

Original Study

Open Access

Jacopo Turchetto*, Giuseppe Salemi

Hide and Seek. Roads, Lookouts and Directional Visibility Cones in Central Anatolia

DOI 10.1515/opar-2017-0004

Received May 26, 2016; accepted October 13, 2016

Abstract: In Cappadocia (central Turkey), routes that were only of a secondary importance during the Roman age acquired a new relevance starting from the end of the 7th century. In this framework, to what extent did the archaeological evidence match the picture recalled by the written sources? To address this question, the relationship between movement and visibility was considered and viewshed analyses were conducted from targeted and strategic spots set along the routes considered. This allowed to better understand the role and the different functions of those axes crossing Cappadocia, and to evaluate the Byzantine/Arab military strategies in central Anatolia.

Keywords: GIS; Viewshed analysis; Visibility cones; Roman and Byzantine Road System; Byzantine and Arab Cappadocia

1 Introduction

Within the framework of the road system of Byzantine Cappadocia (central Turkey), the regional network of communication seems to have remained almost constant, with no substantial alterations over the course of the centuries, with respect to the system developed during the Roman period.¹

Nonetheless, as far as we can ascertain on the basis of the archaeological data available and of the written sources, some modifications and different choices of itinerary can clearly be identified at a more local level. Where it was possible and permitted by the morphological characters of the landscape, certain routes, which were only alternatives or of a secondary importance during the Roman period, acquired a new and relevant role.

In particular, this is the case of the road network established between *Koloneia/Aksaray* and *Tyana/Kemerhisar*, running both along the feet and across the volcanic group formed by Hasan Dağı, Keçiboğdoran Dağı, Melendiz Dağları and Göllü Dağı (Fig. 1).

¹ The road network of classical and post-classical Cappadocia represented the focus of a PhD thesis conducted at the University of Padova, within the framework of the researches carried out by the Chair of Ancient Topography in central Anatolia (Turchetto 2010-2012; Turchetto in press a). The results obtained therein are the starting point for the analysis we would like to present in this paper. All the figures in the paper were elaborated by J. Turchetto. Paragraphs 1-3 are by J. Turchetto; paragraph 4 is by J. Turchetto and G. Salemi.

Article note: This article is a part of Topical Issue on Uncovering Historical Routes for Sustainable Mobility: Methods, Tools and Case Studies

***Corresponding author: Jacopo Turchetto**, University of Padova, Department of Cultural Heritage, Piazza Capitaniato 7, 35139 - Padova (PD), Italy, E-mail: jacopo.turchetto@unipd.it

Giuseppe Salemi, University of Padova, Department of Cultural Heritage, Piazza Capitaniato 7, 35139 - Padova (PD), Italy

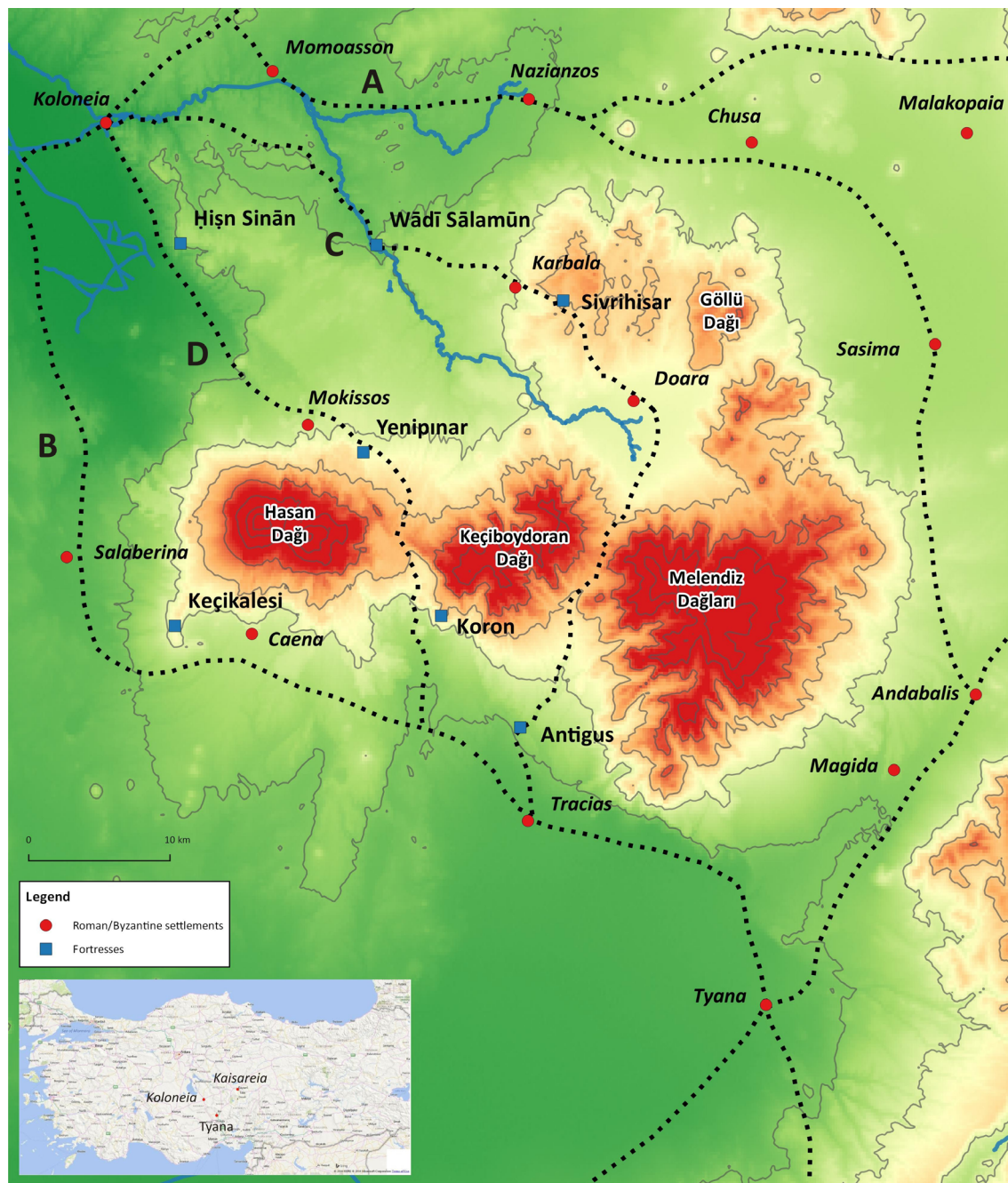


Fig. 1 The area of the volcanic massif and the possible routes of the Roman and Byzantine road network in central-southern Cappadocia.

1.1 Around and Across the Volcanoes

During the Roman period, the principal axes reasonably crossed the plain extending to the north and to the south of these mountain ranges. In particular, as suggested by the *Itinerarium Antonini*² and the *Itinerarium Burdigalense*,³ the ‘northern’ route (Fig. 1A), after leaving *Colonia Archelais* (the Byzantine *Koloneia*), would

² *ItAnt*, 144, 4-145, 2: 20 (Cuntz).

³ *ItBurdig*, 576, 8-578, 1: 92-93 (Cuntz).

have reached *mutatio Momoasson* (Mamasun-Gökçe), *Nandianulus/mansio Anathiango* (Nenezigözü), *Chusa* (Kuyulutatlar), *Sasima/mansio Sasima* (Tırhan) and would have arrived at *Tyana* passing by *Andabalis/mansio Andavilis*, known today as Yeniköy/Aktaş (Equini Schneider et al. 1997, 108–111, with earlier bibliography). The route of the ‘southern’ road (Fig. 1B), instead, is suggested by the Peutinger Table,⁴ which, between *Koloneia* and *Tyana*, registers the stopping places of *Salaberina* (identified with Kepez Tepe, just to the south of the present-day village of Gideriç), *Caena* (in the vicinity of Uluören) and *Tracias* (to be found probably in the surroundings of Kınık Höyük) (Equini Schneider et al. 1997, 108–111, with earlier bibliography). Moreover, during the Byzantine period between *Salaberina* and *Caena*, the fortress of Keçikalesi was built on the south-westernmost foothills of the Hasan Dağı, at an average height of 400 m from the road (Hild, Restle 1981, 136–137; Equini Schneider et al. 1997, 138–141).

Starting from around the end of the 7th/first part of the 8th century onwards, instead, it seems that the mountainous routes started to be frequently, if not preferentially, used as well. This is clearly suggested by Greek and Arabic written sources, and especially by the military itineraries describing the different stages and stopping places set along the routes followed by the Arab armies, when entering Cappadocia (most recently, Turchetto in press b).

The first of those routes (Fig. 1C) branched from the ‘southern’ road in the area around *Tracias* and proceeded towards the fortress of *Antigus/Altunhisar*, set about 50 m above the road (Hild 1977, 48–50; Hild, Restle 1981, 142). Running northwards along the Omerlı Deresi valley, it passed by the modern village of Divarlı (ancient *Doara/Durra*) and through the Melendiz plain, which can be plausibly identified with the *Marğ al-Uşquf* (i.e. the ‘Bishop’s Meadow’) mentioned by the Arabic sources (Hild, Restle 1981, 171–172; Cassia 2004, 114–115). From there, before reaching *Koloneia*, the route would have turned to the north-west, passing underneath the fortress of Sivrihisar, built about 200 m above the road, on the top of the Kulaklı Tepe/Gelin Tepe, (Hild, Restle 1981, 245–246; Equini Schneider et al. 1997, 143–144) and of the fortress of *Wādī Sālamūn/Sālamun* (100 m above the road), which has been correlated with the fortification of Selime Kalesi (Hild, Restle 1981, 269–270; Kalas 2007, 280–281).

As for the second route (Hild 1977, 50–51), it would have ran through the col formed by the eastern slopes of the Hasan Dağı and the western slopes of the Keçiboydoran Dağı (Fig. 1D). It passed beneath the fortress of *Koron*, which stands about 300 m above the road (Hild, Restle 1981, 216–217; Equini Schneider et al. 1997, 141–143; Cassia 2004, 119) and in the vicinity of the fort of Yenipınar, built close to the site of *Mokissos/Helvadere*, 100 m above the road (Hild, Restle 1981, 305; Equini Schneider et al. 1997, 135–138). The route, then, ran underneath the fortress of *Hişn Sinān* (Hild, Restle 1981, 277–278), which has been identified with the fortress of Akhisar, 10 km south-east of *Koloneia/Aksaray*. Its position on an “...isolated, teardrop-shaped spur of the plateau...”, 300 m above the road, represented a perfect and strategic choice for a “...lookout guarding access...” to the plain beneath (Ousterhout 2005, 8–9, 125–126).

It is clear, then, that a shifting in the use of that road network can be pointed out between the Roman and the Byzantine periods. Such a change should be directly linked to the cultural, political and historical transformations Cappadocia underwent during that phase of ‘fragmentation’, characterised especially by the raids of the Arab forces. Indeed, from the first part of the 8th to the 10th century, Cappadocia became a strategic territory along the frontier line between the Byzantine Empire and its neighbours (Asa Eger 2014; Haldon 2016). For this very reason, a new defensive/offensive strategy was developed for the control of that stretch of land north of the Taurus Mountain, made of “...frontier fighting and skirmishing, of guerrilla tactics and raiding” (Haldon 2001, 89). The Arab raids were “...directed almost entirely at the border districts of the empire and their hinterland [and] aimed chiefly at the collection of booty and at damaging Byzantine morale, rather than forming part of any grand general strategy, as had been the case up to 718” (Haldon & Kennedy 2004, 145; Kennedy 2010, 175–178). This meant that the Byzantine response to those guerrilla tactics and raiding was predominantly aimed at harassing, dogging and shadowing the invading forces, as well as at controlling their every movement along the routes in order to be promptly informed about their logistical choices. All this was made possible (and was partly successful) thanks to the garrisoning of numerous small forts or fortresses (most recently, Haldon 2013).

⁴ TabPeut, IX, 1-2.

1.2 The ‘View’ of the Ancients

As the 9th–10th century Greek written sources recall (Haldon 2013), the fortresses should be built in strategic positions, usually at the summit of steep and precipitous spurs of the mountains (“If there are high and rugged mountains on the frontier with the enemy, they [the commanders] should place the watch post on them” – *Skirmishing*, 1, 151; “...most of our fortified towns [*kastra*] are built in strong, rugged locations...” – *Skirmishing*, 21, 225; “The commander should make an effort to seize the highest point in the area, or even a fort, if there happens to be one already built in that place” – *Campaign organization and tactics*, 19, 295). Indeed, “the observation post in which the commander of the troops [...] is stationed should be suitable for observing the enemy in pursuit at a great distance, estimating the number of their troops, and studying the way in which they are making the pursuit” (*Skirmishing*, 17, 209). Moreover, that strategic position allowed the commander “... to observe the approach of the enemy...” (*Strategy*, 9, 29) and “...have a better view of the smoke and clouds of dust [...] if the enemy troops are coming” (*Strategy*, 15, 199): “from these signs he [the commander of the unit] should be able to form an estimate of their route of march and where they are likely to camp” (*Skirmishing*, 8, 165). In this respect, forts, fortresses and beacons offered also the possibility “... to make the fire and smoke signals warning of the enemy’s approach [...] fire by night and smoke by day” (*Strategy*, 8, 27).

Fortresses were also “...erected [...] not far from the route the enemy are expected to take, so that any hostile advance will not go undetected by the garrison” (*Strategy*, 9, 29). “Other men should look for places in which the roadway narrows... If they guard these places carefully, the enemy will not be able to move out secretly” (*Skirmishing*, 1, 151). Special attention was effectively given to the roads and to the sentries appointed to guard them, as well: “the role played by the sentries along the roads is essential. The general must devote a good deal of attention to these also and set up their posts in suitable locations, so that when the enemy begin to move the sentries will learn of it from the posts along the road. The general will have advance knowledge that the enemy are moving out and what road they plan on taking. The people in the countryside, then, warned by the sentries and the *expilatores* [scouts], may take refuge with their animals in fortified locations” (*Skirmishing*, 2, 152). Indeed, not only did the forts represent relevant lookouts and watch-posts for the Byzantine army, but functioned also as defensive places where the local population could seek refuge during the Arab incursions, and store goods and food. This would have deprived “... the enemy of the chance to collect provisions and easy booty” (Haldon 2001, 89–90; see also Métivier 2008): “...the villagers may escape to the strong places and fortresses and be preserved from harm” (*Skirmishing*, 12, 189); “The *expilatores* should get the inhabitants of the area with their animals to take refuge in the fortified towns [*kastra*] or, if there are none, in very strong and secure position high up in the mountains” (*Skirmishing*, 7, 165). Moreover, the proximity between fortresses and routes was also essential when the invading forces would have decided to siege and attack the fortresses “...which have become the refuge for the farmers with their families and children”. In that case, indeed, the general should “...make haste to lead the inhabitants of the villages to more remote, stronger, and more defensible places...” occupying the roads leading to them, guarding them securely (*Skirmishing*, 20, 223).

1.3 What We Were ‘Looking For’

Within this framework, what we wanted to understand was the role each fortress played within that sector of the Cappadocian landscape and their function in terms both of strategic and military perspectives. In particular, this paper aimed at answering the following questions: to what extent did the central Cappadocian fortresses match the picture recalled by the written sources? To what extent did they face the needs derived from the new offensive/defensive strategy? What kind of control did they exercise over that frontier territory, and which was the relationship established between the fortresses and the routes crossing the volcanic district of Melendiz Dağları, Hasan Dağı and Göllü Dağı?

2 Methods

With these questions in mind, we carried out a GIS-based study aimed mainly at defining the level of control each fortress could offer over the territory beneath, through the analysis of the visibility (i.e. the width/extension of the ‘in-view’ areas) provided by the forts themselves.

In particular, we carried out viewshed analyses from seven forts/fortresses: *Antigus*, *Hişn Sinān*, Keçikalesi, *Koron*, Sivrihisar, *Wādī Sālamūn* and Yenipınar. Six of those structures were precisely localised and georeferenced on the basis of their archaeological remains and of the references given in the most reliable archaeological literature. On the other hand, the fortress of *Antigus*, which is mentioned by both Byzantine and Arabic sources, but has not been identified on the ground yet, was localised in more general terms at the summit of the hill of the modern village of Altunhisar, which should correspond to that ancient site (Hild, Restle 1981, 142).

Through the application of the *Advanced viewshed analysis* plugin,⁵ available in QuantumGis 2.6.1 *Brighton*, we generated a binary viewshed raster map for each of the fortresses mentioned above, which acted as observer points. We decided to opt for a cumulative viewshed analysis, instead of a simple one, because the potential observation points along the walls of the fortresses were not limited to a single location only. In this sense, where permitted by the archaeological remains and in relation to the plans of the forts, we selected up to five different points, in order to take into consideration the visibility from all the different sides of the fortresses themselves (Llobera 2015).

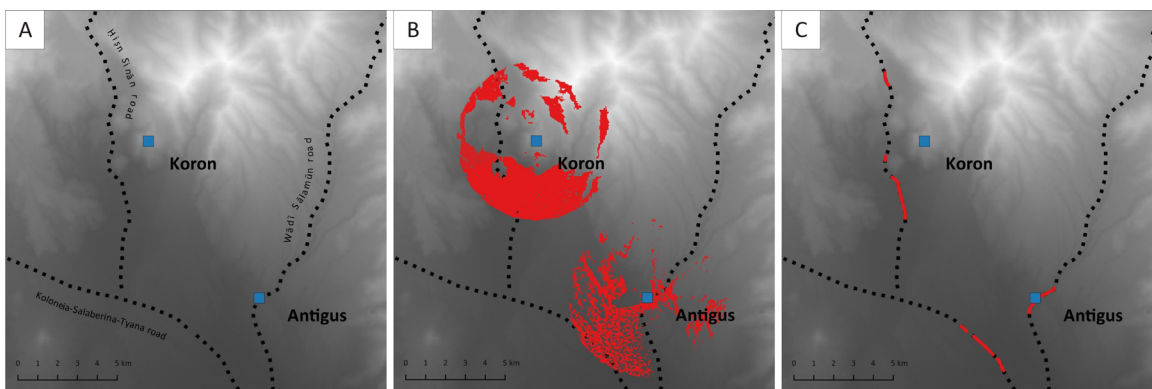


Fig. 2 A) The topographical location of the fortress of *Koron* and *Antigus*; B) Cumulative binary viewshed map obtained from the two fortresses; C) Stretches of the routes (in red) visible from the fortresses, resulting by clipping the layers of the roads on the basis of the viewshed maps.

Moreover, we set the *Observer height*, where that was made possible by the archaeological remains, according to the effective height of the fortresses’ walls and, in the case such data was not available, at an average height of 7 m. As for the *Search radius*, we decided to limit the visibility analysis within the range of 4 km from each fortress. Such a distance falls within the visual range recently suggested by similar archaeological studies (Murrieta-Flores 2014, with earlier bibliography) and, as has been directly verified in Cappadocia, fits well for the aims of our research.

As for the elevation raster required for the determination of the visibility from the viewpoints, we used the ASTER GDEM ASTGTM2_N38E034 and ASTGTM2_N37E034.⁶

Once the binary viewshed raster maps were obtained, we gained information about the areas of the landscape that were visible from the viewpoints and, with reference to the aim of this paper, of the stretches of the roads under visual control from the fortresses. In this latter case, we obtained more detailed results

⁵ <https://plugins.qgis.org/plugins/ViewshedAnalysis/>

⁶ ASTER GDEM is a product of METI and NASA.

from a visual point of view, by clipping the layers of the roads on the basis of the viewshed maps and then calculating the total length of the segments that were visible from the fortresses (Fig. 2).

Moving further, and in order to better understand the effective role played by the various fortresses in terms of defensive strategy and territorial control, as well as to define more precisely the relationship established between the fortresses and the natural corridors along which the routes ran, we carried out directional visibility analyses. Such a method was first developed by David Wheatley and Mark Gillings (2000) and more recently applied by Patricia Murrieta-Flores (2014), when assessing the role of visibility and of landscape markers in terrestrial navigation in Spain.

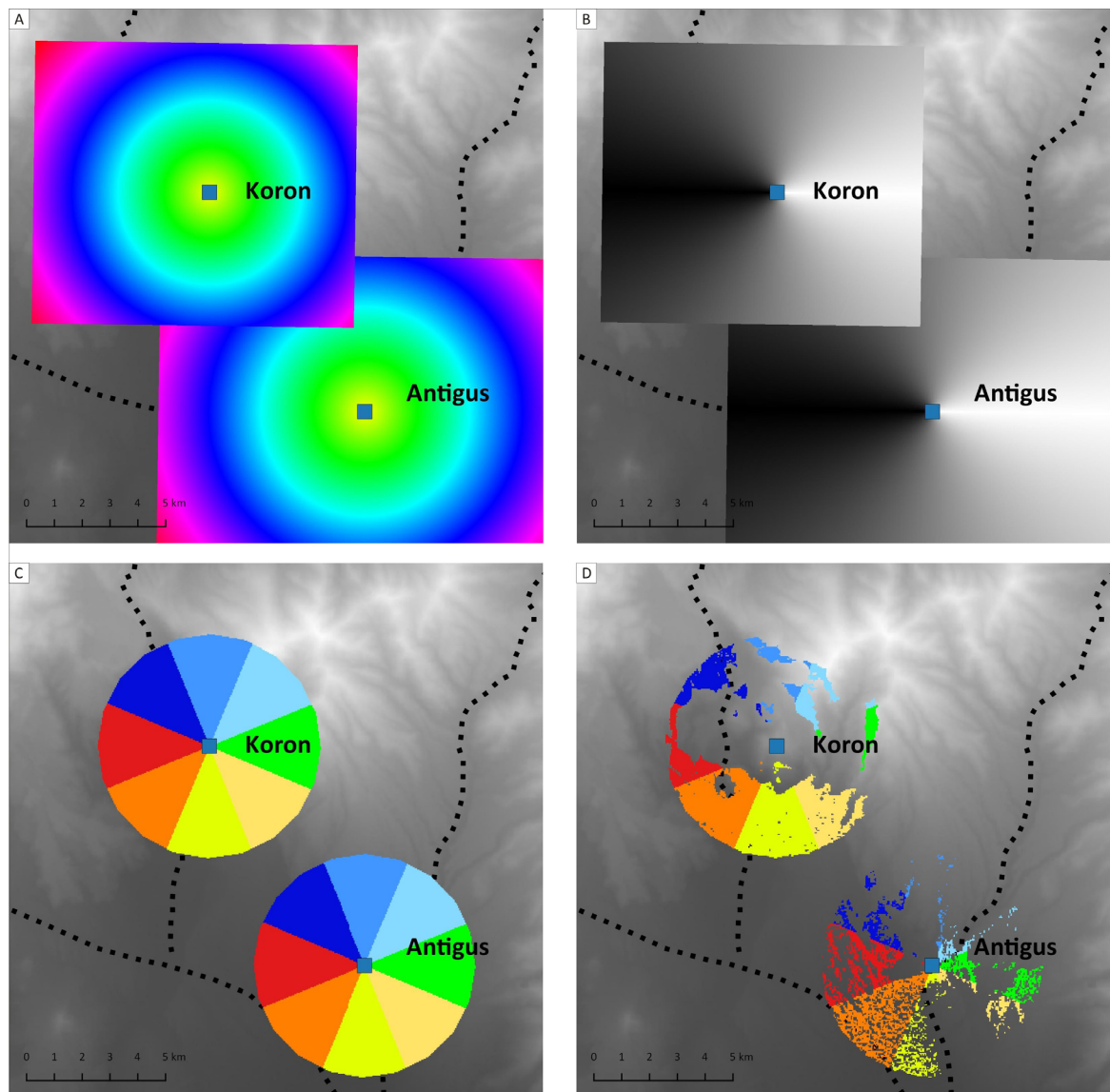


Fig. 3 A) Calculation of the Euclidean Direction from the fortress of *Koron* and *Antigus*; B) Calculation of the aspect raster maps, indicating the directions of the slopes; C) Reclassification of the aspect raster maps into eight directional zones; D) Overlay of the viewshed maps and the corresponding reclassified raster maps.

First of all, by applying the *r.grow.distance* module⁷ (available in QuantumGis through the *Grass* plugin), we calculated the Euclidean Direction from the observer points, and we obtained raster maps representing circular and concentric isolines of distance from each fortress (Fig. 3A). Then, the distance values of the resulted raster maps were inverted (so that the closer you get to the viewpoint, the more the values of the cells grow), so as to obtain a sort of cone with the observer point on the top. Those inverted values layers were afterwards used to produce, through the *r.aspect* module,⁸ aspect raster maps, with the indication of the directions of the slopes (Fig. 3B). The *r.reclass* module,⁹ on the basis of reclassification tables we had previously developed, allowed us to reclassify the aspect raster maps and ‘divide’ them into eight directional zones, which appear as ‘cones of visibility’: north, north-east, east, south-east, south, south-west, west and north-west (Fig. 3C).

Finally, each viewshed raster map and the corresponding reclassified layers were overlaid (Fig. 3D). As a result, we gathered information about the level of visibility along each of the eight directional zones, thus being able to determine the dominant (or preferential) direction towards which each fortress offered a better and more effective control.

In addition to the ‘visual representation’ of the ‘in-view zones’ for each different direction analysed, a graph was generated for each fortress, indicating the visible square kilometres falling within each of the eight ‘cones of visibility’. This allowed us to obtain a more precise quantification of the visible sectors.

3 Results

The results obtained through the application of the binary viewshed analysis confirmed that the Cappadocian fortresses were effectively built in strategic positions, overlooking and controlling significant stretches of the routes running especially across Hasan Dağı, Keçiboydoran Dağı, Melendiz Dağları and Göllü Dağı, and, to a lesser extent, along the southern slopes of those same mountains. In particular, three out of the four routes linking *Koloneia* and *Tyana*, even if to varying degrees, fell into the 4 km-radius of the visibility cones generated from the fortresses we have considered (Fig. 4).

Furthermore, we can demonstrate that the southern road, running by *Salaberina*, *Caena* and *Tracias*, could be controlled for an overall length of about 3 km from the fortresses of Keçikalesi and *Antigus*, which were respectively set at 3.2 km and 4.2 km from the road itself.

As for the route running along the Omerli Deresi valley, an overall length of 10.984 km could be controlled by the fortresses of *Wādī Sālamūn*, Sivrihisar and *Antigus*, which were respectively set at a distance of about 200 m, 600 m and 125 m from the route. The way of communication passing by *Mokissos*, instead, was overlooked by the fortresses of *Hişn Sinān* (set at 1400 m from the road), Yenipınar (700 m from the road) and *Koron* (1700 m from the road), which could provide a visual control for an overall length of 9.914 km.

On the other hand, the application of directional viewshed analyses allowed us to shed new light on the location of the fortresses within the mountainous landscape of central Cappadocia, as well as to better understand how the needs derived from the new Byzantine and Arab offensive/defensive strategy were faced (Fig. 5). Indeed, analysing the extension of the ‘in-view’ areas for each of the eight ‘visibility cones’ generated from the fortresses, we were able to determine that the dominant or prevalent direction of visibility (and, as a consequence, of control) was mainly oriented towards the routes. This appears rather clear and evident, for example, when considering the directional viewshed generated from the fortress of Sivrihisar (Fig. 6). In this case the highest level of visibility was towards the west and the south-east, which correspond to the directions followed by the two sections of the road reaching Sivrihisar from *Wādī Sālamūn* and from *Antigus*.

7 <https://grass.osgeo.org/grass64/manuals/r.grow.distance.html>

8 <https://grass.osgeo.org/grass64/manuals/r.slope.aspect.html>

9 <https://grass.osgeo.org/grass64/manuals/r.reclass.html>

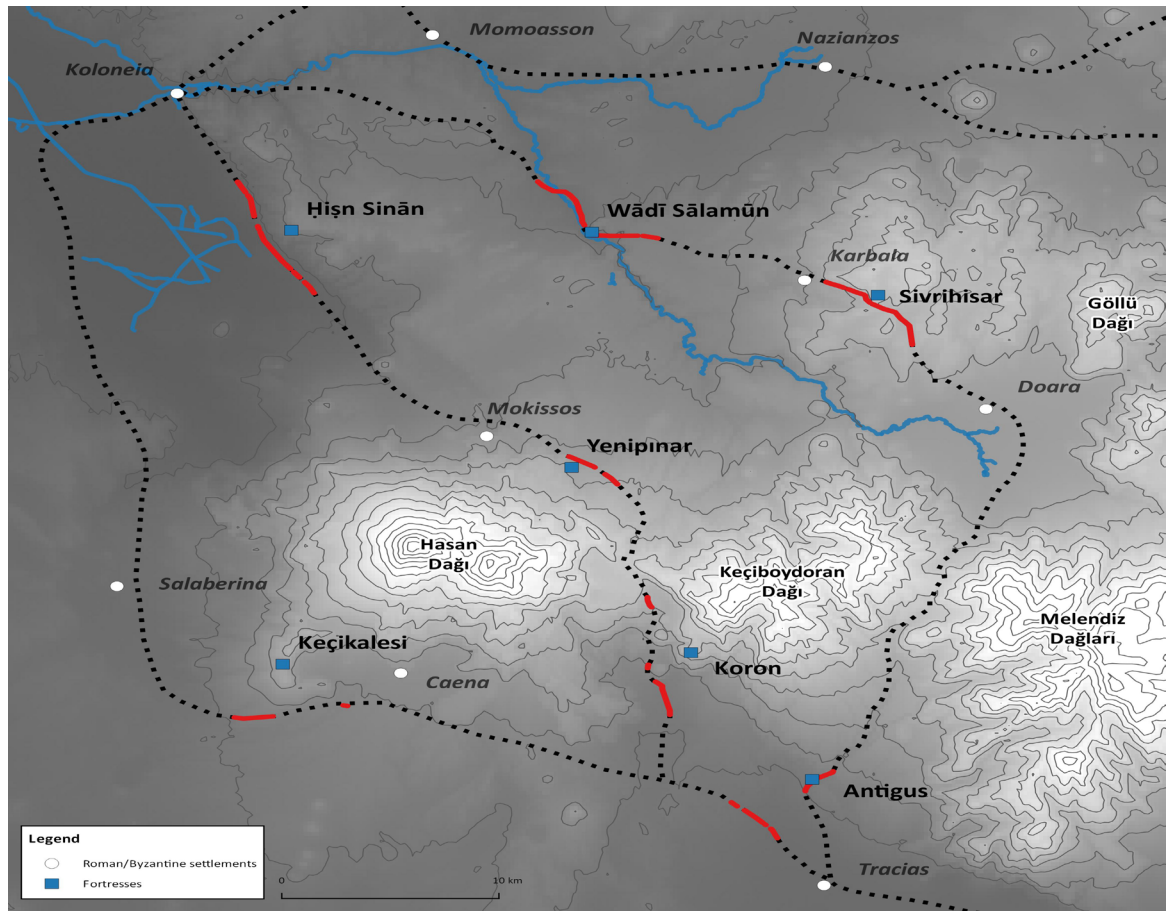


Fig. 4 Overall view of the stretches of the routes (marked in red) that were visible from the seven fortresses considered.

We can also try and widen our considerations on the location of the fortresses in order to gain a more in-depth knowledge of the role they played within the landscape. In general terms it is interesting to note that, when analysing the overall results of the directional viewshed raster maps and of their related graphs, one aspect leaps out. The dominant direction of visibility is not only oriented towards the routes but, in many cases, towards the access points the invading armies could have used to penetrate deeply into that mountainous sector of central Cappadocia, where the local population had taken shelter during the various raids and incursions with their goods and food.

It is not by chance that an efficient visual control was provided towards the west/north-west by the fortress of *Hişn Sinān* and *Wādī Sālamūn* (Fig. 7). They were built at the ‘north-western corner’ of that same sector overlooking - we can say - the initial stretches of the routes coming from *Koloneia*, and thus, acting as defensive and strategic viewpoints against possible attacks originated from that side. Similarly, *Keçikalesi* and the other two fortresses (*Koron* and *Antigus*), built on the southern slopes of the volcanic massif in the proximity of the junction between the main road running across the plain and the mountainous pathways, provided an effective control towards the west/south-west and the south (Fig. 8). These fortresses protected the area against the invading armies coming from the central Anatolian plateau, as well as from the Taurus Mountain (especially from *Herakleia*, which can be located in the vicinity of Ereğli).

Within this framework, we have to say that the results derived by analysing the directional viewshed, originating from the fort of *Yenipınar*, seem to differ from this strategic pattern (Fig. 9). Indeed, the prevalent visibility (towards the north/north-east) does not fit with the direction of the route passing by, running diagonally from the north-west to the south-east. However, an explanation may be found when taking into consideration the general defensive strategy of the area. The fort of *Yenipınar* was set ‘in the middle’ of the

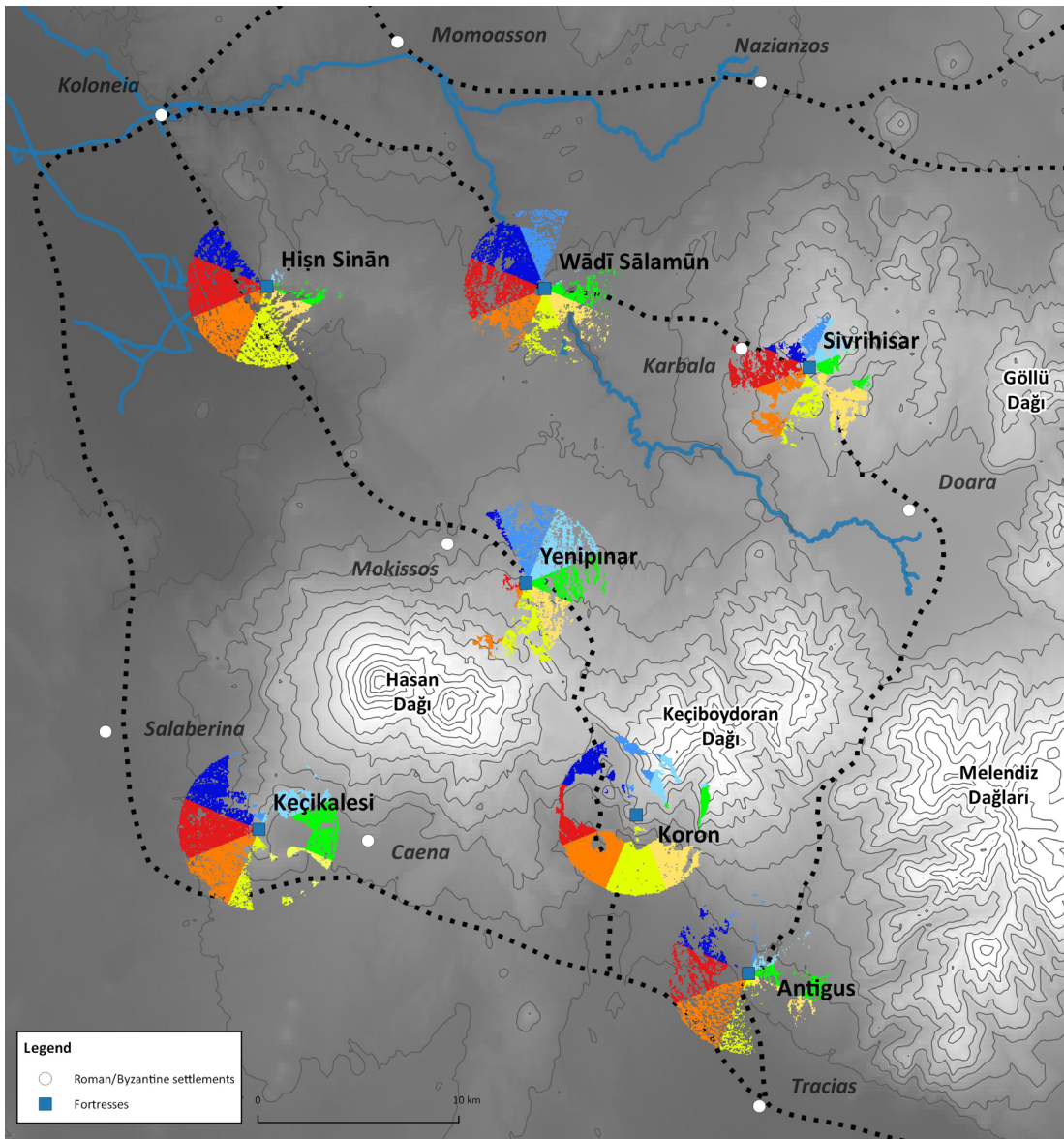


Fig. 5 Overall view of the directional viewshed raster maps generated from the seven fortresses considered.

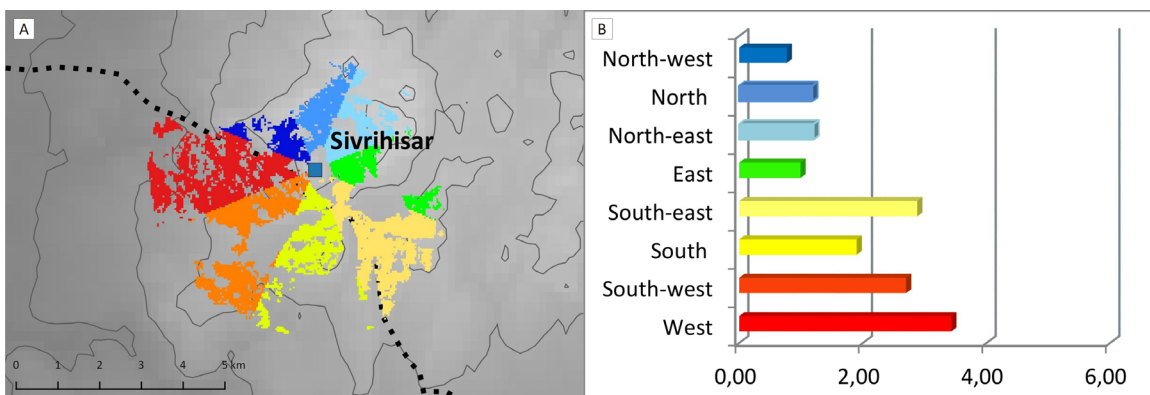


Fig. 6 A) Directional viewshed raster map referred to the fortress of Sivrihisar; B) Graph indicating the visible square kilometres falling within each of the eight 'cones of visibility' generated from the fortress of Sivrihisar.

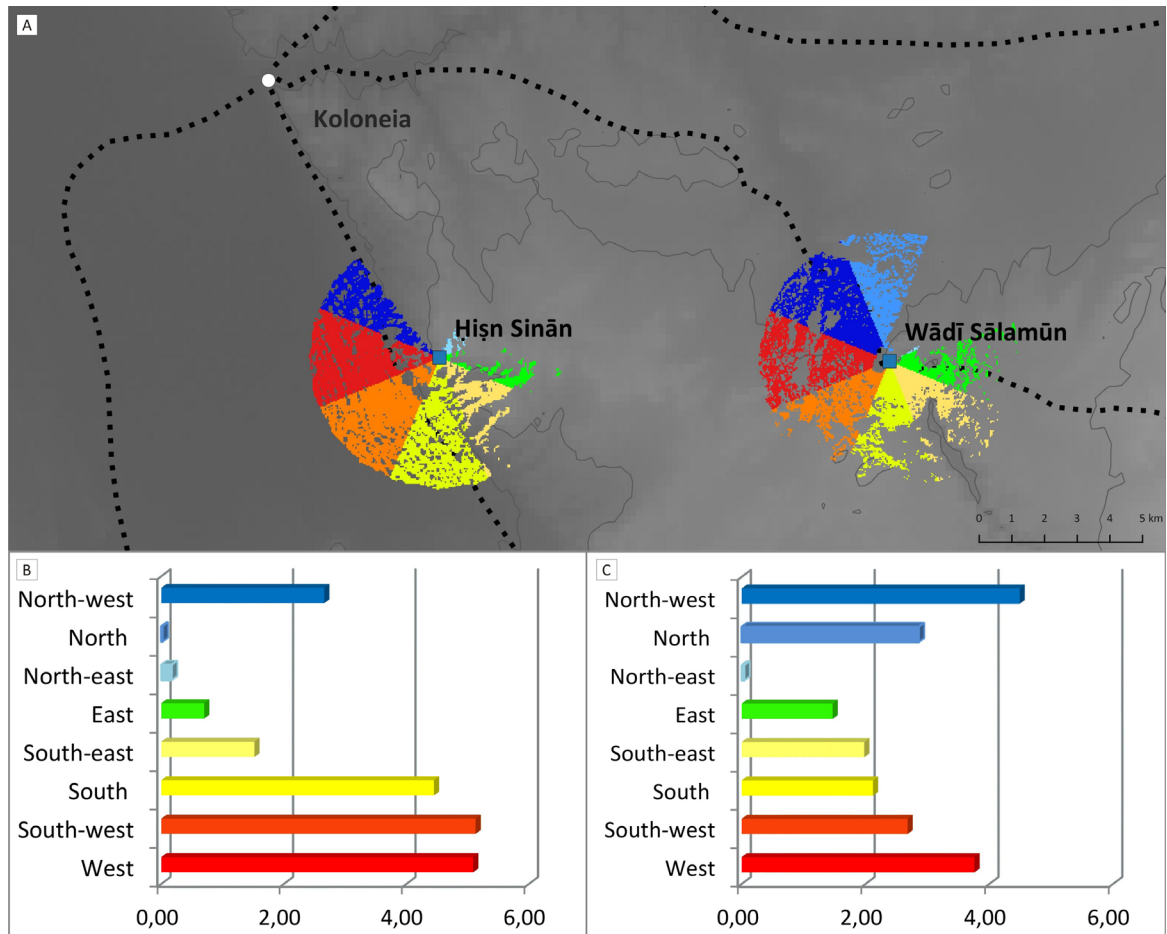


Fig. 7 A) Directional viewshed raster maps referred to the fortresses of *Hişn Sinān* and *Wādī Sālamūn*; B) and C) Graphs indicating the visible square kilometres falling within each of the eight ‘cones of visibility’ generated, respectively, from the fortresses of *Hişn Sinān* and *Wādī Sālamūn*.

route, which was already ‘defended’ and guarded to the north by the fortress of *Hişn Sinān* and to the south by that of *Koron*. Instead of exclusively controlling that same way of communication, it could also have acted as a signalling lookout from that side of the plain to the other. Now, *Wādī Sālamūn* and Sivrihisar stand exactly to the north and to the north-east of Yenipınar, i.e. along its dominant directions of visibility. A simple *Intervisibility* analysis demonstrated that those fortresses were indeed visible from Yenipınar, thus providing a more efficient and rooted level of control all over that district, as well as of communication in case of danger.

4 Discussion

Approaches merging together written sources and GIS-based analysis can be really fruitful. Information gathered from the sources can stimulate reflexions and generate a new hypothesis; computational and geomatic analyses can confirm (or not) that hypothesis, opening up new research perspectives on the topic (for an overview on further GIS-based approaches to the historical geography of Byzantium, see more recently Popović 2014).

In any consideration of the limits often levelled against archaeological visibility studies, but also (and above all) of their potential (Llobera 2012), the GIS-based analyses applied to our research have allowed us to confirm what the Greek written sources record about the strategy to adopt against the Arab raids and incursions, led beyond the frontier line of the Byzantine Empire in order to enter the Anatolian plateau

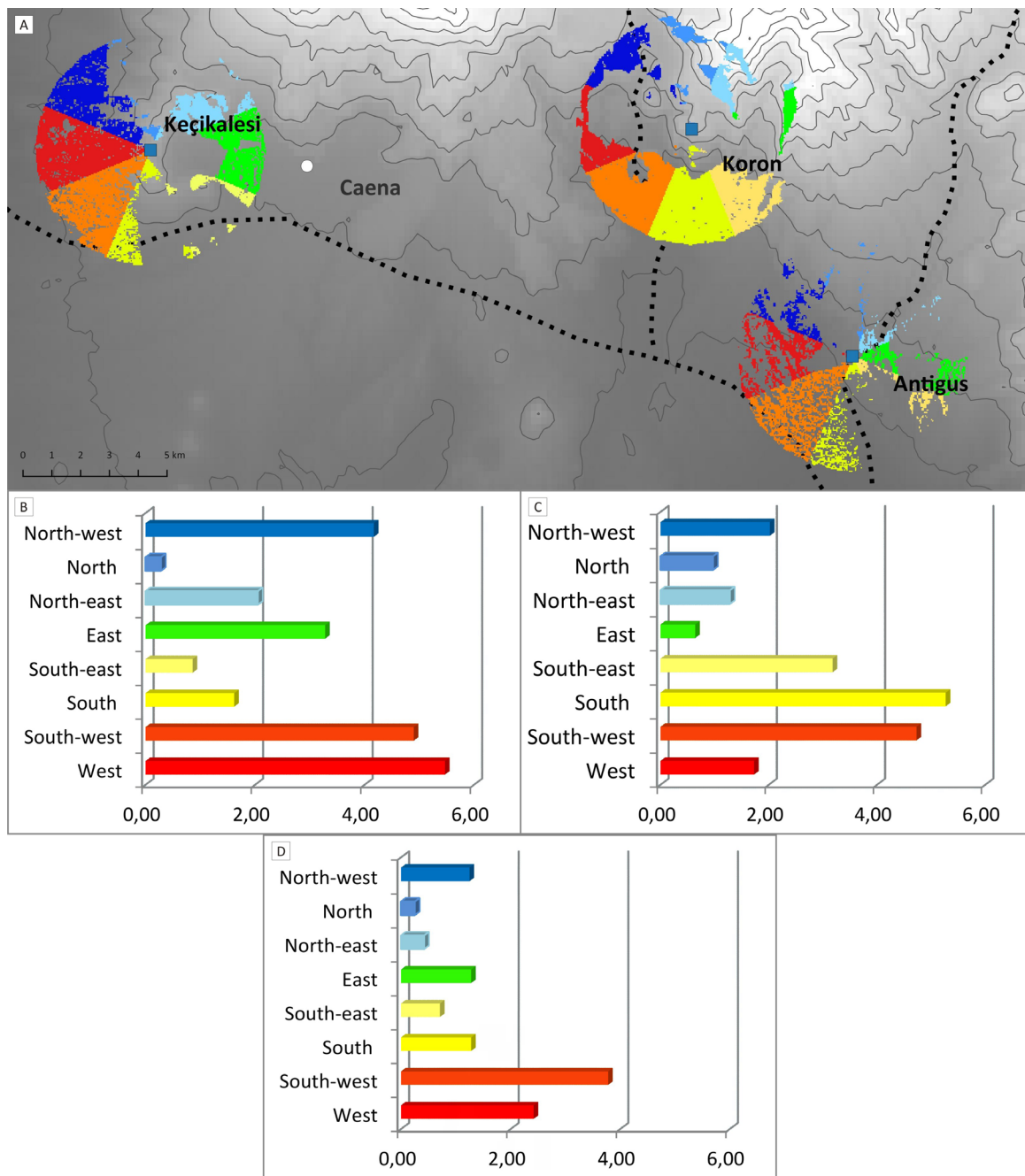


Fig. 8 A) Directional viewshed raster maps referred to the fortresses of Keçikalesi, Koron and Antigus; B), C) and D) Graphs indicating the visible square kilometres falling within each of the eight ‘cones of visibility’ generated, respectively, from the fortress of Keçikalesi, Koron and Antigus.

and the Cappadocian territory. Indeed, our geomatic analysis has revealed the centrality of the fortresses and of the garrisoning system within guerrilla tactics, where careful observation of the enemies and their movements without being seen proved to be fundamental. In particular, the directional viewshed analysis has allowed us to demonstrate that the position of those forts along the natural corridors, traversing the mountainous landscape of Melendiz Dağları, Keçiboydoran Dağı, Hasan Dağı and Göllü Dağı, was not determined accidentally. On the contrary, it reflected the needs derived from that new offensive/defensive strategy. Forts and fortresses were placed as to provide the better level of visibility and of control all over the territory, in order to avoid possible ambushes from the invading forces. More specifically, they

provided special and particular control towards the points of access into that mountainous district (from the north-west, the west and the south) and over the ways of communication. As we have seen, the central Cappadocian fortresses offered a certain level of defence over the routes, which were not only followed by the invading armies looking for easy booty, but certainly used also by the local population living in the villages (presumably set in the flat countryside), to reach fortified places for refuge during the raids.

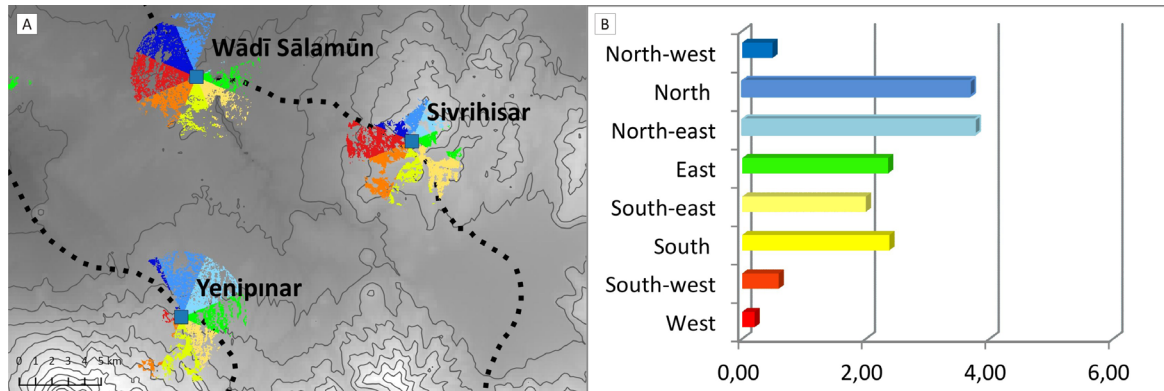


Fig. 9 A) Directional viewshed raster map referred to the fortress of Yenipinar, and its 'visual' relation with the fortresses of *Wādī Sālamūn* and *Sivrihisar*; B) Graph indicating the visible square kilometres falling within each of the eight 'cones of visibility' generated from the fortress of Yenipinar.

Considering the prevalent directions of control offered by the seven fortresses we have analysed, the 'visibility' towards the south-east seems lacking, and as a consequence, an efficient control over the south-eastern sector of the volcanic area was not guaranteed. We have to say, anyway, that towards those same directions *Tyana* itself could have provided a strategic control. Due to its position very close to the frontier line and at the crossroads of many pathways traversing the southern Cappadocian district, it played a central role within the dynamics of power between Byzantines and Arabs, maintaining the same pivotal role and relevance it held during the Roman period. In this sense, it is not mere chance that *Tyana* was not simply captured and destroyed by the Arab armies, but also settled and fortified in 833 AD, even if for a very short period (Canard 1962, 358–359; Haldon, Kennedy 2004, 113–114, and most recently Turchetto in press b).

Moreover, farther towards the south-east, another important fortress provided special control over the natural corridor leading to the Cilician Gates, which represent (now, as happened in the past), one of the few feasible passages across the Taurus, linking the Anatolian plateau and the Mediterranean coast of Cilicia. We are referring here to the fortress of *Loulon*, which Ibn al-Aṭīr describes as a fishbone in the throat of the enemy: it was impossible to conduct an expedition on land or by sea, without being seen from it and immediately identified (Vasiliev 1950, 136). Its function, moreover, went beyond the mere control of that passage across the mountain. *Loulon* represented, indeed, the first of the beacons of an early warning system, extended from the slopes of the Taurus as far as Constantinople, set in place to counter possible Arab attacks (Pattenden 1983; Durak 2013). It is interesting to note that the second beacon is generally identified with the fortress of Keçikalesi. It could have reasonably acted as a joining link between the control system of the Taurus and that of central-southern Cappadocia, which, if considered on a wider scale and within the context of the overall garrisoning network put in place in that border region, could have provided an efficient level of control, from all the possible 'invading' directions.

What can be added to these considerations is that the new road network of Byzantine Cappadocia, in which the use of the mountainous pathways started to be strengthened and preferred - instead of the routes running along the plain to the north and to the south of the volcanic massif - was directly 'shaped' by those same fortresses. Without any doubt, indeed, the insecurity determined by the Arab incursions into Cappadocia led the local population to seek a better place wherein to take refuge (with their goods

and food). The morphological characteristics of the district suited that need quite well, allowing for the construction of defensive places high up in the mountains, which, at the same time, offered the possibility for a strategic control over the territory, by visually following the movements of the invading forces. On the other hand, as the dominant or prevalent direction of visibility provided by the forts seems to suggest, those same fortresses were built along or in the proximity of pathways which had been used and followed well before the Roman and Byzantine periods.

The point is, in any case, that the fortresses really began to act as effective territorial markers within the landscape, both for the Cappadocian population looking for a shelter and for the invading armies looking for booty. In this sense, those new needs changed the way the road network of central Cappadocia was previously conceived. At the time of the Arab raids an efficient road network should have been suitable for quick and rapid escapes to safer and better protected places, equipped with defensive structures such as forts and fortresses, but still linked to the main axes of communication traversing Cappadocia and, thus, making that border territory an effective ‘central periphery’ of the Byzantine Empire.

References

- Asa Eger, A. (2014). *The Islamic-Byzantine frontier. Interaction and exchange among Muslim and Christian communities.* London: I.B.Tauris & Co Ltd.
- Canard, M. (1962). La prise d’Héraclée et les relations entre Harun ar-Rashid et l’Empereur Nicéphore Ier. *Byzantion*, XXXII, pp.345-379.
- Cassia, M. (2004). *Cappadocia romana. Strutture urbane e strutture agrarie alla periferia dell’Impero.* Catania: Edizioni del Prisma.
- Campaign organization and tactics.* In G. T. Dennis (Ed.), *Three Byzantine military treatises. Text, translation, and notes* (pp.241–335). Washington, DC: Dumbarton Oaks.
- Durak, K. (2013). Traffic across the Cilician frontier in the ninth and tenth centuries: movement of people between Byzantium and the Islamic Near East in the early middle ages. In A. Kralides, A. Gkoutzioukostas (Eds.), *Proceedings of the international Symposium Byzantium and the Arab world. Encounter of civilizations, Thessaloniki, 16-18 December 2011* (pp.141–154). Thessaloniki: Aristotle University of Thessaloniki.
- Equini Schneider, E., Morselli, C., Spanu, M., et al. (1997), *Varia Cappadocica.* *Archeologia Classica*, XLIX, 101–209.
- Haldon, J.F. (2001). *The Byzantine wars. Battles and campaigns of the Byzantine era.* Stroud: Tempus.
- Haldon, J.F. (2013). Information and war: strategic geography and strategic planning 6th – 10th c. In A. Sarantis, N. Christie (Eds.), *War and warfare in Late Antiquity: current perspectives*, 8.2 (pp.373–393). Leiden: Brill.
- Haldon, J.F. (2016). *The Empire That Would Not Die. The Paradox of Eastern Roman Survival, 640–740.* Cambridge, MA; London: Harvard University Press.
- Haldon, J.F., & Kennedy, H. (2004). The Arab-Byzantine frontier in the eight and ninth centuries: military organisation and society in the borderlands. In M. Bonner (Ed.), *Arab-Byzantine relations in early Islamic times* (pp.142–178). Aldershot: Ashgate Publishing Ltd.
- Hild, F. (1977). *Das Byzantinische Strassensystem in Kappadokien.* Wien: Österreichische Akademie der Wissenschaften.
- Hild, F., & Restle, M. (1981). *Tabula Imperii Byzantini 2. Kappadokien (Kappadokia, Charsianon, Sebasteia und Lykandos).* Wien: Österreichische Akademie der Wissenschaften.
- Kalas, V. (2007). The 2004 Survey of the Byzantine Settlement at Selime-Yaprakhisar in the Peristrema Valley, Cappadocia. *Dumbarton Oaks Papers*, 60, 271–293.
- Kennedy, H. (2010). *Gli eserciti dei califfi. Militari e società nello Stato islamico delle origini.* Pordenone: Libreria Editrice Goriziana.
- Llobera, M. (2012). Life on a pixel. Challenges in the development of digital methods within an “interpretive” landscape archaeology framework. *Journal of Archaeological Method and Theory*, 19 (4), 495–509.
- Llobera, M. (2015). Working the digital: some thoughts from landscape archaeology. In R. Chapman, A. Wylie (Eds.), *Material evidence: learning from archaeological practice* (pp.173–188). Abingdon: Routledge.
- Métivier, S. (2008). L’organisation de la frontière arabo-byzantine en Cappadoce (VIIIe-IXe siècle). In E. Cuozzo, V. Déroche, A. Peters-Custot, et al. (Eds.), *Puer Apuliae: Mélanges offerts à Jean-Marie Martin*, 2 (pp.433–454). Paris: Association des amis du centre d’histoire et civilisation de Byzance.
- Murrieta-Flores, P. (2014). Developing computational approaches for the study of movement: assessing the role of visibility and landscape markers in terrestrial navigation during Iberian Late Prehistory. In S. Polla, Ph. Verhagen (Eds.), *Computational approaches to the study of movement in archaeology theory, practice and interpretation of factors and effects of long term landscape formation and transformation* (pp.99–132). Berlin/Boston: De Gruyter.
- Ousterhout, R. (2005). *A Byzantine Settlement in Cappadocia.* Washington, DC: Dumbarton Oaks.

- Pattenden, P. (1983). The Byzantine Early Warning System. *Byzantion*, LIII (1), 258–299.
- Popović, M. (2014). Historische Geographie und Digital Humanities. Eine Fallstudie zum spätbyzantinischen und osmanischen Makedonien. *Peleus, Studien zur Archäologie und Geschichte Griechenlands und Zyperns*, 61. Mainz-Ruhpolding: Verlag Franz Philipp Rutzen.
- Skirmishing*. In G. T. Dennis (Ed.), *Three Byzantine military treatises. Text, translation, and notes* (pp.137–239). Washington, DC: Dumbarton Oaks.
- Strategy*. In G. T. Dennis (Ed.), *Three Byzantine military treatises. Text, translation, and notes* (pp.1–136). Washington, DC: Dumbarton Oaks.
- Turchetto, J. (2010–2012). *Cappadocia centro-meridionale (Turchia). Il sistema della viabilità antica in una terra di frontiera* (Unpublished doctoral dissertation). University of Padova, Padova.
- Turchetto, J. (in press a). From the Taurus to the *Halys*. Roads and routes of Greco-Roman Cappadocia. *Agri Centuriati. International Journal of Landscape Archaeology, Suppl. 2*. Pisa-Roma: Fabrizio Serra Editore.
- Turchetto, J. (in press b). From *Loulon* to the Fortress of the Black Camel. Territorial markers for the reconstruction of the routes of the Arab incursions in Cappadocia (Turkey). In *Proceedings of the International Conference Pathways of communication. Roads and Routes in Anatolia from Prehistory to Seljuk times, Ankara, 20th–22nd March 2014*.
- Wheatley, D. & Gillings, M. (2000). Vision, perception and GIS: some notes on the development of enriched approaches to the study of archaeological visibility. In G. R. Lock (ed.), *Beyond the map: archaeology and spatial technologies* (pp.1–27). Amsterdam: IOS Press.
- Vasiliev, A.A. (1950). *Byzance et les Arabes. Tome II.2: La dynastie Macédonienne (867–959). Extraits de sources arabes. Edition française préparée par H. Grégoire et M. Canard*. Bruxelles: Éditions de l'Institut de philologie et d'histoire orientales et slaves.