

# *A conduit between two worlds: Geography and connectivity in the Euboean Gulf*

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Since Euboea lies parallel to the whole of the coast from Sounion to Thessaly, with the exception of the ends on either side, I would connect my description of the island to the areas around it.

– Strabo 10.1.1

## *Περίληψη*

Σε αυτό το άρθρο εξετάζεται ο ευβοϊκός κόλπος ως ένας σημαντικός αγωγός δια μέσω του οποίου σταδιακά δημιουργήθηκαν ποικίλες ανθρώπινες αλληλεπιδράσεις. Κατά καιρούς η θαλάσσια λωρίδα του ευβοϊκού κόλπου λειτουργούσε ως φράγμα μεταξύ του νησιού και της απέναντι ηπειρωτικής χώρας, αν και πολύ πιο συχνά ως ζεύξη που συνέδεε τις ακτές που βρίσκονταν εκατέρωθεν του καθώς και το βόρειο με το νότιο Αιγαίο. Από αυτό το σημείο έχουν γίνει συνδέσεις με πολύ πιο μακρινές ακτές, από την ανατολική Μεσόγειο μέχρι το βόρειο Αιγαίο και την Τυρρηνική θάλασσα. Ο ρόλος της γεωγραφικής θέσης στη μοναδική ιστορική τροχιά των περιοχών που περιβάλλουν τον ευβοϊκό κόλπο είναι αναμφισβήτητος, αν και είναι κάτι περισσότερο από αυτό καθώς αποτελεί μια σημαντική θαλάσσια διαδρομή. Ο ίδιος ο κόλπος ολόένα και περισσότερο αναγνωρίζεται ως μια ενωτική περιφερειακή οντότητα. Μέχρι τώρα σε λίγες μελέτες έχει εξεταστεί ουσιαστικά η σημασία της γεωγραφικής του θέσης – ιδίως μέσω πρακτικών, φαινομενολογικών και εννοιολογικών αλληλεπιδράσεων με αυτόν. Σκοπός αυτού του άρθρου είναι να διερευνήσει τα σημεία που διασταυρώνονται η ξηρά, η θάλασσα και οι ανθρώπινες κοινωνίες. Με αυτόν τον τρόπο μπορούν να προκύψουν σχέσεις μεταξύ της γεωγραφικής θέσης και της κινητικότητας ιδιαίτερα με τη μελέτη των χερσαίων και των θαλάσσιων διαδρομών καθώς και των στρατηγικά τοποθετημένων κόμβων και πόρων που συνδέουν αυτά τα θαλάσσια και χερσαία δίκτυα. Σε αυτή η μελέτη χρησιμοποιήθηκαν Γεωγραφικά Συστήματα Πληροφοριών (GIS) και αρχαιολογικά οικιστικά μοντέλα προκειμένου να αποδειχτεί το πώς η γεωγραφική θέση λειτουργεί τόσο ως χώρισμα όσο και ως ζεύξη ιστορικών περιοχών και μικροοικοθέσεων σε ολόκληρο τον Ευβοϊκό κόλπο. Ιδιαίτερη έμφαση δόθηκε στην Ύστερη εποχή του Χαλκού (ΥΕΧ) και στην πρώιμη εποχή του Σιδήρου (ΠΕΣ), όταν στον κόλπο σημειωνόταν έντονη δραστηριότητα με εκτεταμένες επιπτώσεις που εκτείνονταν πολύ πέρα από τις ακτές του.<sup>1</sup>

## *Introduction*

As a geographical entity, the Euboean Gulf is a strait that runs between the island of Euboea and the Greek mainland, but its shores touch upon several regions that are generally treated separately (Fig. 1). These regions include Attica, Boeotia, East Lokris, Thessaly and Euboea (which itself may be

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1. This paper is an outgrowth of my PhD dissertation from Brown University (Knodell 2013). The scope and goals of this paper are different, focusing on geography, networks and the applicability of this framework, and this short article can only summarize some of the larger points that are treated in greater detail in the PhD thesis, to which I would refer readers for further details and explication of some arguments found here in summary form.

divided into several parts on historical or geographical grounds).<sup>2</sup> As a waterway, the Euboean Gulf, too, is often split into its northern and southern parts, and disconnected from the other bodies of water into which it flows. Yet, even as geographical designations are used to atomize these entities and their study, they might also be called upon to bring together the sites, territories and regions surrounding this body of water. This paper is largely concerned with the ability of geography, especially maritime geography, to guide social interactions, though these of course also depend on historical, socio-cultural circumstances. Like many of the papers in this volume, and like Strabo, I want to view Euboea in its larger context, in this case with respect to its immediate neighbours.

To that end, this paper is divided into three parts. I begin by discussing the role of the natural environment –specifically the maritime entity of the Euboean Gulf– in human mobility. I then turn to a means of connecting places and modelling complex interactions through network theory. Finally, I turn to the case of the Late Bronze Age (LBA) and Early Iron Age (EIA) Euboean Gulf to examine how shifting conceptions of territory, settlement and interaction impacted the social changes that occurred during this transformative period (Table 1). While this paper focuses on certain aspects of a much broader study, it nonetheless highlights the utility of diachronic approaches to network thinking, in particular in certain types of natural environments that lend themselves to interaction and mobility. The specific case discussed here concerns the LBA and EIA, but this framework has much wider relevance for the long-term history of the Euboean Gulf, an area which has served as an important maritime conduit as long as sailors have plied the shores of the Aegean.

Cultural Period	Ceramic Period	Approximate Dates BCE
Palatial Bronze Age (c.1400-1200)	Late Helladic III A1 (LH IIIA1)	1420/1410-1390/1370
	Late Helladic III A2 (LH IIIA2)	1390/1370-1330/1315
	Late Helladic III B (LH IIIB)	1330/1315-1210/1200
Postpalatial Bronze Age (c.1200-1050)	Late Helladic III C (LH IIIC)	1210/1200-1070/1040
	Early	1210/1220-1170/1160
	Middle	1170/1160-1100
	Late	1100-1070/1040
Prehistoric Iron Age (c.1050-800)	Early Protogeometric (EPG)	1070/1040-1000
	Middle Protogeometric (MPG)	1000-950
	Late Protogeometric (LPG)	950-900
	Early Geometric (EG) / Sub-Protogeometric (SPG)	900-850
	Middle Geometric I (MG I) / Sub-Protogeometric (SPG)	850-800
Protohistoric Iron Age (c.800-700/650)	Middle Geometric II (MG II)	800-750
	Late Geometric (LG)	750-700 (or 650?)

Table 1.1 Chronology for the LBA and EIA Aegean.<sup>3</sup>

2. e.g. Sackett et al. 1966.

3. For dates up to LH III B, see Manning (2010, 23, table 2.2); from the end of LH III B to EPG, see Weniger and Jung (2009, 416, fig. 14), though I have amended this to conflate LH III C Developed and LH III C Advanced into LH III C Mid-

### *Geographical conduits and maritime conductors*

There is no question that ever since Braudel,<sup>4</sup> the Mediterranean has been increasingly considered a coherent unit of study and that the sea (in abstract terms) plays a critical role in culture change and connectivity; this has even given rise to a ‘new thalassology’.<sup>5</sup> The role of the sea and other maritime units in the long-term development of human societies is well evidenced by the explosion of recent academic and popular interest in large-scale maritime history.<sup>6</sup> While such maritime histories are admirable and have quite significantly energized academic and popular interest in ‘big history’, there has been considerably less interest in tackling similar themes on smaller scales, or indeed on multiple scales. We might ask, therefore, how particular maritime circumstances within the Mediterranean fit into local, regional and trans-Mediterranean dynamics of human societies. The Euboean Gulf is an ideal locale for such an examination.

Several recent excavations and surveys attest to the importance of the regions surrounding the Euboean Gulf, especially in the Bronze and Iron Ages.<sup>7</sup> As our knowledge of this period grows, so too does our recognition of the significance of the area, especially in relation to the late prehistory and early history of the Mediterranean as a whole. Yet few studies in this macro-region have critically examined the importance of geography as it relates to mobility, in order to consider the practical and conceptual interactions between the physical environment and human communities dwelling within it.

After an overreliance on environmentally driven approaches to archaeology in the 1960s and 1970s, this topic became somewhat unfashionable in the following decades.<sup>8</sup> At the same time, however, a total rejection of environmental impacts on human activities and decision-making processes is simply not tenable. In the parlance of much contemporary archaeological theory, we might ask what agency geography, landscape and environment have in social interactions. For if we are to discuss the agency of art, idols and, more generally, materials or ‘things’,<sup>9</sup> we must also include the mountains, trees, rivers, springs and sea, which were all personified and animated almost ubiquitously in the ancient world.<sup>10</sup> So whether we consider the role of the environment in terms of agency, impact, influence or something else, it is inescapable and ever present, though this is no way the same as determinative.

Concerning the importance of the sea, Braudel<sup>11</sup> argued for a certain Mediterranean unity, a point which Horden and Purcell<sup>12</sup> contradicted and expanded upon, arguing that it is precisely the diversity, or disunity, of the Mediterranean that unifies it in terms of connectivity between communities. The lands surrounding the Mediterranean, and the Euboean Gulf within it, are characterized by heterogeneous sets of micro-regions, where variability, rather than uniformity, is the ecological rule. In this way, no individual micro-region was self-sufficient, and distinct places relied heavily on neighbours and connections farther afield. Many of the most basic facts of life, then, such as subsistence, marriage

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dle, and I have included Sub-Mycenaean in LH III C Late (see Papadopoulos et al. 2011 for problems with Sub-Mycenaean as an independent phase); for MPG to LG see Dickinson (2006, 23, fig. 1.1) and Coldstream ([1977]2003<sup>2</sup>, 435, fig. 128); for a possible extension of the Late Geometric period into the 7th century, see Papadopoulos (2003, 146; Forthcoming). See also recent work by Toffolo et al. (2013) for a summary of chronological debate within the EIA and new radiocarbon dates that largely confirm this chronology. For the non-traditional division of Prehistoric Iron Age and Protohistoric Iron Age—a designation based on socio-cultural change, rather than ceramic styles—see Knodell (2013, 28-34).

4. Braudel 1972.

5. Horden and Purcell 2006.

6. Abulafia 2010; Broodbank 2013; Norwich 2006; Paine 2013.

7. For a summary of recent fieldwork, see Lemos 2012.

8. Thomas 2012<sup>2</sup>.

9. Gell 1998; Hodder 2012; Knappett 2012<sup>2</sup>; Latour 2005; Olsen et al. 2012; Witmore 2007.

10. See e.g. Horden and Purcell 2000, 403-423 on relationships between religion and the physical environment.

11. Braudel 1972.

12. Horden and Purcell 2000.

and, in general, survival, depend on interaction between micro-regions—in terms of both movement and socialization.

This resource diversification is especially relevant for the agricultural and construction needs of complex societies. By comparing current land use with landscape types suitable for particular uses of the land, we can begin to get a sense of resource distribution and regional patterning. GIS provides excellent tools for this, in which digital elevation models can be used to generate the distribution of slopes suitable for agriculture, where slopes of under 5% are considered plains, 5-10% undulated, 10-20% hilly, and over 20% extreme (Fig. 2a). This corresponds with current patterns of agricultural land on plains and some undulated areas, as well as forests over certain elevations and in certain hilly and extreme slopes (Fig. 2b).

So, while most construction and agricultural activity could have operated on a local or regional basis, even this very basic type of resource procurement necessitated movement within the landscape and encounters between communities. This trend is exaggerated further by the unequal distribution of minerals—especially metals—across the earth's surface, which serves as an impetus for interactions on an entirely different geographical scale, at times encompassing the entire Mediterranean, where rich metal deposits in south-western Spain, Sardinia, western Italy, the northern Aegean and Cyprus, among other places, have a particular capacity to connect.<sup>13</sup> Also, a brief consideration of a *chaîne opératoire*<sup>14</sup> for metal or ceramic production—involving raw material and fuel procurement, preparation of materials, primary and secondary production, circulation/exchange, consumption and deposition—highlights the wide range of scales on which such seemingly basic economic routines took place.

But how are connections between such geographies made? What are the land routes and sea routes through which interactions flow? Archaeologists are making increasing strides towards taking into account the practicalities of movement and distance, often through the use of GIS and other approaches rooted in spatial sciences.<sup>15</sup> One particular approach of both practical and heuristic use is to model land routes based on the relative cost of passage across the landscape.<sup>16</sup> While GIS has the ability to model exact paths between two routes, the degree to which these correspond with actual ancient pathways can rarely be known with certainty, except where there are actual road remains. However, a general 'cost surface' provides a projection of corridors through the landscape, where certain areas are more passable or favourable for traffic than others, shown here on a spectrum from green to red (Fig. 3).<sup>17</sup> By rendering least cost paths as a surface, rather than a specifically defined vector route, we are better positioned to evaluate a range of options from a broader regional perspective—a methodology perhaps more in line with how individuals actually encounter landscapes. Perceptions change, of course, in the presence of known paths or built roads, which when known tend to fall within the corridors rendered by the cost surface. This provides a baseline model for the relative cost of passage for a human walking across a landscape. However, it does not (and cannot) account for variables such as vegetation cover or individual preferences on the part of travellers; nor does it model other forms of travel or transport, such as by horse, donkey or wheeled cart, though comparison between several types of cost surfaces could be a fruitful direction for future research. These caveats aside, the model is an extremely useful heuristic tool for evaluating the significance of archaeological settlement patterns and land-based mobility and interaction.

13. e.g. Kassianidou and Knapp 2005.

14. See Leroi-Gourhan 1964, with recent discussions in Dobres 2000; Miller 2007.

15. e.g. Bevan 2010; Bevan and Conolly 2013; Bevan and Lake, 2013; Conolly and Lake 2006.

16. e.g. Conolly and Lake 2006; Doyle et al. 2012; Siart et al. 2008.

17. This cost surface was created by modelling the relative cost of passage across a landscape, based originally on an ASTER 30-metre resolution digital elevation model (DEM). This elevation data is then combined with a study of the relative effort required to walk uphill or downhill at different slopes (Minetti et al. 2002). In order to simulate a bidirectional cost path, the values of walking uphill and downhill are added together, then used to reclassify a slope model derived from the DEM in GIS. The result gives the relative cost of passage across the landscape.

Sea routes are more difficult to model, owing to the number of variables that must be accounted for in their rendering (wind, currents, vessel type), as well as the dramatic degree to which these factors can themselves vary, based on time of year and individual weather patterns. A general sense of dominant paths, however, can be derived from studies of currents and wind direction, as in the work of Agouridis and Papageorgiou.<sup>18</sup> Such approaches have then been successfully combined with the distribution of imports and other aspects of material culture to examine trade in the eastern Mediterranean.<sup>19</sup> The Euboean Gulf is of particular relevance as a bidirectional path, where movement can occur relatively easily, going either way. It also affords a distinct advantage for groups that are able to control certain parts of it, for example at particular anchorages or ‘choke points’ such as the Euripos (Fig. 1). In sum, then, the Euboean Gulf was significant for as long as seafaring was practised, as a conduit that linked the north and south Aegean, as well as Euboea and the parallel coast of the mainland. Sea routes going through it, and land routes going towards and around it influenced the creation of particular nodes of interaction, often at or near places of anchorage on the coast or intersections of land routes. While these geographical conditions do not necessarily *explain* the types of interaction and social dynamics that occur over time, they do *contextualize* them in meaningful, even critical, ways.

### ***From geography to connectivity: Mapping network models***

An explanatory framework that incorporates relational elements into geographical analysis can be found in aspects of network theory. Networks are increasingly used as analytical and interpretative frameworks in archaeology and ancient history.<sup>20</sup> Well-known examples can be seen in the work of Broodbank in the Early Bronze Age Cyclades,<sup>21</sup> in Knappett’s work with respect to Minoan Crete,<sup>22</sup> and Malkin’s work on Archaic Greek expansion throughout the Mediterranean.<sup>23</sup> Most recently, Tartaron has brought network thinking to the Mycenaean coastal worlds of the Saronic Gulf.<sup>24</sup> My own research has worked to apply aspects of network theory to the Euboean Gulf to examine social interactions in a multi-scalar and diachronic framework.<sup>25</sup> One very productive use of network theory lies in the application of certain types of network analysis to model interactions, and then using principles concerning network behaviours to explain and interpret social change over time. Such an approach thus falls somewhere between the ‘hard’ science of networks<sup>26</sup> and what might be thought of as ‘softer’ conceptual applications of network thinking.<sup>27</sup>

Four principles in particular stand out, which are found as common network behaviours in a variety of situations ranging from connections between neurons to links between Hollywood actors.<sup>28</sup> These are scale-free network growth, centrality, the small-worlds concept and the strength of weak ties (Fig. 4). Viewed together and applied to particular historical or archaeological circumstances, these can help explain interactions on multiple scales, ranging from the local, to the regional, to the trans-Mediterranean. Scale-free network growth essentially describes the rich-get-richer phenomenon, which

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18. Agouridis 1997; Papageorgiou 2008.

19. Burns 2010; Sauvage 2012.

20. e.g. Knappett 2011; 2013; Knappett et al. 2008; Malkin 2003; 2011; Malkin et al. 2007.

21. Broodbank 2000.

22. Knappett 2008; 2011.

23. Malkin 2011.

24. Tartaron 2013.

25. Knodell 2013.

26. e.g. Knappett et al. 2008.

27. e.g. Malkin 2011.

28. For a general overview of network theory see, e.g., Barabási 2002.



means that places which are well connected are likely to become better connected, at least until some radical change results in dramatic reorganization.<sup>29</sup> In highly centralized networks there are few hubs, through which all interactions must go (in this graph—on the top right—there is one). This means that much control over interaction resides in a single hub, which can thus be very powerful and efficient. However, the entire system is left vulnerable to collapse—if the central hub is compromised, inhibited or removed, the whole network breaks down.<sup>30</sup> Much more common are decentralized networks, where hubs emerge in many different places. Distributed networks have no hubs. They are relatively stable, though not particularly effective in moving people, ideas or things from one side to the other—there must be many stops along the way.

A small world is a type of network where most nodes are connected to their nearest neighbours, but certain links exist which connect other small worlds to each other.<sup>31</sup> A concept that operates within small-world networks is the strength of weak ties.<sup>32</sup> While interactions between near neighbours are likely to be more frequent (or stronger) than less frequent, often longer-distance interactions between other small-world networks—that is, the weak ties—can be particularly significant. Such weak ties serve to introduce new ideas, materials or goods, and can be made exclusive to particular sects of society. If we consider the small worlds of the Euboean Gulf, changes in centrality are extremely important for how societies operate locally and regionally, and changes in weak ties—especially access to them—are relevant for interregional, long-distance and intercultural interactions. These come together when the small worlds that operate locally and regionally are joined by weak ties.

As an analytical method, I use Proximal Point Analysis (PPA) to create networks based on the settlement patterns of the regions surrounding the Euboean Gulf in the LBA and EIA (Fig. 5).<sup>33</sup> This analysis assumes connections between each site represented in the settlement pattern and a minimum of its three nearest neighbours, in order to extrapolate likely interactions as a baseline for analysis. This assumption is made based on the predilection towards connectivity exhibited in Mediterranean environments, where microecological variability necessitates a certain amount of interaction to sustain human societies. Moreover, we are dealing with mostly small communities, where interaction is further necessitated by economic practices, such as craft and agricultural production and exchange, as well as social purposes, such as exogamy and more general intercommunity socialization.

Such networks can then be considered together with geographical circumstances and known aspects of material, visual and textual culture, in particular with respect to how they change over time. The network principles outlined above, when viewed in light of this model of macro-regional interaction and archaeological evidence, wield great explanatory power when examining the drastic social changes that occurred in the Euboean Gulf in the late 2nd and early 1st millennia BCE. So, while networks do not provide a definite formula with a clear answer, they offer useful interpretative frameworks that are certainly relevant in this period, and might also be usefully applied to others.

### ***Modelling transitions: From Bronze Age to Iron Age***

The Mycenaean Palatial period differed dramatically from what came before and after it in central Greece. Rapid shifts in power dynamics at major centres, such as Orchomenos and Thebes, can

29. Barabási and Albert 1999.

30. Baran 1964.

31. Watts and Strogatz 1998.

32. Granovetter 1973.

33. For previous applications of PPA to archaeological research see, e.g., Broodbank 2000; Terrell 1977.

be characterized as state-formation processes and marked intensifications in social complexity.<sup>34</sup> Networks became highly centralized around these centres, as evidenced by material changes in the form of an expansion of settlement across the landscape, as well as monumental building and exclusivity in the consumption of foreign exotica at particular centres. The Linear B archives from Thebes clarify the picture further, indicating that this was the main centre for agricultural consumption in Boeotia.<sup>35</sup> While imports and exotica are not in the domain of the tablets, the archaeological record indicates that these too were focused on the palace,<sup>36</sup> and must have arrived from the eastern Mediterranean via the Euboean Gulf. A regional centralization of consumption and labour at the locations of the palaces is thus clear; at the same time, ties between palaces are evident in the shared 'package' of palatial architecture, administrative texts and elite material culture. More mundane, everyday networks tied together smaller-scale settlements, but the centrality of the palaces—both geographically and in network terms—remains evident even when evaluating a PPA of the palatial settlement pattern (Fig. 5a).

The territories of Mycenaean states are hard to define, though network perspectives are helpful in terms of seeing how places connect. In the Euboean Gulf, there were certainly places that were outside the control of the Mycenaean palaces, whose hegemonic aims, I argue, were rather strictly regional. For example, I do not believe that Euboea was under the direct control of Thebes, despite the appearance of Karystos and Amarynthos in the Theban Linear B documents. Like Palaima,<sup>37</sup> I recognize that this signifies contact and perhaps influence, but I have a minimalist view concerning a Theban hegemony applying to Euboea. The Linear B archives at Thebes (and elsewhere) lend themselves naturally to network approaches, as places that are mentioned in a hierarchical relationship to Thebes tend to be much closer, located in southern Boeotia.<sup>38</sup> The greater network distance to Euboea suggests that both this and geographical distance were quite important for Mycenaean palaces. On its own this argument is plausible, but is better supported by the diachronic perspective adopted here.

It appears that Euboea and parts of the mainland in the northern Euboean Gulf were very much outside palatial influence, precisely because of what happened when the palaces went away. The palatial collapse was near total, largely because of what made the palaces successful in the short term—the high degree of centralization, especially with respect to political geography. But as areas under palatial control fell into disarray, a power vacuum was filled by regions such as east Lokris and central Euboea.

The Postpalatial, LH IIIC settlement pattern is very different from the pattern in the Palatial period, which resulted in major shifts in the network model of inter-site interaction (Fig. 5b). This reorganization is oriented very strongly towards the Euboean Gulf. The distribution of archaeological sites shifts overwhelmingly towards the coast, something which can be noted especially in the largest and most influential settlements such as Lefkandi and Kynos.<sup>39</sup> This is supported by the iconographic revival of LH IIIC middle, in which imagery of seafaring, often violent, surged markedly after being nearly absent in the Palatial period.<sup>40</sup> These sites and others, such as Perati<sup>41</sup> in the southern Euboean Gulf, seem to co-opt long-distance ties to the eastern Mediterranean, likely because the Euboean Gulf remained an important destination as a major sea route through the Aegean, despite the palatial collapse. Recent work on the quantification of Postpalatial imports by Murray has shown that the trend

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34. Knodell 2013, 131-136; Phialon 2011.

35. Aravantinos et al. 2001; Del Frio 2009.

36. Dakouri-Hild 2010.

37. Palaima 2011.

38. Del Frio 2009.

39. Dakoronia 2003; 2009; Evely 2006.

40. Dakoronia 1990; Thomatos 2006; Wachsmann 1998.

41. Iakovidis 1980; 2003a; 2003b.

for coastal living is reflected to an even greater extent in terms of long-distance connections, especially in the Euboean Gulf.<sup>42</sup>

The Postpalatial shift in the regional politics of power—and the networks that connected settlements throughout the region—continued into the Prehistoric Iron Age, when further reorganization occurs. Numbers of sites increase, and the coastal emphasis is not as profound, though is still very much present in places such as central Euboea. Lefkandi, in particular, exhibits marked growth in socio-political complexity, with major inequalities represented in the burials of the famous Toumba Building<sup>43</sup> and Toumba Cemetery.<sup>44</sup> Lefkandi also has clear ties to Athens in terms of its ceramic imports and influences, as well as the wider Aegean world in the form of an Euboean *koine* that Lemos argues encompasses the central and southern Euboean Gulf, as well as Skyros and certain parts of the Cyclades, with some influences extending into Macedonia.<sup>45</sup> While the exact nature of this *koine* is debatable, it is at the very least indicative of mobile materials, technologies and ideas, in which central Euboea—and thus the Euboean Gulf—played a major role.

The shift from the Postpalatial Bronze Age to Prehistoric Iron Age settlement pattern (Fig. 5c) is noteworthy, in that the consequent reorganization of the regional network model would seem to reflect a more outward-looking Athens and Attica. This expansion seems to reflect on the one hand a broad consolidation within Attica, demonstrated by the growth of Athens and a pattern of re-centralization, and on the other an expansion of Attic interaction on the macro-regional level; there is no question that Attic Protogeometric is the most widespread and influential pottery style of this period, followed closely by Euboean Protogeometric.<sup>46</sup>

Finally, the wealthy cemeteries of Lefkandi, Athens, Thessaly and East Lokris exhibit connections to the eastern Mediterranean, again quantified in recent work by Murray.<sup>47</sup> This work also shows that such connections were the exception, rather than the rule for EIA Greece, highlighting the importance of the Euboean Gulf and places well connected to it; the Argolic Gulf and Crete are the only regions besides those included in this study to have significant imports, and the trend within the Euboean Gulf macro-region is again very coastal. Import trends are roughly paralleled by export trends from Euboea and Athens, which are known from the relatively widely distributed findspots of Attic and Euboean pottery in Cyprus and the Levant.<sup>48</sup>

In a way, the Euboean Gulf and Mediterranean as a whole were well primed for what happened next—a coincident explosion of both settlement and seafaring, which caused major shifts in mobility on local, regional and trans-Mediterranean scales. The massive intensification of settlement in the 8th-century (Protohistoric Iron Age) landscape no doubt resulted in a certain amount of crowding (Fig. 5d). This crowding had important consequences for mobility between communities. As a simple matter of proxemics, necessary interactions cover shorter distances and are likely to have occurred more frequently, resulting in either conflict or the reinforcement of social ties. This change would also have affected conceptions of geography. Networks, too, would have shifted, becoming much more intensive, and in some cases more localized, or closed, as is the case in East Lokris. To some extent, this can help to explain the regionalization seen in the Late Geometric period in the form of regionally distinct pottery styles<sup>49</sup> and epichoric alphabets.<sup>50</sup> Such shifts may also be re-

42. Murray 2013, 314.

43. Catling and Lemos 1990; Popham et al. 1993.

44. Popham and Lemos 1996.

45. Lemos 2002, 213.

46. Coldstream [1977]2003<sup>2</sup>; Lemos 2002; Snodgrass [1971]2000.

47. Murray 2013, 351.

48. Lemos 2002, 229.

49. Coldstream 1983.

50. Jeffery [1961]1989.



flected in semi-legendary accounts of early Greece, concerning the consolidation of Attica and the Lelantine War.

In network terms, there was a tightening of small worlds, which resulted in new trends in material culture and societal practices. Coincident with the emergence of regionally specific pottery styles and alphabets, new types of religious practice emerged in the form of tomb cult, hero cult and non-urban sanctuaries<sup>51</sup>—these are memory-driven, group-formation practices linked to specific parts of an increasingly crowded landscape. Regional sanctuaries such as Kalapodi also continued as places of meditation within and between regions; some of these would evolve into Panhellenic sanctuaries, although not in the Euboean Gulf—a point that would be of great consequence for the future.

Long-distance interactions can also benefit from some rethinking in network terms. The Euboean Gulf was clearly a place of great importance in the 8th-century Mediterranean. Chalkis and Eretria are well known as the points of origin for some of the earliest Greek settlements overseas, first at Pithekoussai, then several other places in western Italy, Sicily, Kerkyra and the northern Aegean.<sup>52</sup> To the east, Euboea certainly was a place of interface with Phoenician traders from the Prehistoric Iron Age, as indicated by the impressive finds at Lefkandi. The region also appears to be of great significance for the earliest adaptation of the Phoenician script into the Greek alphabet. Of the 15 earliest (8th-century) findspots of alphabetic inscriptions in Greece, five are located in the regions surrounding the Euboean Gulf (Lefkandi, Eretria, Oropos, Kalapodi, Athens) and a further three are located in places with close ties to Euboea (Pithekoussai, Methone, Al Mina). Moreover, multiple inscriptions have been found at several of these sites.<sup>53</sup> The rapid diffusion of this innovation throughout the Greek-speaking world (and beyond) was followed quickly by the development of regional variants in the form of epichoric scripts, which as noted above has a parallel trend in decorated pottery.

The combination of long-distance interactions, serving here as weak ties linking the small worlds of the Euboean Gulf to the wider Mediterranean, served to both globalize and localize Greek society in the face of an increasingly connected world. The settlement networks seen in Fig. 5d aid in the explanation of other social phenomena, as well as demonstrating the role of physical and relational geography in the highly dynamic Euboean Gulf in the LBA and EIA.

### *Conclusions and implications*

In this brief paper I have sought to summarize how settlement networks operate within the macro-region of the Euboean Gulf to impact seemingly divergent social phenomena. In particular, I have argued that the geopolitics of the Palatial period were left fragile by the centralized nature of the social networks operating in this particular region. This allowed for the emergence of other locales, other centres, precisely in the regions that had not been affected greatly by the Mycenaean palaces. In the following Iron Age, political and settlement networks continued to shift, and can shed light on the wide variety of social and technological innovations of this period. The transition into the Postpalatial period set the tone for the centuries that followed, in which a rapid change towards greater coastal mobility resulted in the Euboean Gulf generally outpacing the rest of the Greek world, in trends parallel to the course of the eastern Mediterranean. In the 8th century, however, a tipping point was reached as settlement pattern shifts redrew the parameters of local and regional interactions and some groups (Euboeans especially) followed their Phoenician associates westwards. Such changes in the character

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51. Antonaccio 1995; Knodell 2013, 300-304; de Polignac 1995; Snodgrass 1980, 37-38.

52. Knodell 2013, 290-300.

53. See Knodell 2013, 305-315 for a full discussion with tables and references.

and scale of physical mobility had far-reaching consequences, which coincided quite profoundly with a more conceptual cultural shift—a media revolution involving a new semiotic system in the form of an alphabetic script and a return to figural art.<sup>54</sup>

Modelling nearest neighbour networks using a proximal point analysis is most valuable when undertaken diachronically and in combination with other cultural and geographical information, as well as explanatory concepts derived from network theory. Such a synthetic, interpretative and explanatory approach has been particularly informative in this specific case, but can also be applied to other periods and places. As this contribution demonstrates, Euboea has a long history as a strategic location, in particular at Euripos. Indeed, even when Euboea was subsumed by larger political entities this significance remained part of greater Macedonian, Roman, Byzantine, Venetian, Ottoman or Greek governmental entities. Thus, with respect to long-term regional history, the two worlds of the island and mainland are in some ways separate, but at the same time inextricably intertwined by the history, politics and interactions that link the small worlds surrounding the Euboean Gulf.

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54. See Knodell 2013, 304-321 for a full discussion of this media revolution.

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Figures

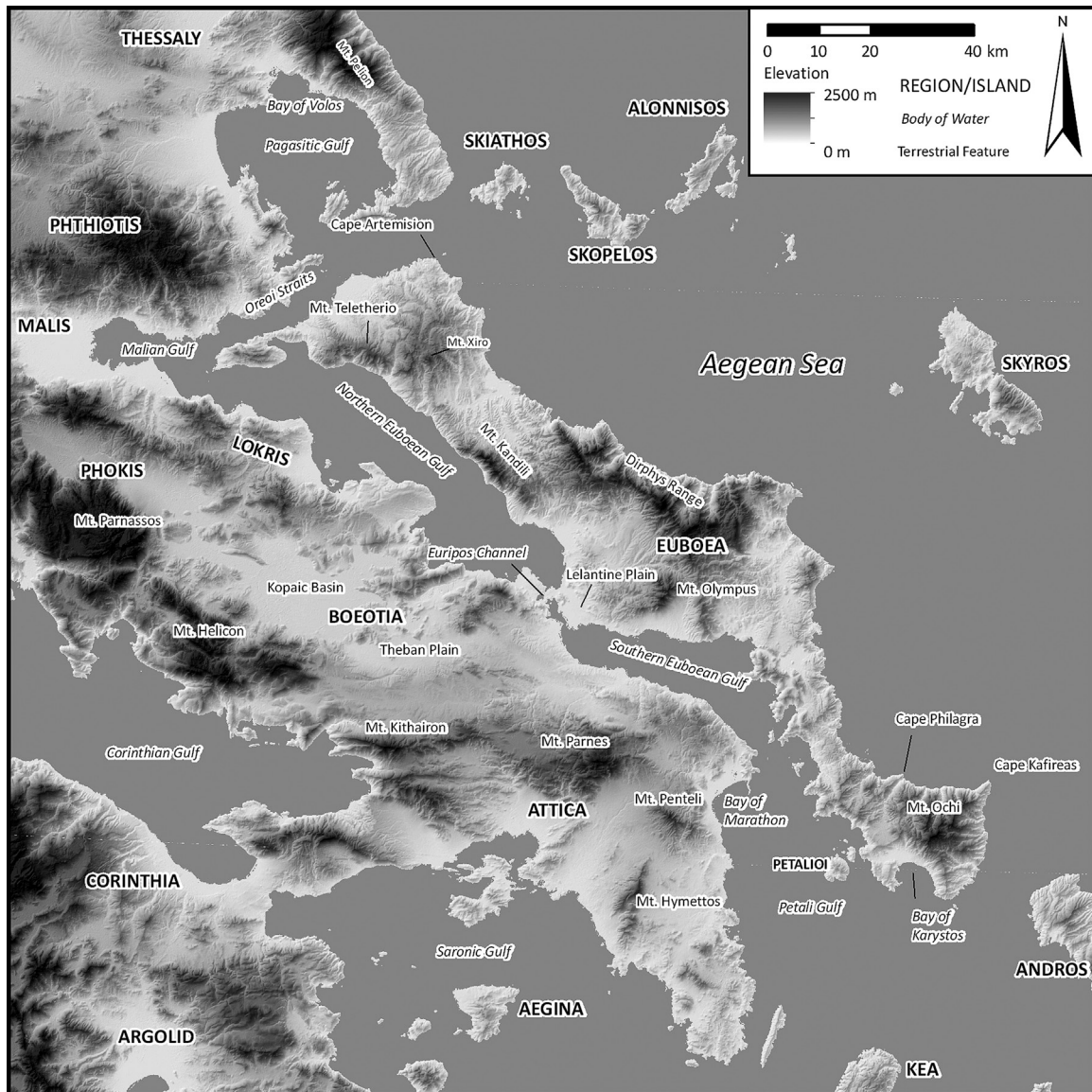


Figure 1. Geography of the Euboean Gulf and surrounding regions (Knodel 2013, 348, fig. 4.1).

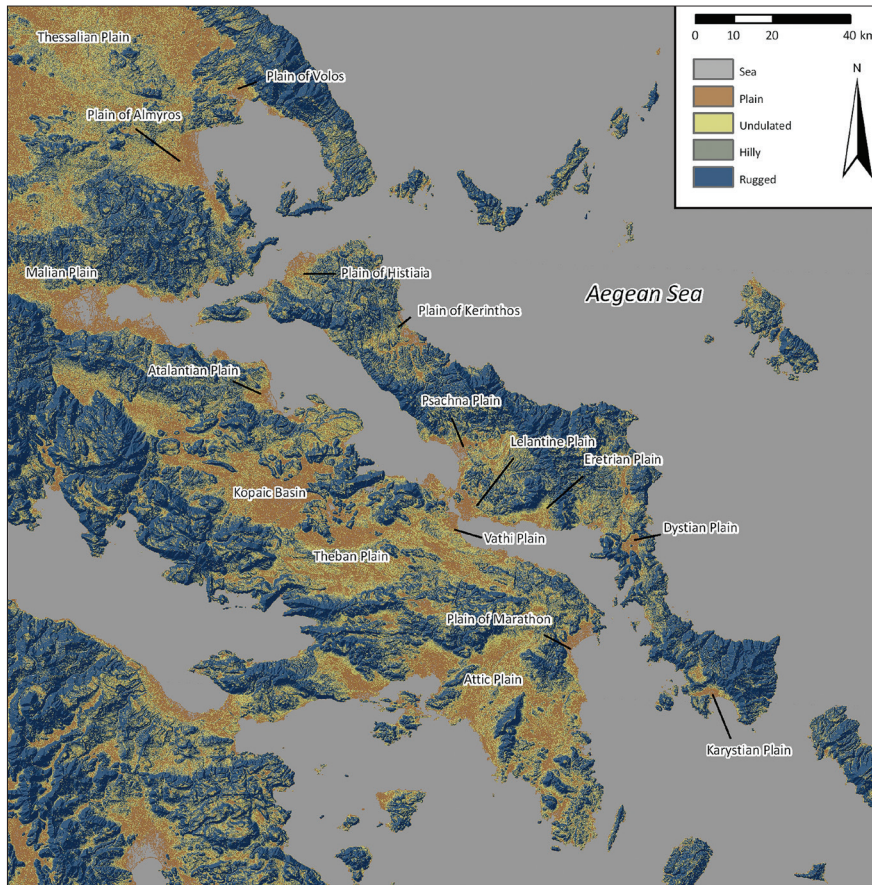
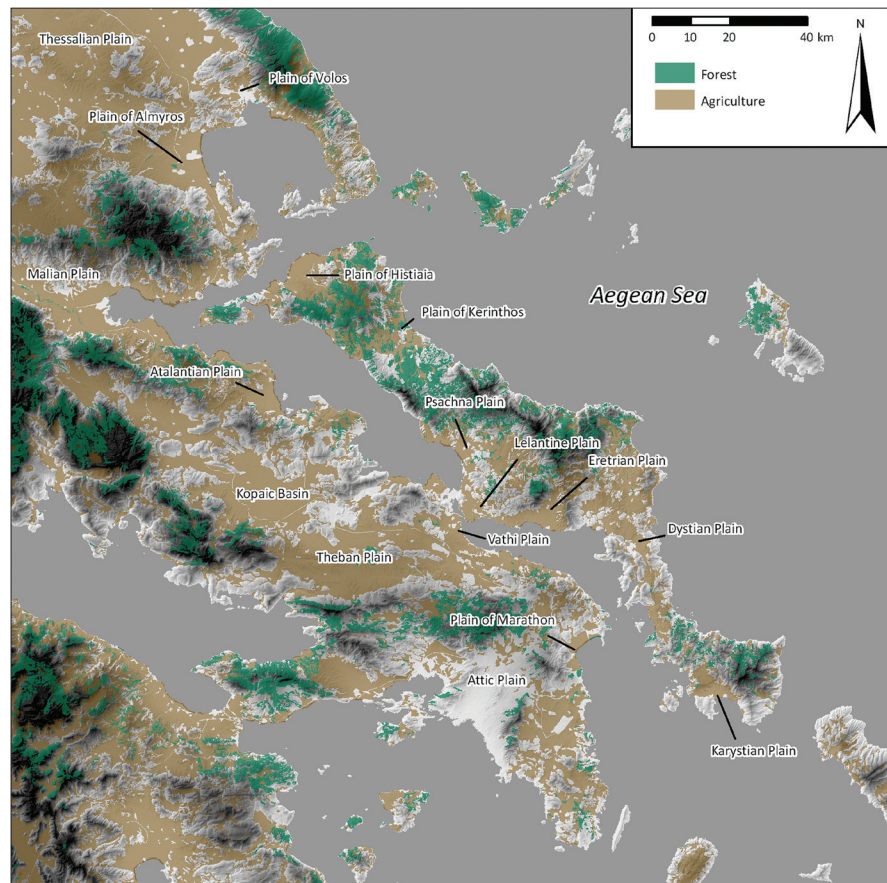


Figure 2. Landscape characterization of central Greece: (a) slope-based model of landscape type; and (b) modern land use (see Knodell 2013, 363-364, figs. 4.17 and 4.18).





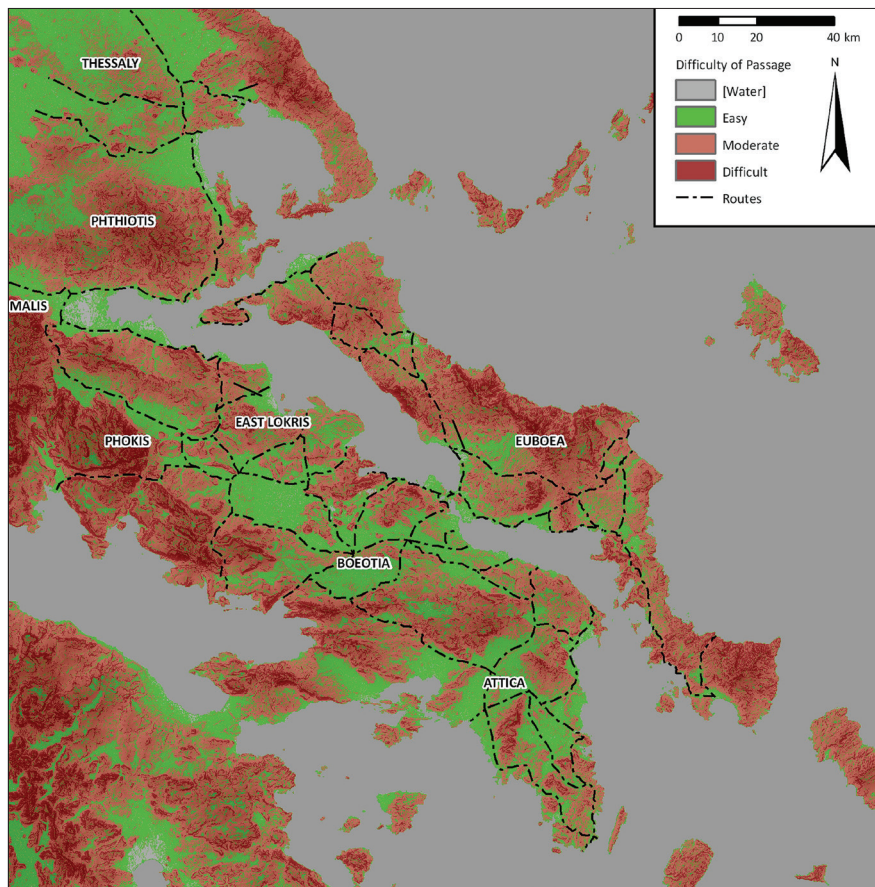


Figure 3. Transportation corridors through regions surrounding the Euboean Gulf, indicating cost of passage across the landscape and major land routes (Knodel 2013, 353, fig. 4.7).

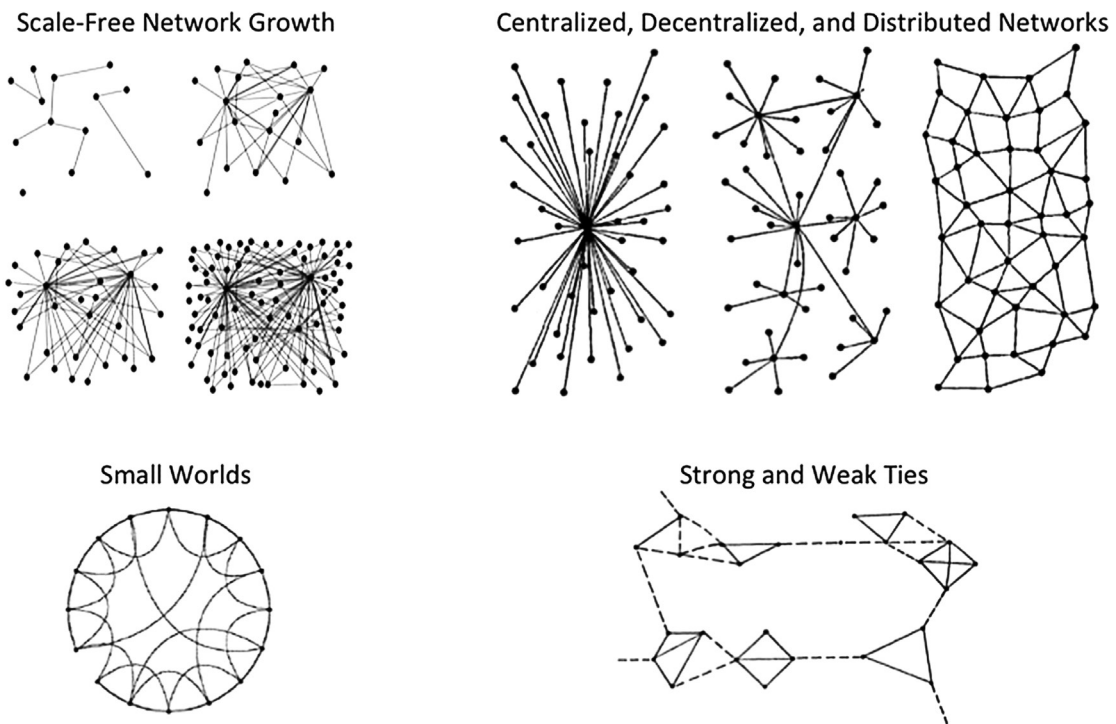
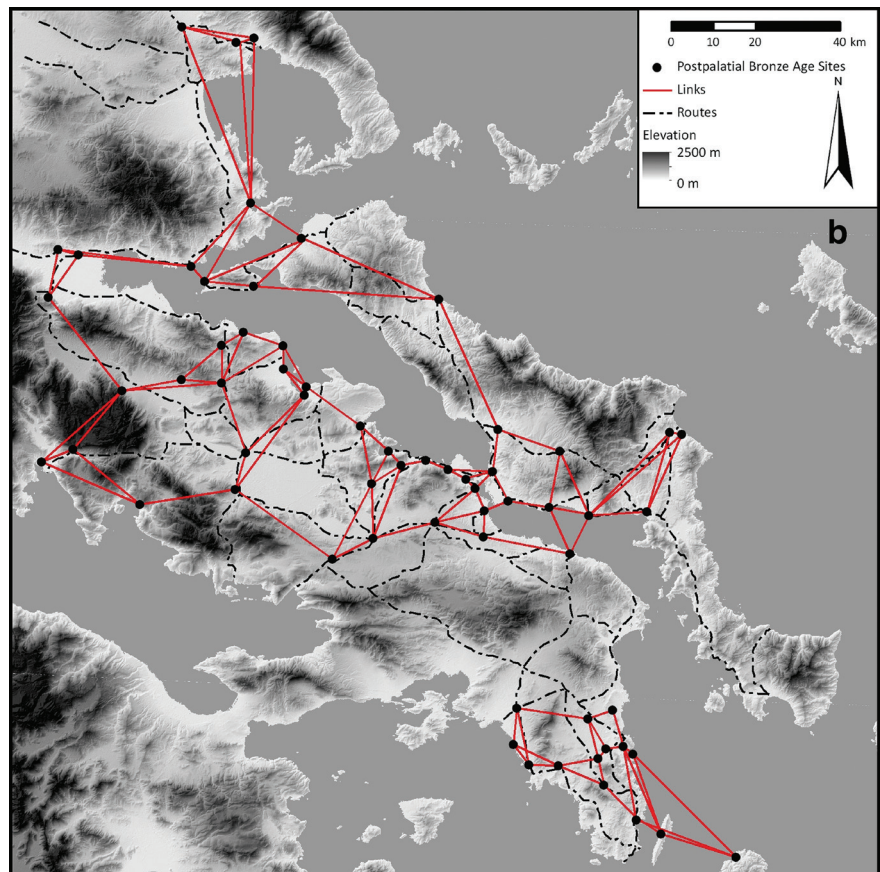
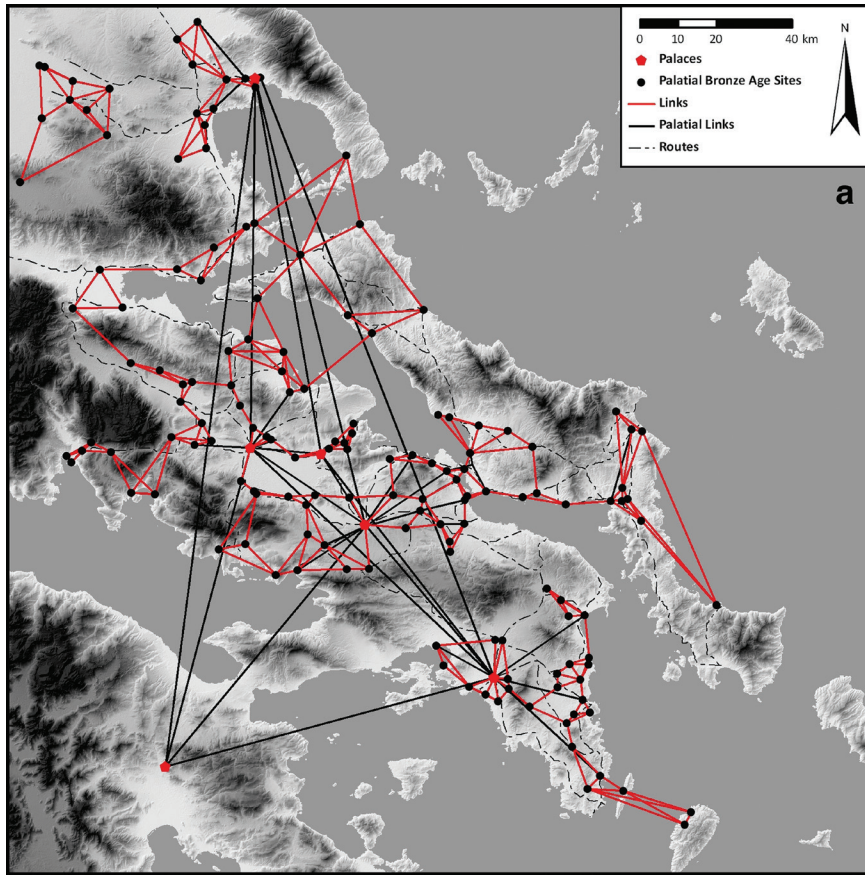


Figure 4. Models of concepts derived from network theory discussed in this paper.





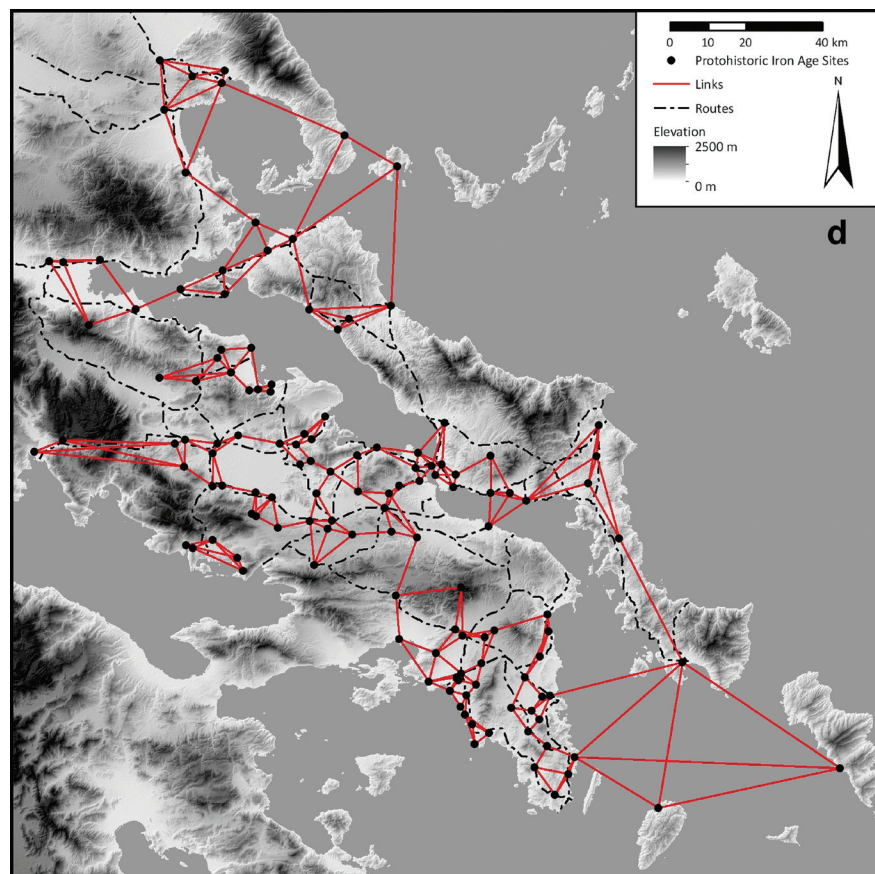
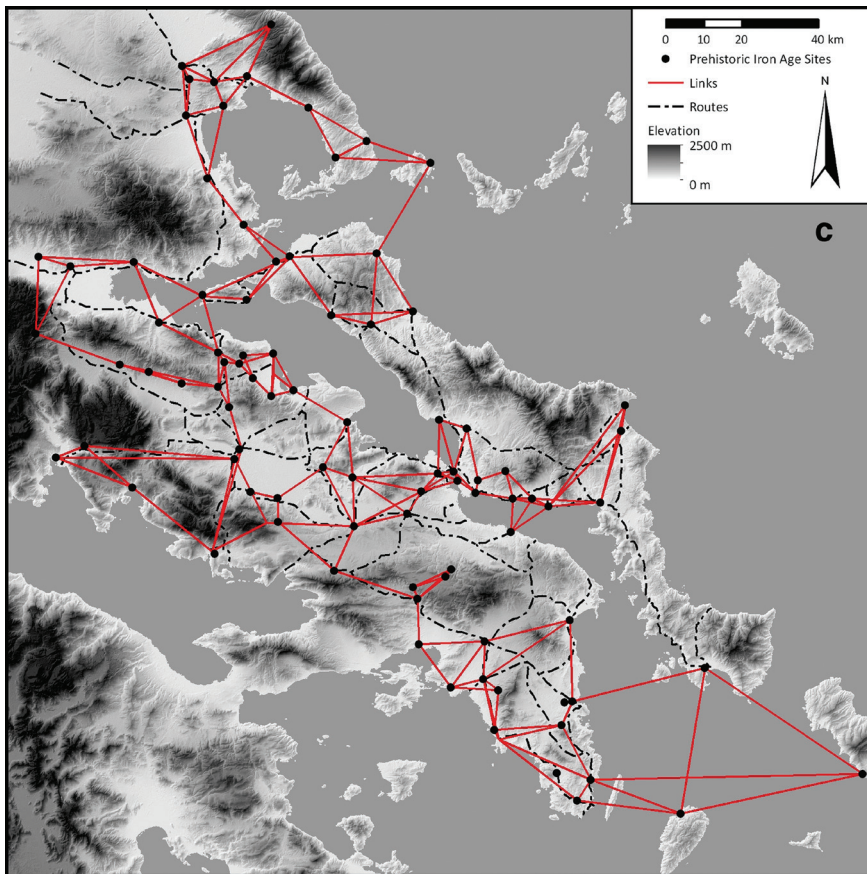


Figure 5. Nearest neighbour networks showing sites and modelled connections for the Palatial Bronze Age (a), Postpalatial Bronze Age (b), Prehistoric Iron Age (c), and Protohistoric Iron Age (d) (see Knodell 2013, 370, 376, 383, 397, figs 5.5, 6.3, 7.3, 8.4).