The Earliest Communication System in the Aegean

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ABSTRACT: A communication system based on fire signals was identified in Crete by the field archaeologist Nikos Panagiotakis, during an archaeological survey he conducted in the Pediada region in central Crete (from 1982 to 1989), covering more than 800 sq. km. The Pediada lies between the Bronze Age palatial sites of Knossos and Malia (from west to east) and extends south and southeast of modern Heraklion. The communication system was used during the Minoan period, especially between 1900-1700 BC. It worked by means of codified fire signals sent from the top of large, man-made constructions (in the shape of a truncated cone), built on the tops of hills or ridges. The network with its interconnecting visual contact could keep a close watch over, and so control natural passes and routes, covering the whole countryside and the coasts.

KEY-WORDS: communication, fire signals, soros, fryktoria, GIS, line of sight.

Bannum, your servant.
Yesterday, I departed from Mari and spent the night in
Zuruban. All the Benjaminites sent messages with fire.
From Samanum to Illum-Muluk, from Illum-Muluk to
Mishlan, all the cities of the Benjaminites in the area
of Terqa replied with the *same signs and to this*
moment I haven't been able to interpret them. I will
try to interpret them and I will write to my Lord. Let
the guard of the city of Mari be intensified and let my
Master not exit the gate.

Letter from the palace archives of Mari
(after G. Dossin)[1]

The oldest communication system, based on the transmission of codified messages using fire and described in the letter above, comes from the archives of the palace of Mari (present Syria) and dates to the beginning of the 2nd millennium BC.[2] As described in the letter, the Benjaminites used codified fire messages to communicate among themselves; these specific fire messages acted at two levels: one, to exchange information, and two, to deter the 'enemy' (i.e., the person who wrote the letter to his lord), from proceeding any further before interpreting them. The fire messages frightened him so much that he advised his lord not to exit the city of Mari and even intensify and strengthen its guard. The fire signals were thus used for both communication and defence. It is not clear in the letter whether the system functioned with large fires on the tops of hills with inter-visibility or simply with torches.

It seems that fire has been used as a fast means of communication by many cultures and in all periods, but as mentioned above, the oldest written evidence we have comes from Syro-Palestine and dates to the beginning of the 2nd millennium. The same system continued to be practiced in the area of Syro-Palestine in later periods as is evident in the Bible but also in Lachish letter no. 4: 'And let (my lord) know that we are watching for the signals of Lachish, according to all the indications which my lord hath given, for we cannot see Azekah'.[3] Mazar suggests that the fire message was sent from an Iron Age fortress, situated on the western slopes of Hebron mountains, perhaps the fortress at 'Khirbet Abu et-Twein or Khirbet Tibneh, … Both could provide fast communication by using fire signals from Lachish to Jerusalem.'[4]

A similar communication and defence system existed in Classical Greece: there was a series of watch and signal towers with inter-visibility that would exchange codified

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[1] Dossin (1938) 174-186.
[2] André Parrot discovered about 20.000 clay tablets within the palace of Zimri-Lim (1730-1700 BC) at the city of Mari. They were written in cuneiform by the Amorites (Semitic people). On the communication system described in the letter see, Dossin (1938) 174-186.
[3] Pritchard (1950).
[4] Mazar (1983) 107-8.

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fire signals.[5] They were called *fryktories* (from *fryktos* = torch). The use of fortresses and towers built as part of the defence programme of large regions is also known from Venetian Crete.[6] Even in the most recent past, fire was used as a means of communication in Crete: for instance, during the Ottoman occupation, if an orthodox Cretan killed a Turk, he would have to escape to a nearby island, and Karpathos, was the island where many Cretans found refuge. The Karpathians would be informed by a fire message sent from the monastery of Toplu,[7] in east Crete; a boat would be sent the same night to rescue the Cretan. Even up to the middle of the 20th century, when there was no priest to perform a funeral service at the island of Gavdos, off the south coast, fire was used to communicate with the priest in the opposite coast town of Sphakia, where the funeral service would take place.

A MINOAN CUMMUNICATION AND DEFENCE SYSTEM BASED ON FIRE

A communication system, contemporary to the one described in the letter at the archives at Mari (dating to the beginning of the 2nd millennium) and based on the same principle – conveying massages using fire - has been identified by Nikos Panagiotakis on the ground, during his intensive archaeological survey in the Pediada region in central Crete (Figs. 1, 2).[8]
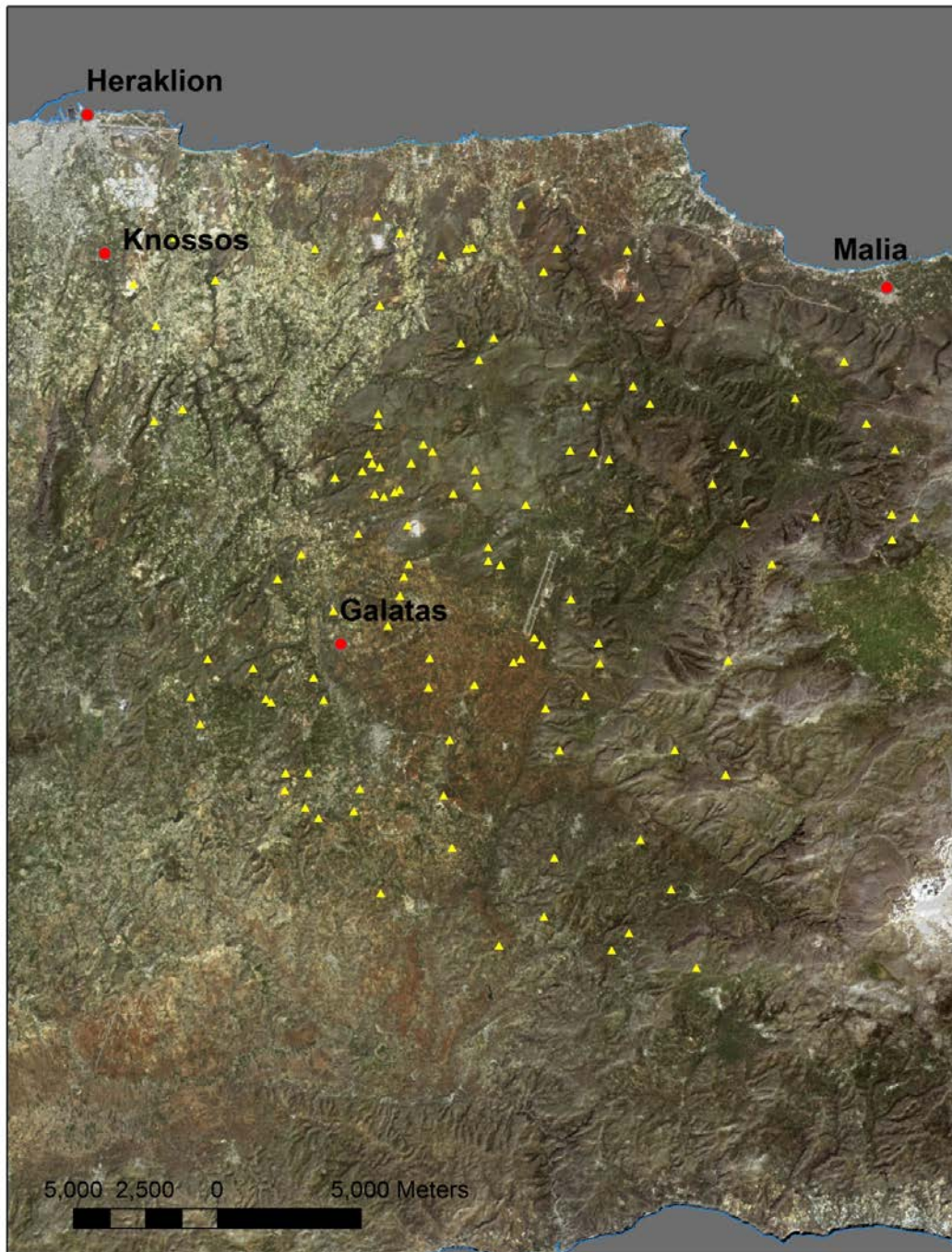

Fig. 1. Map of Crete with the Pediada region highlighted

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[5] McCredie (1966) 89, 117-120. Lohmann (1992) 40, n. 35.
[6] Panagiotakis (2003) 368.
[7] A vat with olive oil was kept at the tower of the monastery of Toplu for that purpose.
[8] The Pediada Survey project, see Panagiotakis (2003) and (2004).

Fig. 2. The Pediada region – distribution of *soroi*.

Both its natural resources and its geographical position at the crossroads connecting the north coast with the south and east Crete with west has made the Pediada an important region throughout the ages. Its history, as revealed through the Pediada survey, started perhaps well before the Neolithic period, but it was during the Bronze Age (the Minoan period, 2nd millennium BC) that an unprecedented number of settlements can be seen to have existed everywhere in the Pediada, suggesting a large

population. Thanks to its natural wealth, the Pediada sustained the two of the most important Bronze Age palatial domains, Knossos and Malia, being in fact their hinterland. It is also the home territory for the Bronze Age palatial town of Galatas (a site also identified through the Pediada survey, Fig. 2).[9] In the historical period (Archaic, Classical, Hellenistic, Roman) six city states developed and flourished in the Pediada: Knossos, Lyktos, Chersonissos, Arkades, Lykastos, Eltynaia. During the later periods (Venetian, Ottoman and 20th century AD) the wealth of the Pediada has been extensively exploited and exported through the main commercial harbour of Crete at Heraklion, where the Minoan harbours of Knossos were also located (at only five km distance from the Bronze Age palace of Knossos).

As stated above, it was at the start of the 2nd millennium (Old Palace period, 1900-1700 BC) that the communication system based on fires was developed in the Pediada region. The topography of most of the contemporary settlements on relatively inaccessible and easily defensible locations, in combination with the cyclopean walls that many of them have, suggests unrest and uncertainty in the Pediada region. It was perhaps this uncertainty that forced the Minoan authorities to create a communication and defence system. The security of the agricultural and pastoral produce of the Pediada, necessary for the viability of palatial economies, would have been the main interest of the polities of Knossos and Malia. Thus, the Pediada centres, including the palatial town of Galatas, seem to have been incorporated into a complex network of exploitation and mobilization of staple goods from the periphery to the core (from the Pediada to the palatial centres of Knossos and Malia). This network was intensified during the succeeding New Palace period (1700-1400 BC), as is evident in the distribution of settlements as well as in the distribution of the newly identified communication system (Fig. 3).
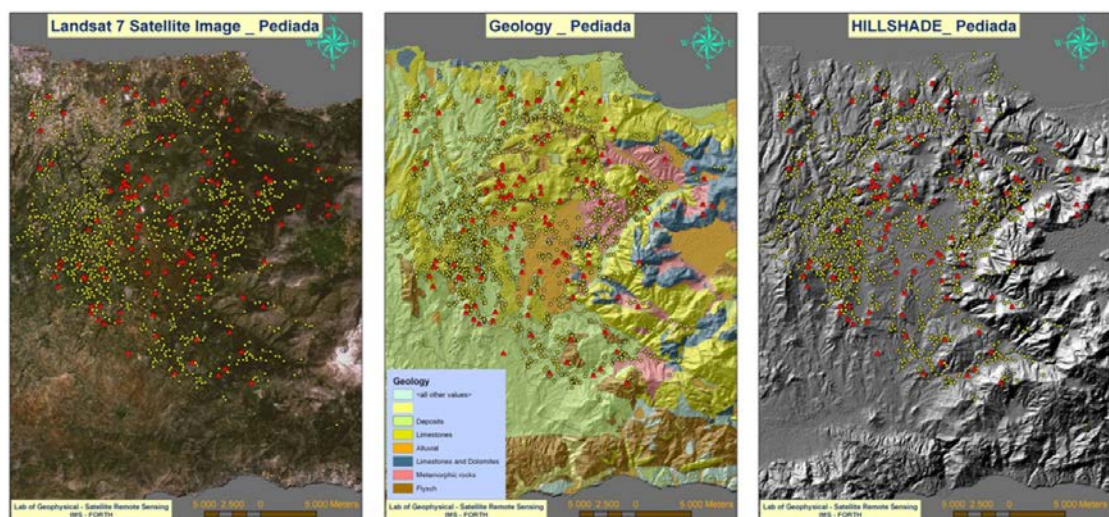

Fig. 3. Distribution of archaeological sites (yellow dots) and soroi (red dots) in the Pediada region. A Landsat satellite image, the geological map and the hillshade of the region have been used as background layers.

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[9] Rethemiotakis (1999) 91-111.

SOROI: TRANSMISSION POINTS

The Pediada survey, apart from bringing to light a large number of settlements, it also identified, on the ground, a new type of site – the s*oros* - (σωρός = pile or heap, plural soroi [σωροί]). A soros is a large construction that looks like a pile or heap (hence the name used by the local people) of pyramidal shape, with a flat top: it looks more like a truncated cone (see below). In fact it was the repetition of the toponym *soros* and its distinctive topography as well as the large amounts of hard-baked clay that assisted Nikos Panagiotakis in identifying the *soros* as a 'watch and signal post' or 'transmission point'. Although most of the *soroi* were recorded and studied during the survey period (1982-1989), their function was understood only in 2000, when Nikos Panagiotakis studied two partly destroyed *soroi*: architectural elements and layers of well-baked, almost burnt clay and ashes were revealed. Both the well-baked clay and the ashes in combination with the topography and the close association with contemporary settlements, made it evident, that these specific structures were transmission points to a system of communication that used fire.[10] The system consists of a network of transmission points situated on the summits of hills or ridges, all of strategic importance. This arrangement recalls the much later (end of the 2nd millennium BC, c. 1230 BC) fire signals that brought the message of the sack of Troy to Mycenae in one night; as described by Aeschylus (*Agamemnon, 281-316*), the system involved a long chain of large pyres on the tops of hills and ridges from Troy to Mycenae (Homer (Iliad 18. 210-213) [11] also refers to fire messages and so does Thucydides (II. 94. I)).[12] However, the actual transmission points of the Mycenaean system were not described by any of the ancient authors and none has been recognized on the ground. None the less, it is possible that the Myceneans used the same structures – the truncated cones or *soroi* (as transmission points) in their system of coimmunication.

Soroi are large man-made constructions that consist of circular or semicircular dry walls strengthened by radially arranged ones springing from the centre of the cone. The flat top had originally a floor of plaster (clay) on which the pyres were lit.[13] The diameter at their base varies from 5 to up to 40 metres; their height also ranges from 2 to 7 or 8 metres. The height of a *soros* may have depended on the height of the hill it was constructed on as well as on the height of the surrounding vegetation. In fact the top of a *soros*, where the fire was lit, had to be set well above the surrounding

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[10] The subject has been aired in many publications among which Panagiotakis (2003a) 348; (2003b) 68-91; (2004a) 180-182; (2004b) 40-53; Sarris, Kakoulaki & Panagiotakis (2006); (2011a); (2011b). The identification of the *soroi* as transmission points was first announced at the conference organized by the British School at Athens and the 23rd Ephorate of Prehistoric and Classical Antiquitiesat Heraklion in Crete, in November 2000, for the Centenary of Sir Arthur Evans's Excavations at Knossos, see Panagiotakis (2004a) 177-186.

[11] Homer (*Iliad* 18. 210-213) ' …fighting from their own city, but as the sun goes down signal fires blaze out one after another, so that the glare goes pulsing high for men of the neighbouring islands to see it, in case they might come over in ships to beat off the enemy' (translation by R. Lattimore).

[12] Thucydides (II. 94. I) 'Beacons were lit to warn Athens of an enemy attack, and a panic broke out …' (translation by R. Warner and M.I. Finlay).

[13] The plaster consists of about 60% clay.

vegetation, so that the fire could be seen from a distance and would not spread to the vegetation around it. The basic idea was to construct a transmission point that could be seen from a distance and from at least one other transmission point (Fig. 3). All the transmission points were thus part of a very wide system of communication that we are trying to reconstruct using modern technical methods and not just the naked eye. A message from one of the largest *soroi* at Ederis (by modern Gouves, east of Heraklion), for example, could reach the Knossos palace (with which there is no direct visual contact), through two or three transmission points. Another way Ederis *soros* could communicate with Knossos would be through the peak sanctuary at Juktas which has direct visual contact with Knossos (if peak sanctuaries were part of the same communication system, as pointed out earlier).[14] Pantelis *soros*, among the largest and constructed on the hilly area by the modern village Smari, could communicate with the large *soroi* along the north coast as well as with many others, east and west (Figs. 4, 5).
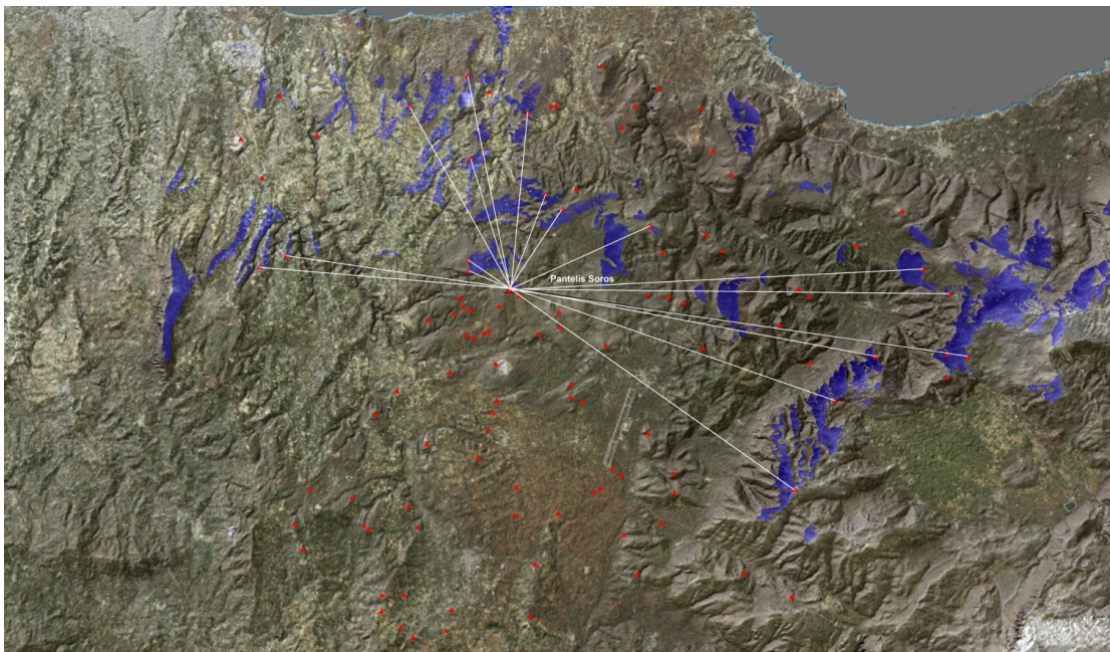

Fig. 4. Example of the visibility network (blue areas) and the lines of sight from Pantelis *soros*.

The large soroi were landmarks in the countryside: even today, when they have lost a lot of their height and magnitude, seem enormous constructions - many stand out, green with vegetation during the winter and spring in the rocky wilderness of the Cretan mountains (Figs. 5, 6).

[14] Panagiotakis (2004) 180-181

Fig. 5. Pantelis *soros*.

Fig. 6. *Soros* t'Amygdaliou (green with vegetation).

Topographic datum columns exist at the top of some of the *soroi*, suggesting that they are still used as landmark points. There is a hierarchical order in their distribution, a fact also highlighted by their size (Fig. 7). Their hierarchy may have been dependant on their particular function and their inter-visibility or extent of control. It may also be expressed in their dimensions: two categories can be distinguished from the fieldwork evidence - the smaller ones have a total area of less or equal to 1000 m^2 and the larger *soroi* cover at least 1500 m^2. They spread from the north coast to the south and from east Crete to the west. The ones along the north coast in central Crete (the north of the Pediada region), are the largest and because of their position they may have had more than one function: one, to transmit messages to corresponding *soroi* in the hinterland, which, could in turn, pass these messages to other *soroi* further inland; two, to send messages to the islands beyond the north coast; and, finally, to assist navigation by acting as beacons for boats approaching the north coast.
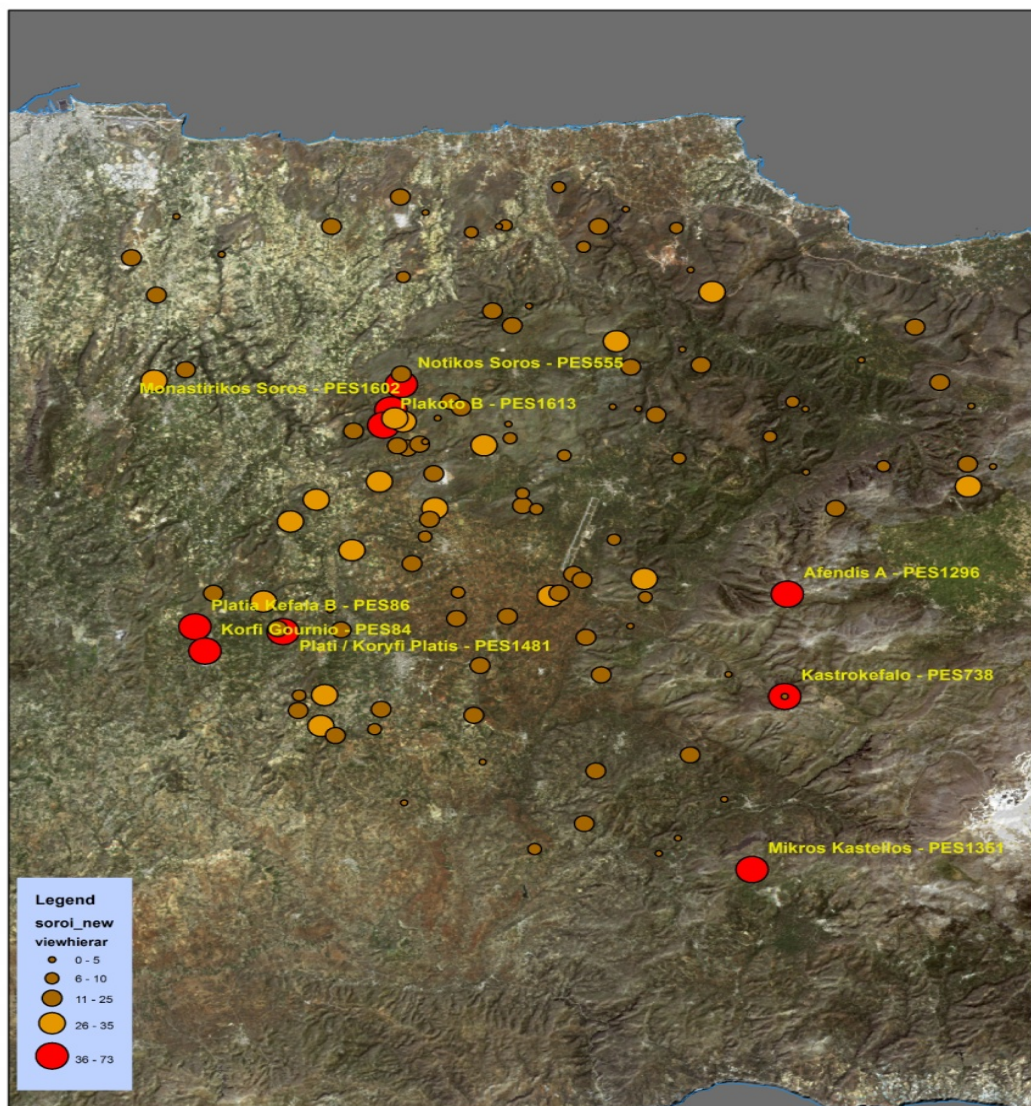

Fig. 7. Visibility hierarchy of the soroi of the Pediada region. The results have been based on the extent of viewshed analysis from each one of the soroi

A large number of such sites has been recognized, originally in the Pediada region and little by little in many different places all over Crete. Their distribution suggests that it was a pan-Cretan system of communication (Fig. 8).

It is worth pointing out that modern communication systems stations have been installed on or by many *soroi*; on one of the largest, the *Ederis soros* at the north coast, the large satellite dishes of the American base at Heraklion (c. second half of 20th century AD) can still be seen, together with a large number of more recently installed radars and antennae of mobile phone.

Soroi are also found by many ancient passes and routes; some actually lie on either side of the route (defining it in reality). A few are so close to one another that messages could be sent by voice or mimetic gestures during the day. The proximity of these *soroi* points to their function as 'watch towers' perhaps to safeguard the transportation of goods and travellers. Messages could thus be transmitted by voice, gestures and fire or smoke, depending on the time a message had to be sent and on its importance; in bad weather when messages could not be sent by fire or smoke, the distance from one *soros* to another could be covered by runners. The clustering of the sites, the high degree of inter-visibility among the *soroi*, the large extent of viewshed coverage by them, their proximity to settlements and their spatial distribution (either on high elevations in relation to their surroundings or close to passes) all indicate their role as communication beacons/transmission points (Fig. 8). It seems that the *soroi* located at the west and east borders of the Pediada region had an additional strategic significance, as they were controlling access to the Pediada region from the east and west mountain ranges as well as from the sea to the north.

Minoan settlements are to be found close to and below a *soros* or at least nearby so that all settlements were linked with at least one *soros* (Fig. 8). The fact that *soroi* were part of everyday life for the Minoans is deduced by the existence on and around *soroi* both of pottery of everyday use such as cooking pots, and also of stone and obsidian tools.

Garrisons must have been stationed on the *soroi* to watch the surrounding region and communicate fast with other such structures as part of the defence system, especially during the Old Palace period (1900-1700 BC). The whole countryside and all its routes as well as the coasts seem to have been under close watch. In this way travelling was safe and the mobilization of goods from the periphery to the palace centres was made easier. Peace and safety was thus provided to the people of the island. The original purpose of the system may have been to guard against external enemies perhaps coming from the sea; this would perhaps explain the fact that the system seems to decline, but may not have disappeared completely, during the New Palace period (1700-1450 BC), when a good road network and a reliable naval power along the coasts could have made this dense and closely knit communication system of the Old Palace period less necessary.
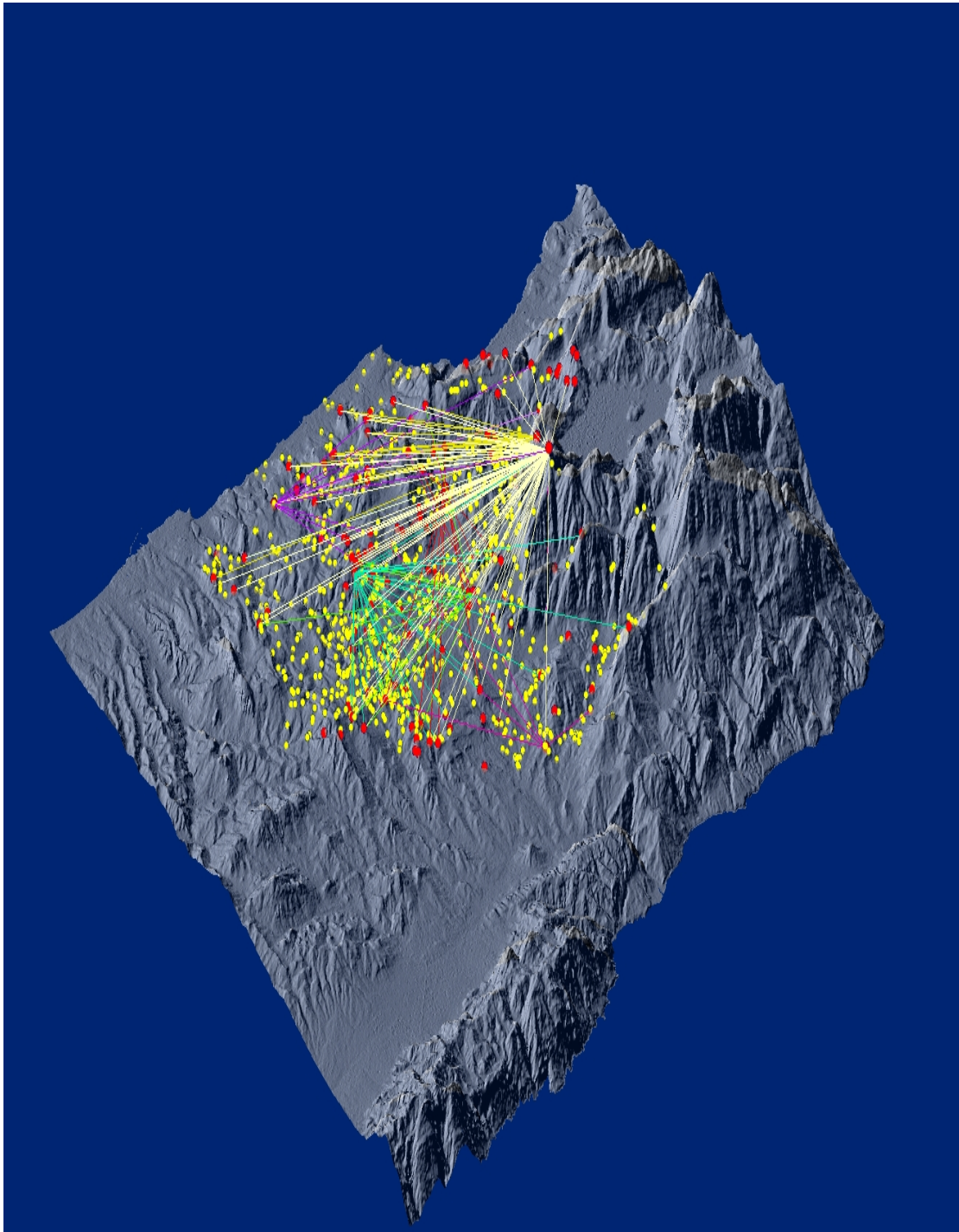
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Fig. 8. Lines of sight from specific soroi indicating the communication network among them. The highest inter-visibility is noticed for *Afentis Soros* located at an altitude of 1568m on the Lasithi mountains; it was probably used for communication between east and central Crete (while the important passes from the Lasithi Plateau and east Crete to the Pediada were controlled by the *Tsouli to Mnima Soros* found on the Lasithi mountains but at a lower altitude than *Afentis Soros*). Lines of sight from Tsouli Mnima (red), Plakoto_b (green), Agios Georgios (purple), Agkinara (red), Xerokambos (violet) and Afentis *Soros* (yellow).

This guard and communication system argues for a very important central authority with sufficient power and means to initiate and maintain for centuries such a dense communication system (that involved enormous constructions and perhaps large numbers of guards). Whether this authority was centred at Knossos or elsewhere cannot now be known, but the fact that such a closely knit guard and communication system was shared by all, may be suggestive of social and political unity.

The baked clay fragments now present at every *soros* (sometimes the only evidence for their existence) were originally part of the top 'floor' where the fire was lit. The hard-baked clay points to large pyres that would be visible from large distances, especially from the larger *soroi*. One can imagine these large pyres rising high above the vegetation and fire and light springing from one *soros* to the next, from one peak to the next and one cannot help sensing the victorious message sent from Troy to Mycenae:

'Beacon lit beacon in relays of flame. From Ida
To Hermes' crag on Lemnos; from that island, third
To receive the towering torch was Athos, rock of Zeus;
There, as the blaze leapt the dark leagues, the watch in
welcome
Leapt too, and a twin tower of brightness speared the
sky,
Pointing athwart the former course; and in a stride
Crossing the Aegean, like the whip-lash of lightning, flew
The resinous dazzle, molten-gold, till the fish danced,
As at sunrise, enraptured with the beacon's glow,
Which woke reflected sunrise on Makistos's heights,
The watchman there, proof against sleep, sunrise or sloth,
Rose faithful to the message; and his faggots' flame
Swept the wide distance to Euripus' channel, where
Its burning word was blazoned to the Messapian guards,
They blazed in turn, kindling their pile of withered heath,
And passed the signal on. The strong beam, still undimmed,
Crossed at one bound Asopos' plain, and like the moon
In brilliance, lighted on Cithaeron's crags, and woke
Another watch, to speed the flying token on.
On still the hot gleam hurtled, past Gorgopis' lake;
Made Aegiplanctus, stirred those watching mountaineers
Not to stint boughs and brushwood; generously they fed
Their beacon, and up burst a monstrous beard of fire,
Leapt the proud headland fronting the Saronic Gulf,
To lofty Arachnaeus, neighbor to our streets;
Thence on this Atreid palace the triumphant fire
Flashed, lineal descendant of flame of Ida.
Such, Elders, was the ritual race my torchbearers,

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Each at his faithful post succeeding each, fulfilled;
And first and last to run share equal victory.
Such, Elders, is my proof and token offered you,
A message sent to me from Troy by Agamemnon.
    (Aeschylus, *Agamemnon*, 285-316, translated by P. Vellacott)

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