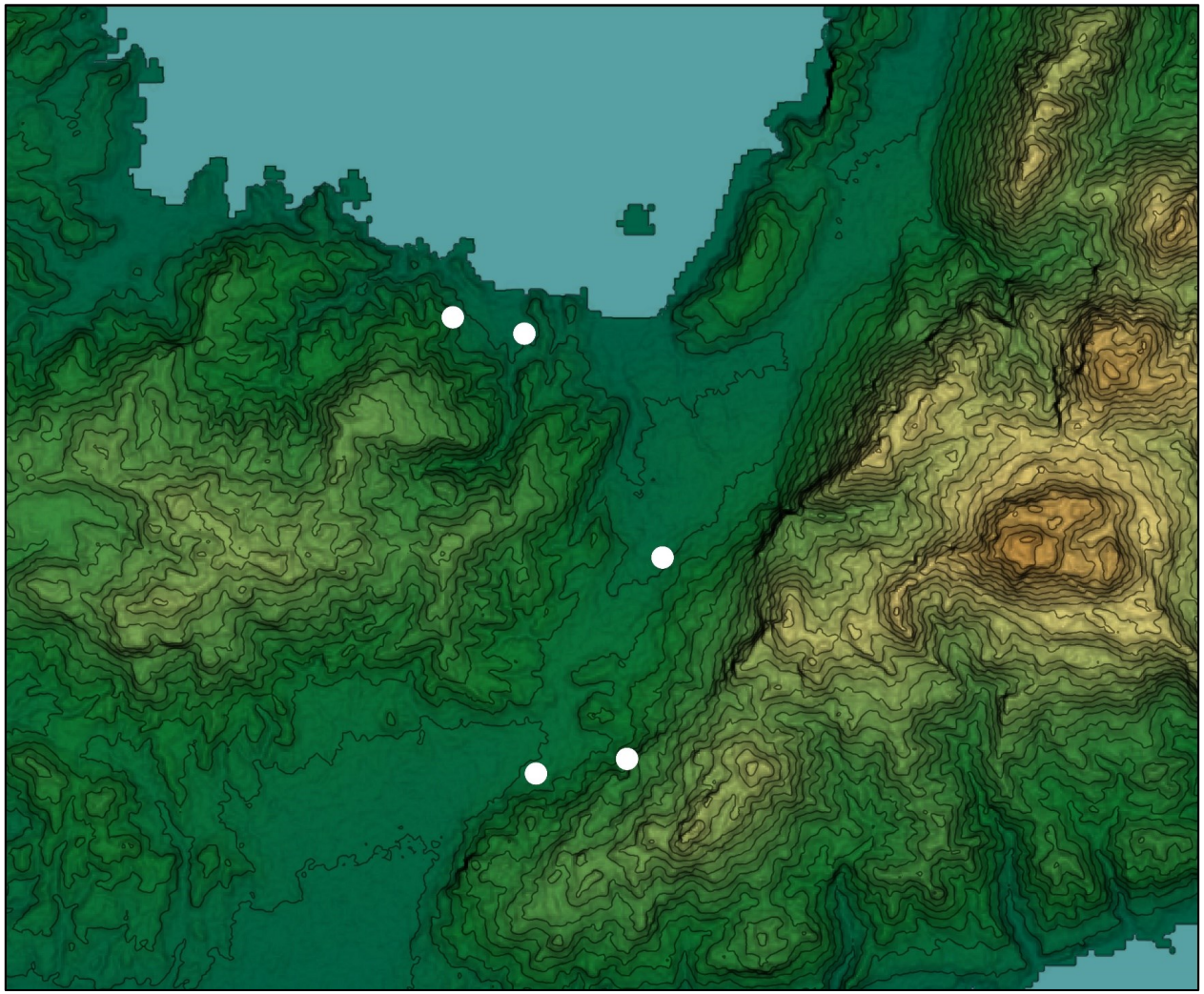
Chronology (as assigned in original survey publication):

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)
? = chronological periods used but dates not defined by authors		LM IIIC:	(1200–1100 B.C)

	FN	EM I	EM IIA	EM IIB	EM III	MM IA	MM IB
Coastscape Engagement Index	**0.09%**	**0.56%**	**0.72%**	**0.29%**	**0.47%**	**0.74%**	**1.36%**
Change	-	+522.22%	+29.30%	-59.95%	+62.83%	+57.41%	+82.92%
Percentage of Highest Extent	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
Coastscape Exploitation Index	**1.40%**	**1.17%**	**1.02%**	**0.14%**	**0.12%**	**0.18%**	**0.16%**	**0.13%**
Change	+3.28%	-16.99%	-12.09%	-86.31%	-15.37%	+51.58%	-11.79%	-18.59%
Percentage of Highest Extent	100%	83.57%	72.86%	10.00%	8.57%	12.86%	11.43%	9.29%

Interpreting the results: Final Neolithic (4000–3500 B.C)



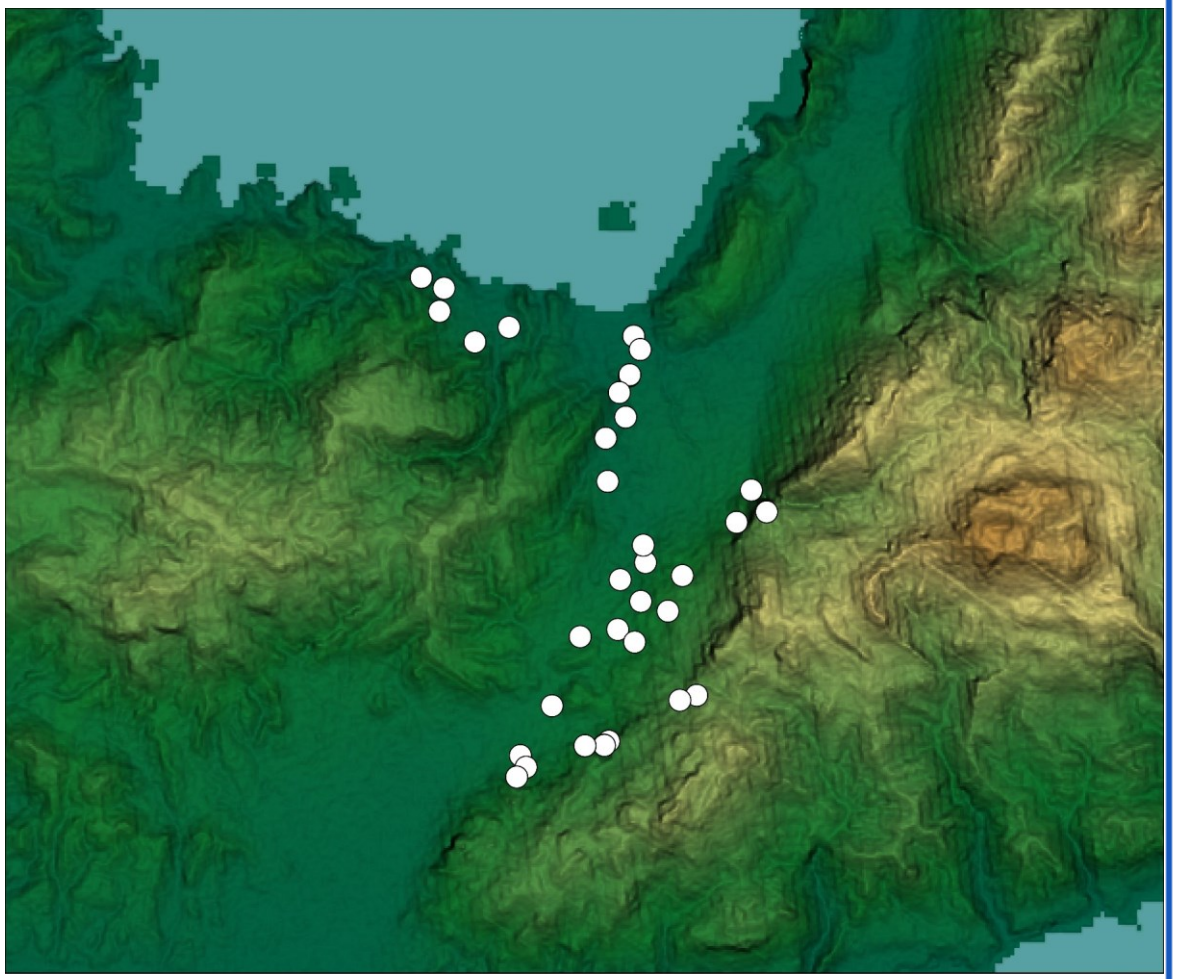
	FN
Coastscape Engagement Index	0.09%
Change from previous	-
Percentage of Highest Extent	6.43%

- 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 I (3500–2900 B.C)

	EM I
Coastscape Engagement Index	0.56%
Change	522.22%
Percentage of Highest Extent	40.00%

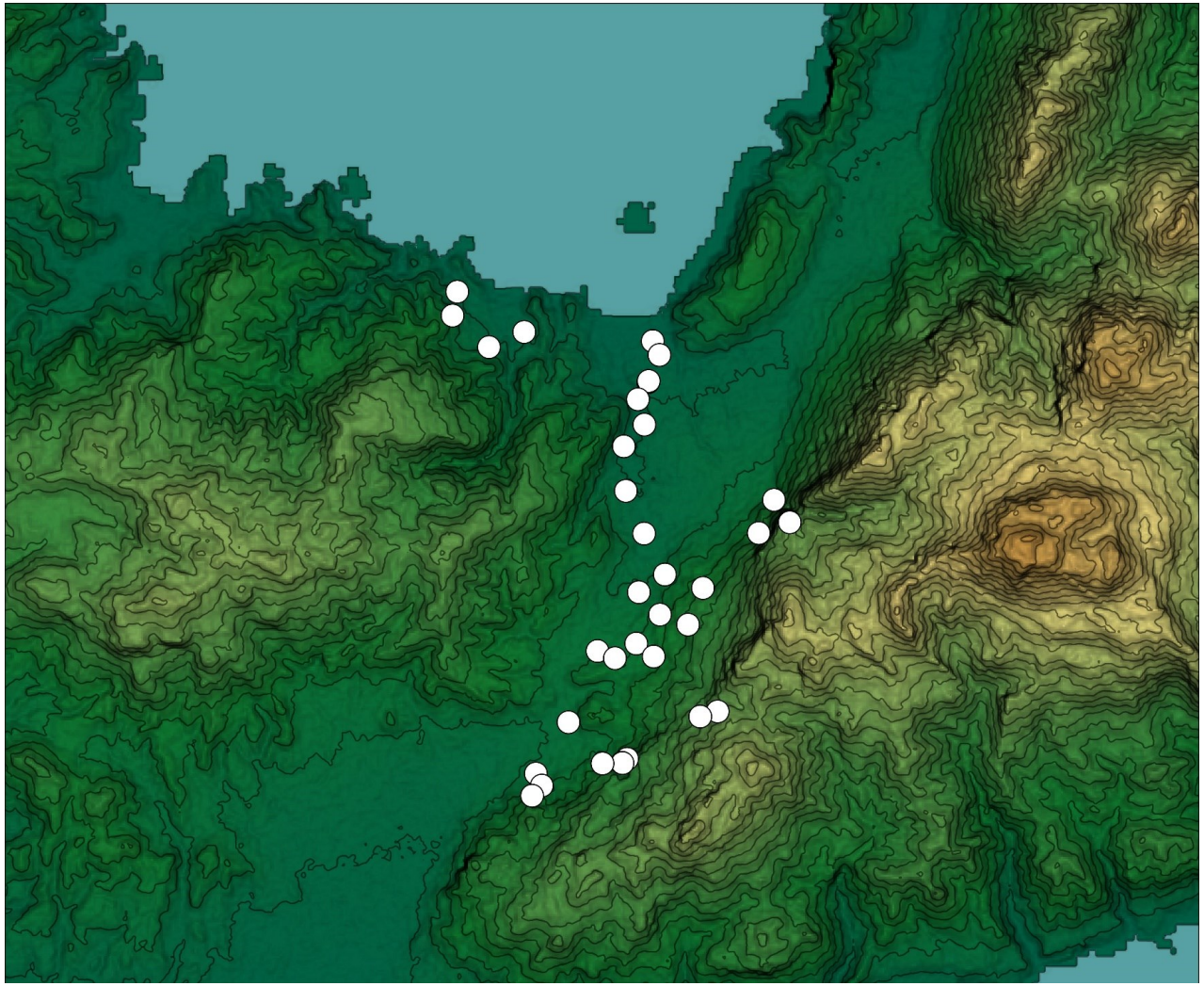
- Increase in general settlement activity – 5 in FN now 38 in EM I
- Population increase?
- Change in subsistence strategy? Pastoralism to agriculture?
- Use of arable lands closer to coast.



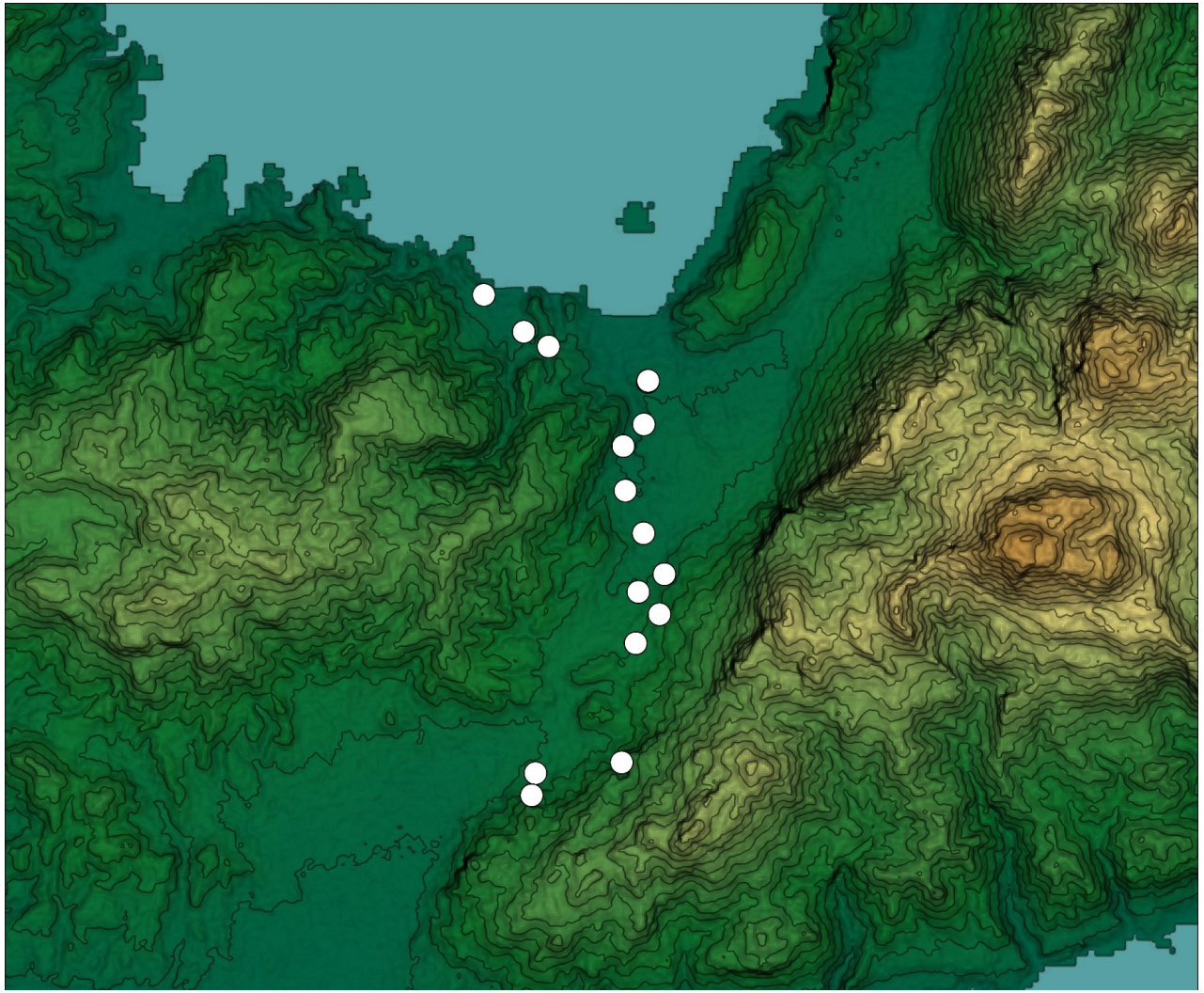
Interpreting the results: Early Minoan IIA (2900–2400 B.C)

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

- Beginnings 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 (2400–2200 B.C



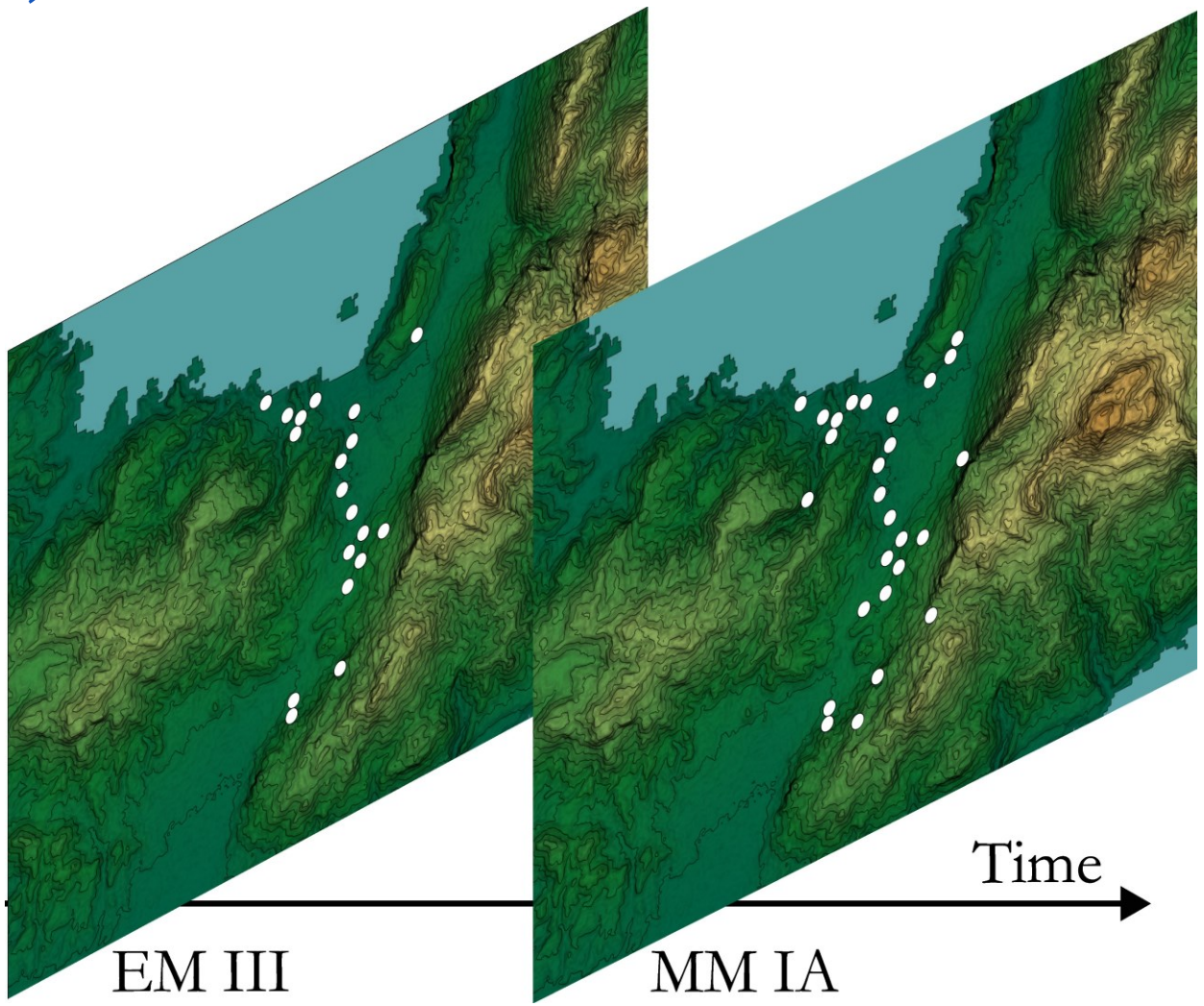
	EM IIB
Coastscape Engagement Index	0.29%
Change from previous	-59.95%
Percentage of Highest Extent	20.71%

- Contemporary Aegean network collapse (Kastri)
- 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: Early Minoan III–Middle Minoan IA (2200–1900 B.C)

	EM III	MM IA
Coastscape Engagement Index	0.47%	0.74%
Change from previous	+62.83%	+57.41
Percentage of Highest Extent	33.57%	52.86%

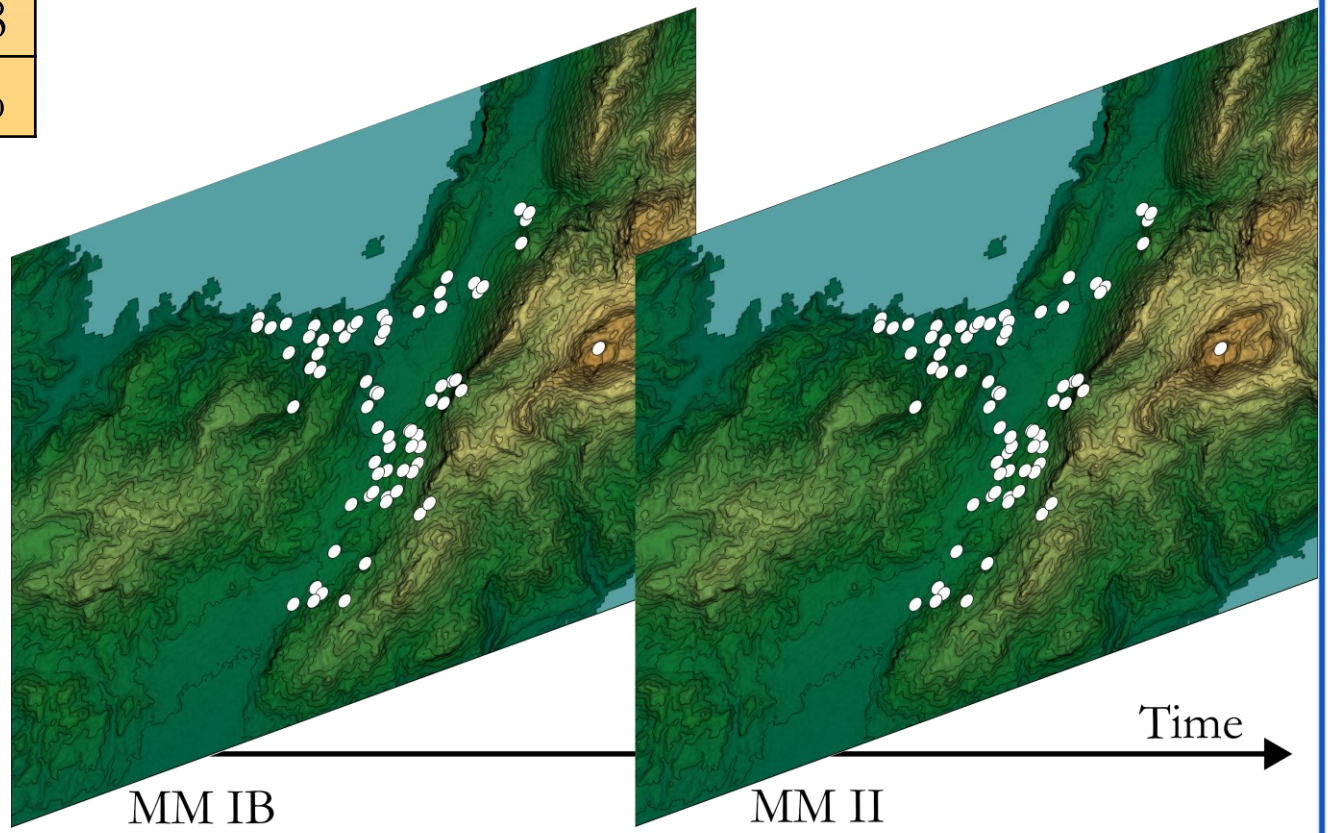
- Slight coastward shift
- Cycladic colonists? (Watrous & Schultz 2012, 38)
  - Cycladic depopulation
  - Grave types (Pacheia Ammos)
  - Pottery-Quartz inclusions (Day & Wilson 2007)
- Resumption of EM IIA trajectory?



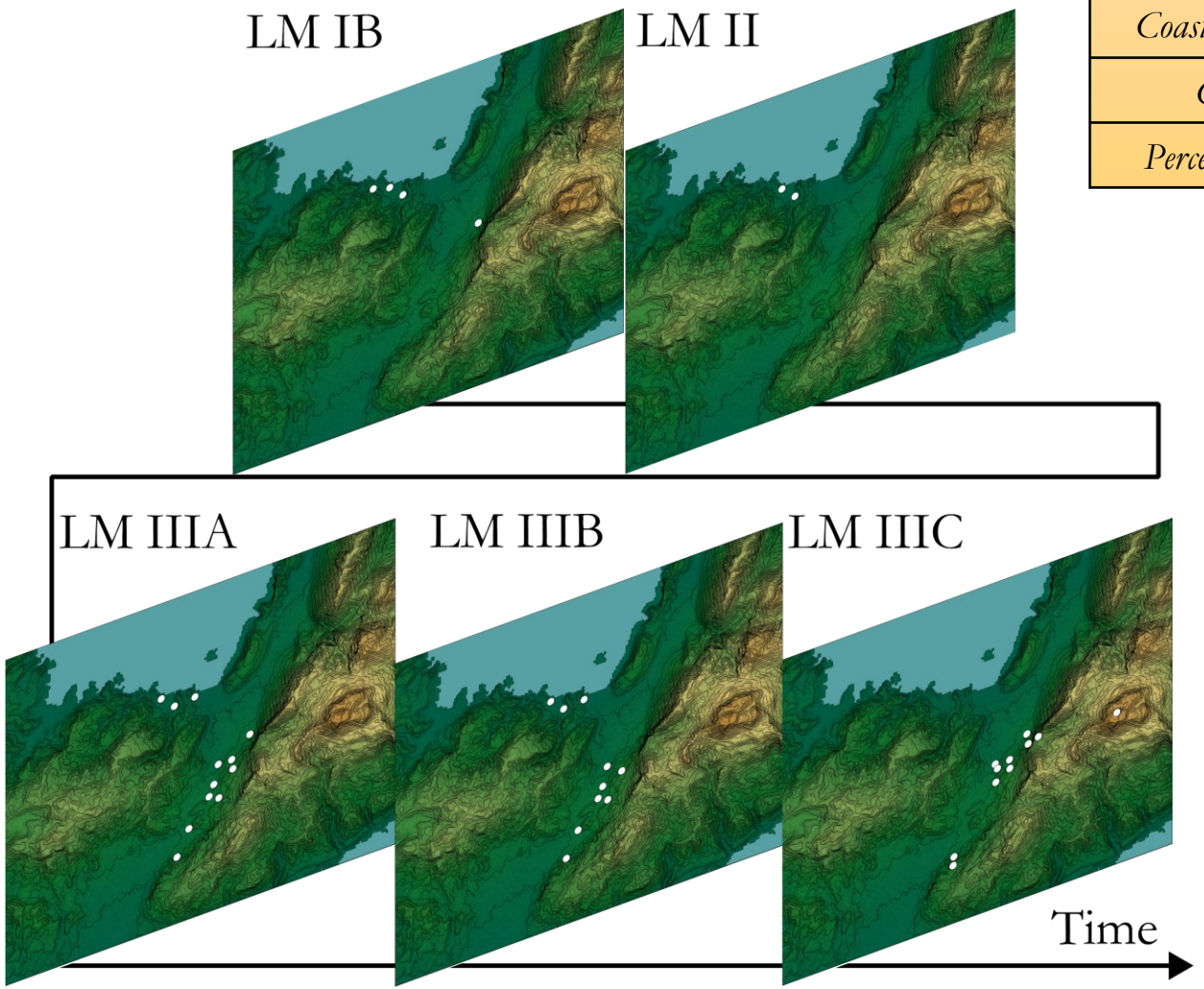
Interpreting the results: Middle Minoan IB–II (1900–1775 B.C)

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

- Most intensive coastal engagement
- Demographic explosion: 75 sites from 20 (EM III)
- Gournia-Pera Alatzomouri-Pacheia Ammos – "site constellations" (Watrous & Schultz 2012, 48)
- Coincides with First Minoan Palaces – no palace in survey area
- Stability and external contact?



Interpreting the results: Late Minoan IB and beyond c.1600–1100 B.C



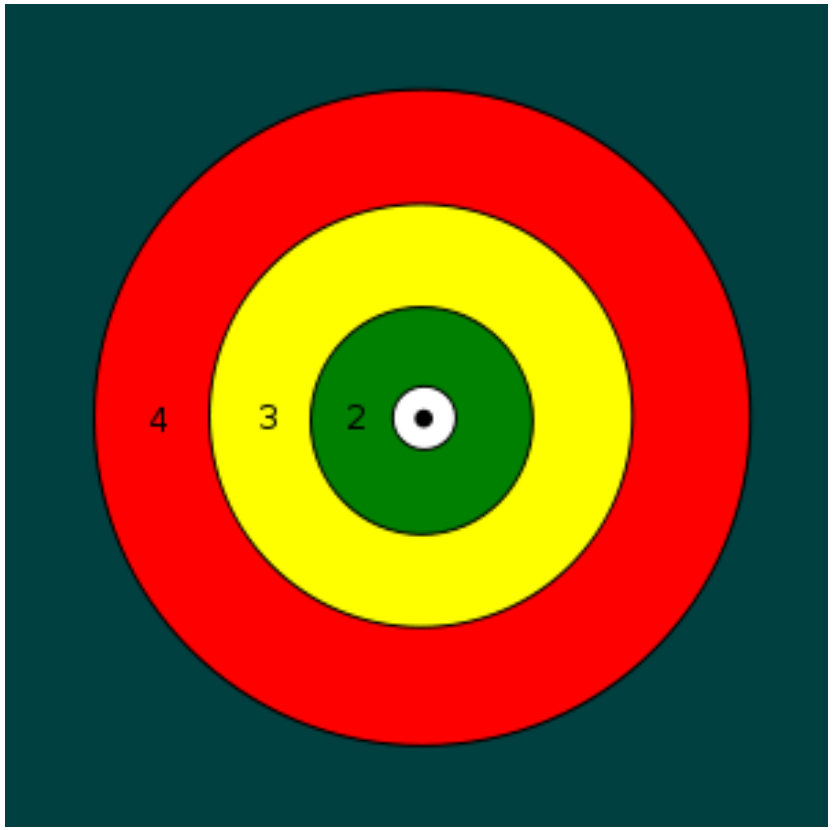
	LM IB	LM II	LM IIIA	LM IIIB	LM IIIC
Coastscape Engagement Index	0.14%	0.12%	0.18%	0.16%	0.13%
Change from previous	-86.31%	-15.37%	+51.58%	-11.79%	-18.59%
Percentage of Highest Extent	10%	8.57%	12.86%	11.43%	9.29%

- 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)
- Abandonment of coastal zone after LM IB
- Not reorientation but depopulation – Gournia abandoned in LM III
- Those remaining generally avoid coastal areas

Marker 3. Maritime Territorial Extent 1

- How much maritime space is incorporated into a site's territory?
- Two catchments: 20 minute and 60 minute
- Based on von Thünen's 'Model of Agricultural space' (1875, *Der isolirte Staat in Beziehung auf Landwirtschaft und Nationalökonomie*)
- Key activities take place within 20-minute walk
- Modelled using walking catchment's cost-distance
- Best summed up:

  "*significance of place correlates with distance from human to place*" (Cloke *et al.* 1991, *Approaching Human Geography*, p. 79)



von Thünen's 'Model of Agricultural space'

Maritime Territorial Extent 2

- Length measurement where walking catchments intersect with paleocoastline
- How much of a coastline was exposed to human agency?
- Which sites had the coast within their core activity zones
- Null hypothesis:
  - If the coast **is** within a 20-minute walk there is a **higher probability** of more intensive interaction with the sea
  - If the coast **is** within a 60-minute walk there is a **lower probability** of intensive interaction with the sea
  - If the coast **is not** within a 60-minute walk there is a more **reduced probability** of intensive interaction with the sea

Case Study: Messenia

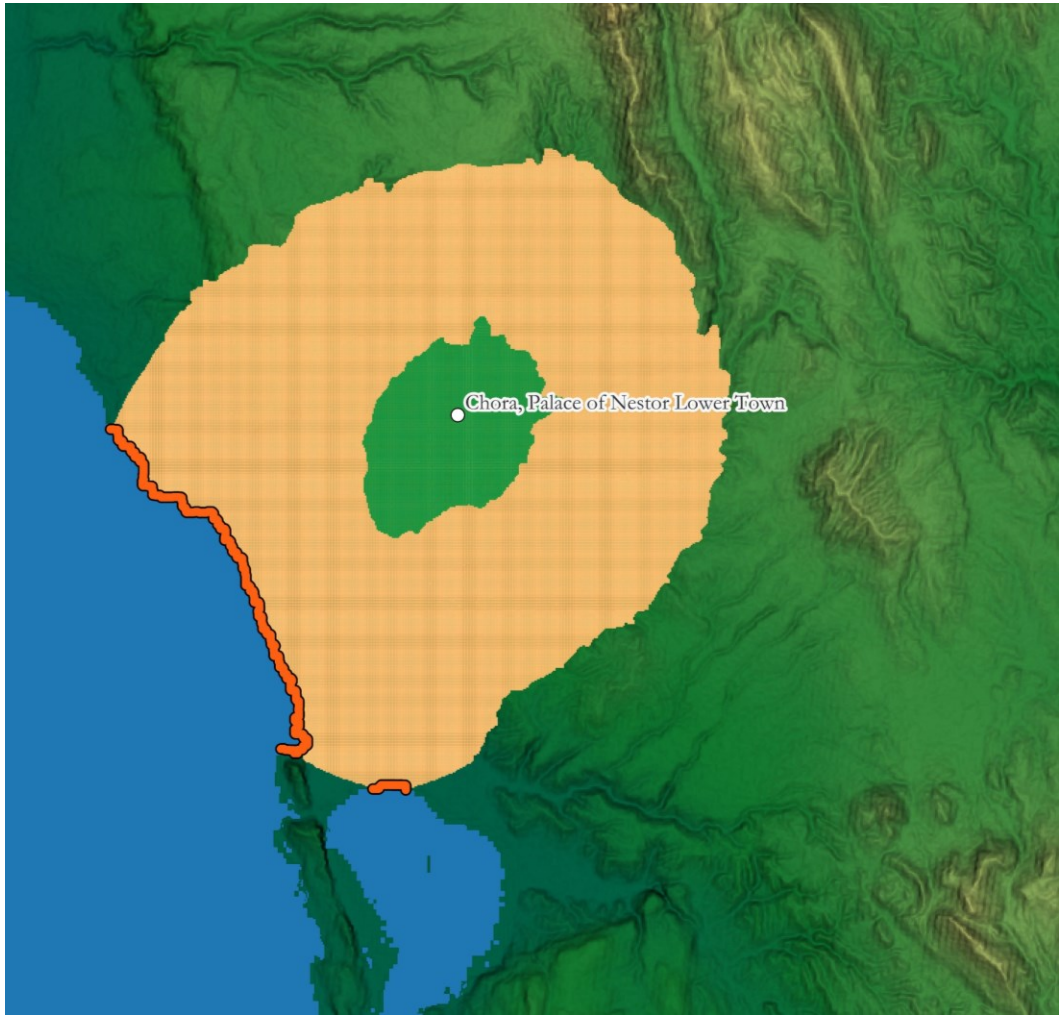
- "*…the inhabitants of Messenia in the Early Bronze Age seem to have preferred to live on or near the sea. Of the known sites 31 percent are situated directly on the coast or within a kilometer of the present coast…*" McDonald & Hope Simpson 1972, p. 131

- "*When we compare MH and EH sites with respect to accessibility to the sea, another striking contrast appears. Whereas about one-third (31 percent) of the EH sites were on the coast, the ratio drops to less than one-sixth (15 percent) in MH times… Of Known MH villages, 62 are situated more than 5 km from the coast, compared to 45 percent in EH times.*" McDonald & Hope Simpson 1972, p. 131

- *"To look for a moment … in LH times, 13 percent of the sites are on the sea and 42 percent are within easy reach of it. These are roughly the same ratios as in the case of MH sites (15 percent and 38 percent)… people in LH times were still oriented more to agriculture and herding in relatively protected areas than were their EH predecessors... the over-all LH total is about double the MH figure, so that there were by this time roughly twice as many coastal or near coastal settlements."* McDonald & Hope Simpson 1972, p. 131

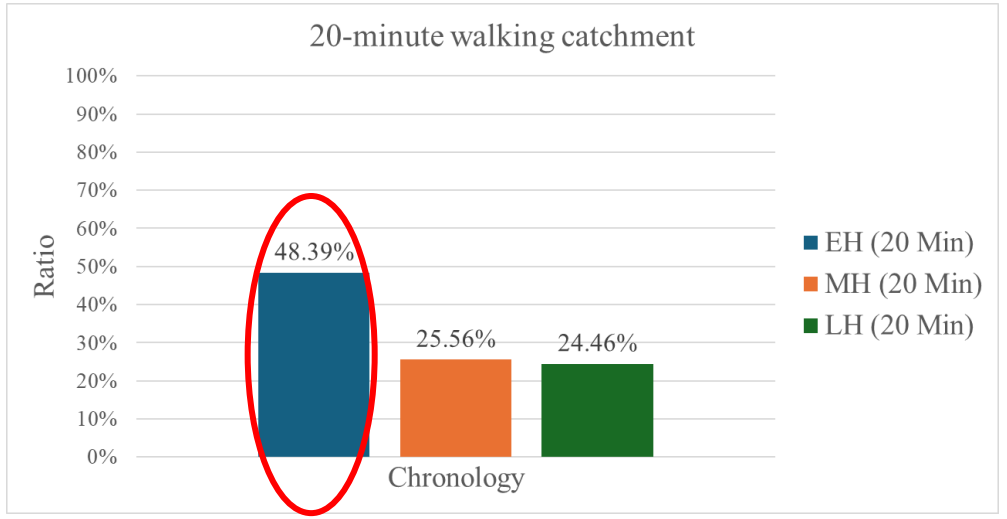
Maritime Territorial Extent: Method

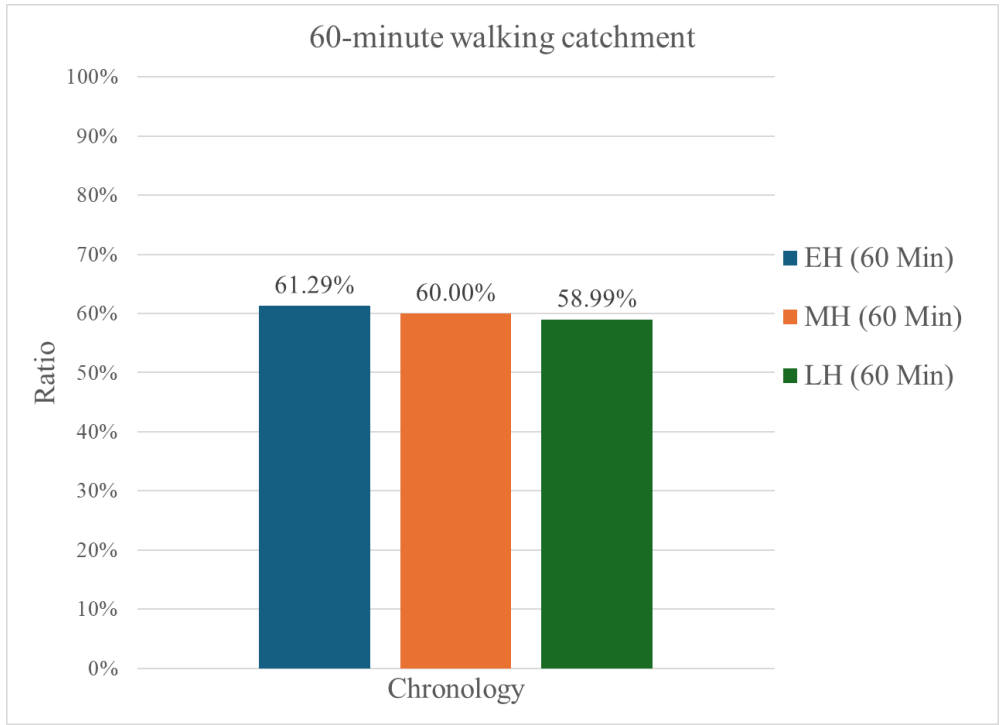
- R.walk (QGIS/GRASS) performed on 175 sites
- 20-minute catchment and 60-minute catchment
- Rasters converted to vectors
- Intersected by paleoshoreline shapefile
- Intersected segments converted from points to path
- Geometrical features added based on projection
- Length in metres of the extent of coastline intersected by walking distances



Case Study: Messenia

- McDonald and Hope Simpson generally correct
- 15/31 EH sites within a 20-minute walking distance of shore (**48%**)
- Reduction in MH: 23/90 sites within 20-minute walking distance (**25%**)
- Consistent in LH: 34/139 sites within 20-minute walking distance (**24%**)
- However remarkable consistency throughout the Bronze Age for the 60-minute walking catchment which is around 60% of sites in each period.



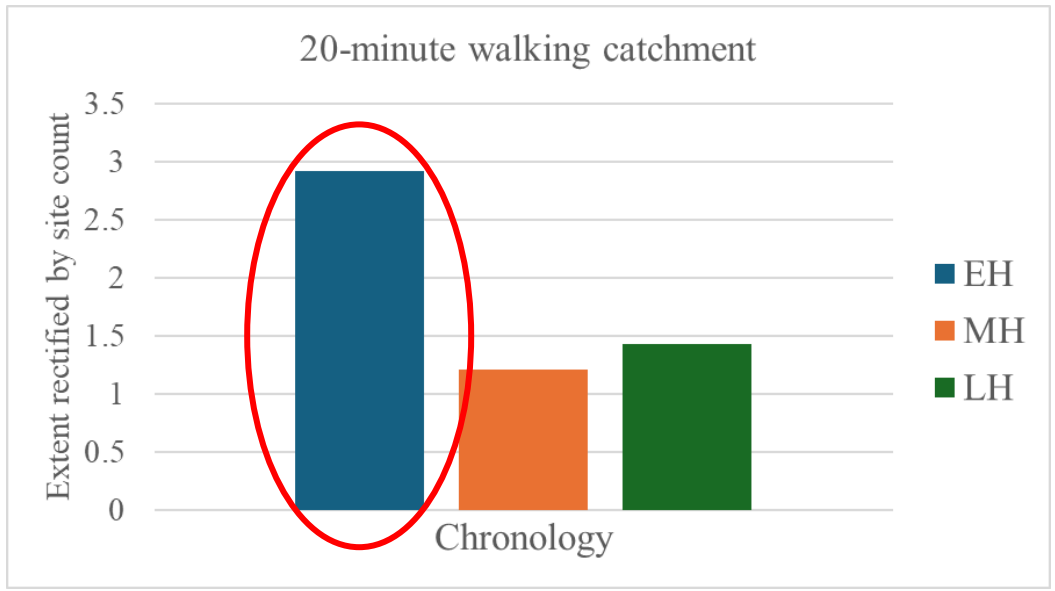


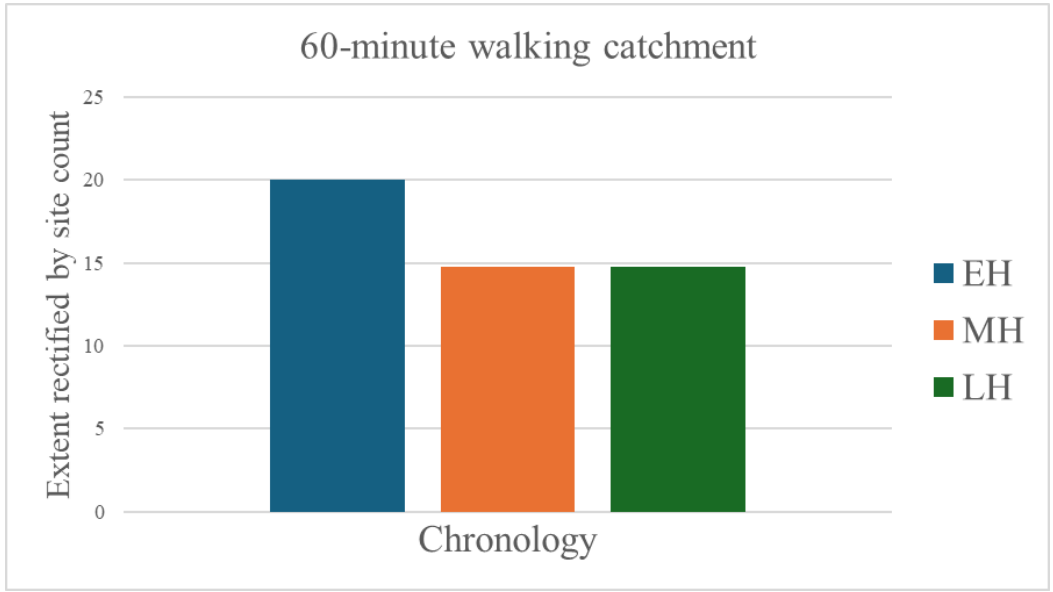
20-minute walking catchment

	EH	MH	LH
Extent (km)	90.569	108.54	198.94
Rectified by count (km)	**2.9216**	**1.206**	**1.4312**
Count	31	90	139

60-minute walking catchment

	EH	MH	LH
Extent (km)	620.57	1329.1	2047.5
Rectified by count (km)	**20.018**	**14.768**	**14.73**
Count	31	90	139





- Figures reinforced with maritime territorial extent measurements
- Adjusting for site numbers, more coastline is exposed to EH sites.
- Shift away from the coast in MH, maintained in LH – specialist coastal/harbour sites?
- Adds greater weight to the arguments of McDonald and Hope Simpson

Final thoughts

- The markers allow for a spatial analysis of coastal landscapes not just in Aegean prehistory but can be repeated in different places/chronologies
- Classification and quantification of human agency
- 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!

chrisnuttallacademia@gmail.com

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