5   AIRBORNE LiDAR AT CARACOL, BELIZE AND THE INTERPRETATION OF ANCIENT MAYA SOCIETY AND LANDSCAPES

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The application of airborne LiDAR to the archaeology of Maya landscapes promises to change our perception of their civilization. Our current view of ancient Maya society has been conditioned by past investigations that, of necessity, have been limited in scope. Even with remote sensing, archaeological survey has been curtailed by karst topography and dense tree canopy – and archaeological excavation often constitutes only a small sample of what was actually present. Similarly, epigraphic analysis of texts are restricted; interpretations of the full range of Maya society are unlikely to be achieved through study of epigraphic texts alone as these records are generally focused on the one segment of society – the elite. With the recent application of LiDAR (light detection and ranging) technology to penetrate the heavily forested canopy of Caracol, Belize, landscape archaeology has succeeded in illuminating the complexity and expansive nature of ancient Maya cities.

Introduction

While the ancient Maya of the Classic Period were in contact and interacted with each other, they did not constitute a uniform cultural expression. Although there was trade, visitation, and warfare among ancient Maya political units, a single social or political model cannot be used to characterize them. This is evident in the diverse archaeological forms that their settlements took relative to their landscapes. The size of ancient Maya sites and polities varied and, because of this, concomitant organizational requirements also differed. This paper focuses on one segment of the Classic Period spectrum of socio-political forms, looking at the large and populous site of Caracol, Belize. These reconstructions concerning the socio-political organization of this city are informed by analysis of hieroglyphic texts, settlement survey, excavations, and remote sensing. Each data source contributes significantly to overall interpretations. Together, these materials permit a broader and more in-depth understanding of the complexity involved in ancient landscape modification and in the organizational requirements necessary to support a Maya urban expression.

The Archaeological and Hieroglyphic History of Caracol

Caracol is located at an elevation of 500 meters in the Vaca Plateau of Belize. Situated in the karst foothills of the Maya Mountains this area receives over 2000 millimeters of rain per year. The site extends over approximately 177 square kilometers. However, settlement survey has been hindered by covering sub-tropical forest with a canopy height of approximately 25 meters. This contrast with what the landscape must have looked like in antiquity, when construction and agricultural terraces replaced the forest growth.

Settlement and landscape archaeology have been grounded in survey and excavation, but sample size has been limited by vegetation that hides archaeological remains, requiring labor-intensive on-the-ground survey. Thus, any determination of settlement boundaries and/or the totality of landscape modifications have usually been presented as hypothesis and speculation. Because of the inherent difficulties in defining the full parameters of ancient settlement, the focus for most socio-political interpretation traditionally has reverted to the concentrations of monumental architecture that are found in the centers of most Maya sites. This monumental architecture produces tombs and specific building forms and plans that can be used for general comparative purposes. Importantly these same remains also usually occur in conjunction with hieroglyphic stone monuments. Because the archaeological record is so difficult to directly "read," the

hieroglyphic records have become pivotal in our current understanding of ancient Maya political interaction (e.g., Martin and Grube 2000). But, the epigraphic record is realistically as incomplete as the archaeological surveys. The hieroglyphics represent only a small segment of ancient Maya society and only describe a very restricted range of topics. How much direct insight they provide for the interpretation of the full range of ancient Maya social and political organization is an open question.

Even though incomplete, the hieroglyphic record provides an excellent frame from which to build a discussion of socio-political regions. For Caracol, the site's texts record the potential founding of its dynasty in A.D. 331 and the existence of an epigraphic history that includes minimally 28 rulers and ends in A.D. 859 in the GMT correlation. The texts document warfare and important events in the lives of several of Caracol's rulers. The war events recorded in the epigraphy also have been key in examining polity size, as they represent conflict between different societies in the Maya lowlands. These texts show that star-wars generally occurred between two sites that are separated by a distance of 66.25 kilometers (A. Chase and D. Chase 1998a:23). Intriguingly, the distance that a marching army can effectively control matches this measurement, being approximately 60 kilometers or a two-day march. However, this does not necessarily mean that contiguous bounded territories always existed; in fact, the attempt to define Maya polities by their territorial boundaries probably reflects a Western perspective regarding political control and land ownership. Based on other Mesoamerican patterns, territorial boundaries themselves were probably not the primary concern of the Maya; instead, control focused on resources and on political and economic factors, meaning that polities may have extended into distant areas.

Archaeological research has been able to establish that there are a series of "foundings" at Caracol in addition to the "dynastic founding" indicated in the hieroglyphic record (A. Chase and D. Chase 2006a). The initial settlement of the Vaca Plateau is estimated to have taken place by 600 B.C., almost 1000 years prior to the official dynastic founding of Caracol in A.D. 331. In addition, an "ideological founding" of Caracol occurred in the early years of the first century A.D. Two of the major buildings in the A Group (Structures A2 and A6) were established at the beginning of the 8th Cycle in A.D. 40 (A. Chase and D. Chase 2006b), suggesting the existence of a powerful elite at Caracol some 300 years before their appearance in the hieroglyphic record. At this same time, several distinct centers – Caracol proper, Cahal Pichik, and Hatzcap Ceel – emerged in the Vaca Plateau. The central plans of all of these centers were characterized by the appearance of what are called "E Groups" (A. Chase and D. Chase 1995) and all three centers were eventually linked together by causeways and settlement into a single metropolitan system. While the early landscape in the Vaca Plateau may have been characterized by minor polities and competing political units, the later landscape demonstrates that these centers were conjoined into a single capital city. The settlement distribution clearly reveals that the Caracol epicenter became the most important locale over time. It may be that Caracol's epigraphic name, the "three stone place," literally refers to the consolidation of these three centers into a single place by A.D. 331. A third "administrative founding" is associated with the huge population growth that occurred at Carcaol in the early Late Classic Period; this founding is physically represented on the ground by Caana, an architectural complex that is unique in the site's landscape (A. Chase et al. 2011).

The majority of the hieroglyphic monuments from the Caracol epicenter date from between A.D. 530 and A.D. 680. During these years, the site appears to have carried out several episodes of successful warfare in the Peten of Guatemala – specifically against Tikal and Naranjo – and the population at Caracol appears to have

burgeoned to at least 100,000 people. Although there are few hieroglyphic texts from between A.D. 680 and A.D. 790 at Caracol, it is clear from the archaeological record that this was still a time of prosperity and growth (D. Chase and A. Chase 2003) – in spite of the lack of dynastic history. The monumental record reappears at Caracol after A.D. 790 and there is some suggestion that the eventual "collapse" at this site may be related to political mis-steps correlated with the attempted resurgence of dynasty at this time (A. Chase and D. Chase 2007).

LiDAR (Light Detection and Ranging)

For almost 30 years, the Caracol Archaeological Project (www.caracol.org) has been involved in recording the settlement at Caracol. This has been difficult because of the karst environment and the encompassing jungle. Nevertheless, we have been able to document the size of the site and to indicate how a system of dispersed reservoirs and extensive agricultural terracing was integrated with the residential settlement and was capable of supporting the site's population (A. Chase and D. Chase 1998b). Besides excavating and testing most of Caracol's epicenter, over 120 residential groups also have been investigated. Although we have successfully mapped some 23 square kilometers of Caracol's residential groups and causeway termini, traditional survey proved inadequate for documenting and/or modeling such a large settlement area. Through the end of the 2009 field season, we had neither been able to define the limits of the site nor completely demonstrate the intensity of agricultural terracing – fully mapping agricultural terraces only in a sample of approximately 4 square kilometers. Thus, in spite of an extremely large dataset, it was difficult to fully contextualize the archaeological data from the site.

In order to resolve these issues, we began searching for alternative ways to determine the settlement area of Caracol through the use of remote sensing. These early attempts were largely unsuccessful.

However, LiDAR had been used to great advantage in Costa Rica to make interpretations about tree canopies (Drake et al. 2002; Weishampel et al. 2000). Early archaeological use of single-phase LiDAR, however, had not been successful (Sheets and Sever 1988) and this form of remote sensing had not been pursued in tropical or sub-tropical archaeology. However, we were encouraged to find a LiDAR image of Copan that was first published in 2001 (Gutierrez et al. 2001); this image suggested the ability of this technology to accurately record ground remains – although the remains at Copan, unlike those at Caracol, were in largely cleared areas. Thus, a group of us became convinced that LiDAR had the potential to work in revealing ground-level features constructed by the ancient Maya. However, it took several years to secure funding to try this technology to search below the Belize jungle canopy. In 2008 funding was secured from NASA (Grant NNX08AM11G to Weishampel, A. Chase, and D. Chase) that permitted us to test LiDAR against the mapped archaeological remains of Caracol – and, in April 2009, the National Center for Airborne Laser Mapping made a swath-based LiDAR survey for us of 200 square kilometers centered on the Caracol epicenter (A. Chase et al. 2010, 2011; Weishampel et al. 2010).

LiDAR is a remote sensing technology that employs lasers to obtain point data that can then be used to create detailed imagery. In the case of Caracol, ground GPS units were established at various locations for satellite triangulation with the laser points. A plane outfitted with the necessary instrumentation was flown at a height of 800 m above Caracol in a series of parallel paths that produced overlapping fields. The system mounted on the bottom of the plane pulsed lasers down to the ground and returned a series of points that produced records of both the ground elevation and the canopy structure. Some 4.28 billion measurements were obtained in this manner with a ground return of up to 20 points per square meter. Using the last laser returns, which presumably represented the ground
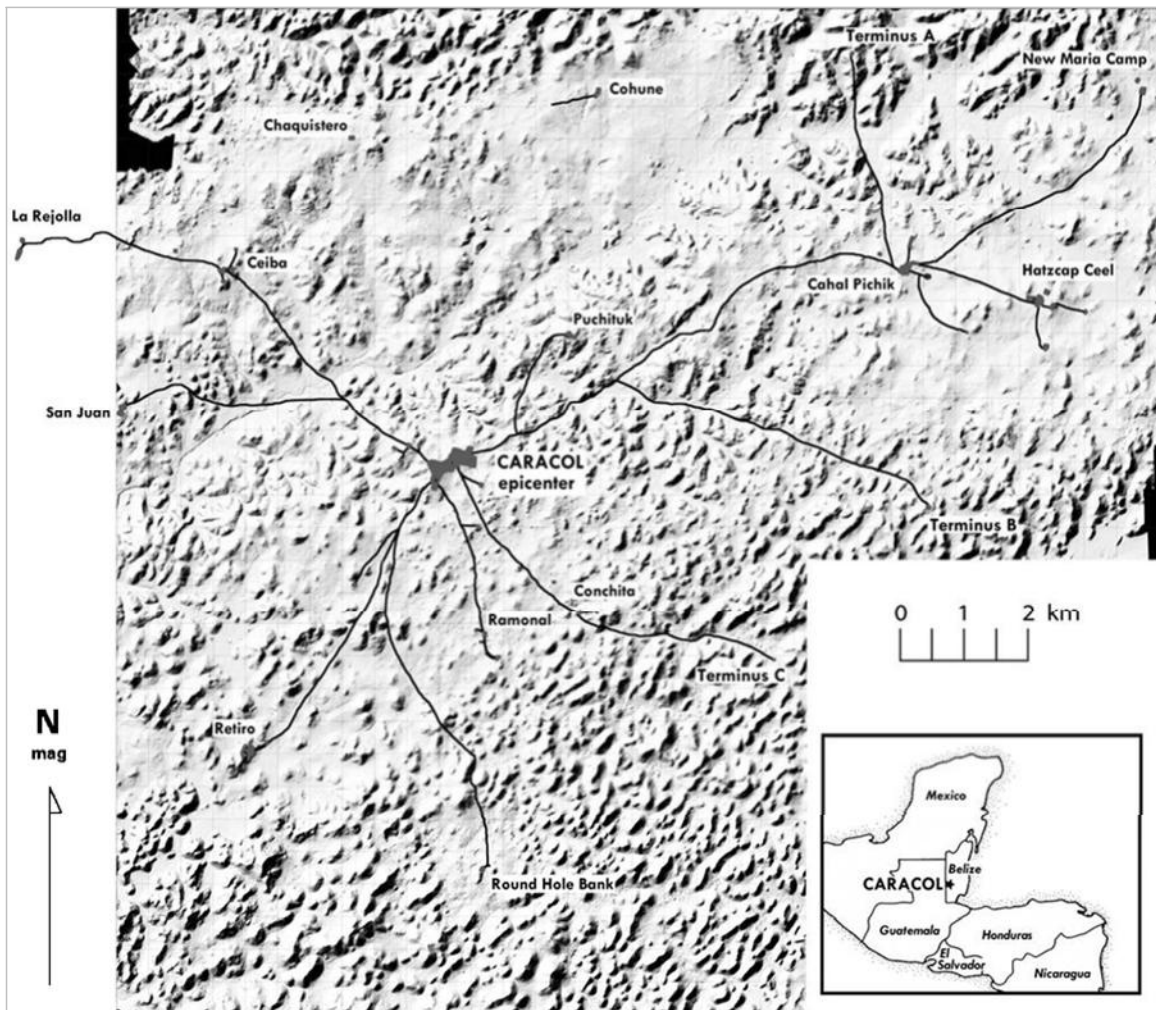
Figure 1. The Caracol LiDAR DEM with an overlay showing the site's causeway system and connected architectural nodes; the DEM covers 199.7 square kilometers.

level, a Digital Elevation Model of 199.7 square kilometers of the Caracol landscape was produced (Figure 1). Within this DEM, it is possible to identify causeways, terraces, residential groups, and individual structures, including those elevated no more than 5-30 centimeters above their surrounding ground surface. The DEM located 11 new causeways, 5 new termini, and thousands of new structures and terraces. It will take some time to make a full analysis of the overall landscape, but minimally 4,732 elevated platforms supporting residential groups are evident in the DEM (A. Chase et al. 2011). More detailed work will likely double this count when ground-level residential groups in flat areas and among

the terraces are included. However, even limited analysis of the DEM permits a much fuller definition of Caracol's settlement density, integration, and limits.

It is clear from the Caracol LiDAR DEM (Figure 1) that relatively dense settlement was present throughout most of the Vaca Plateau. Excavations that have been carried out in residential units within the area reveal that, while Early Classic occupation was more limited, almost all of These groups were occupied in the Late Classic Period. Concentrated nodes[1] of non-epicentral monumental architecture are embedded in this landscape; the majority of these nodes are linked to the Caracol epicenter by purposefully constructed
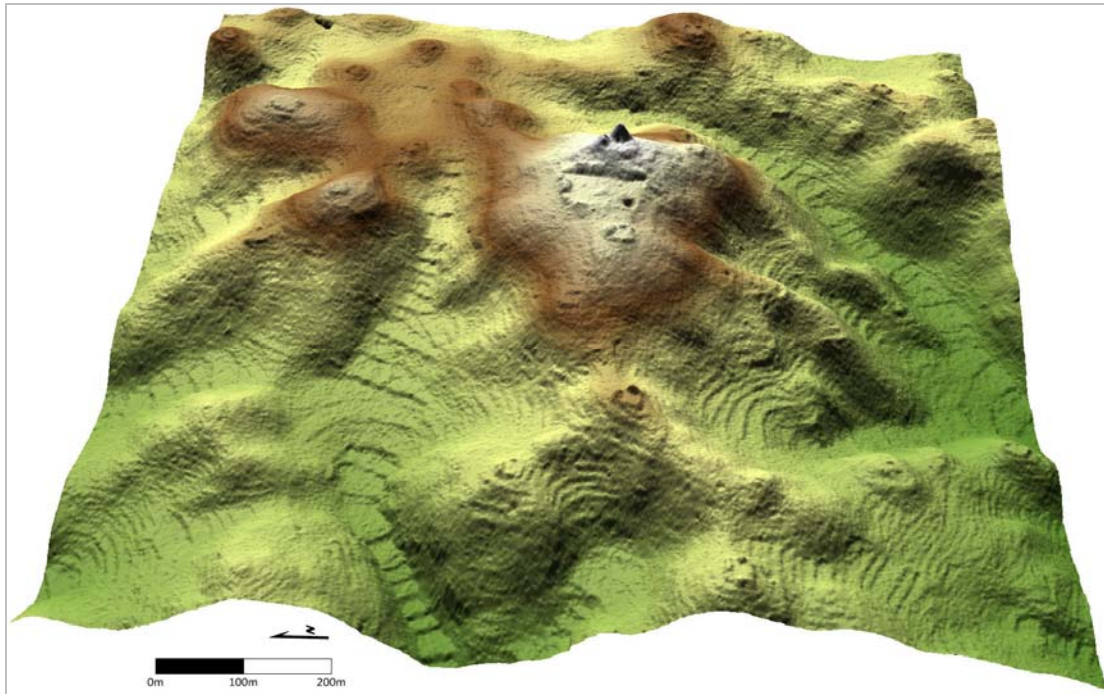
Figure 2. Image of the Puchituk area of Caracol rendered in 2.5D LiDAR, showing the causeway, the terminus, settlement groups, agricultural terracing, and topography.

causeways. While some of these nodes were constructed in the landscape as early as 300 B.C., archaeological data has shown that others were purposefully placed within the landscape in the early part of the Late Classic Period or A.D. 550 to 650 (Figure 2). Most of these nodes incorporate special-function plaza areas suitable for administrative and market functions. The causeways and the outlying monumental architecture and plazas were surrounded by residential settlement and agricultural terracing. The broader metropolitan area – composed of settlement, public architecture, road systems, and agricultural terracing – covered a sizeable spatial area that was integrated into a single city. In spite of the extent – already 200 square kilometers – it is important to keep in mind that the LiDAR DEM reflects metropolitan Caracol, but not the boundaries of the Caracol polity, which also ebbed and waned with time. Integrated within Caracol's direct political sway during the Late Classic Period were neighboring sites and regions, including the southeast Peten (A. Chase 2004) and occasionally the

Belize Valley (Helmke and Awe 2009), as well as other portions of the Vaca Plateau (Iannone 2005).

Parameters for Models of Maya Society

Roland Fletcher (2009) has defined a dispersed form of tropical settlement that he refers to as "agrarian-based low density urbanism;" this urban form is characterized by relatively dense – albeit dispersed – settlement over a relatively large spatial area. While there may be some variation within this tropical urban form, Caracol likely fits this kind of settlement characterization (A. Chase et al. 2010, 2011). In spite of the incorporation of agricultural production between housing within the city landscape, it should be noted that the site's population density was likely as great or greater than many modern suburban metropolitan landscapes. Even though broadly dispersed over the landscape, settlement at Caracol was still relatively dense (Figure 3), averaging approximately 600 people per square kilometer over 170 square kilometers (Tikal
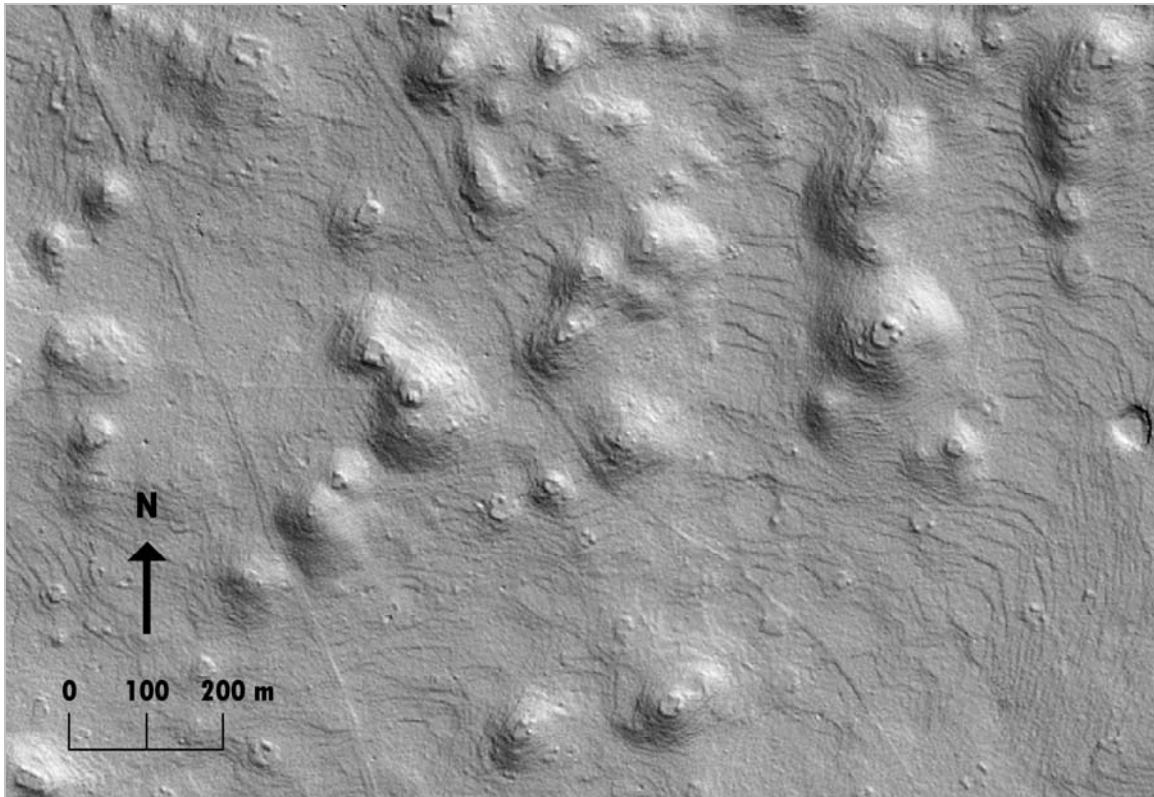
Figure 3. Image of south-central Caracol showing the dispersed residential settlement groups situated within almost continuous agricultural terracing, as well as parts of the Conchita and Pajaro-Ramonal Causeways.

averages 517 over 120 square kilometers; Culbert and Rice 1990). For a modern comparison, this contrasts with the 2000 U.S. census that indicates general population densities in Central Florida of between 381 and 458 people per square kilometer (as compared to an urban population density for Orlando of 768 people per square kilometer). Unlike more modern settlement patterns, the Caracol residential plazuela groups were embedded in and integrated with house-gardens and terraced agriculture (A. Chase and D. Chase 1998b). With an input of labor, these agricultural systems were capable of supporting this population density and were sustainable over the long term (Murtha 2009), constituting a Maya example of agricultural involution (Geertz 1963).

In spite of the multiple networked monumental architectural nodes in evidence in the Caracol landscape, as already noted, the hieroglyphic record is largely restricted to the Caracol epicenter itself. When viewed from the broader perspective of the overall landscape, the largely central distribution of these texts is striking. However, some hieroglyphic texts occur outside of the central administrative unit; in the case of Caracol, they may correlate with the urban edges of the city. The occurrence of these texts at far-flung secondary administrative complexes within Caracol also correlates with potential times of stress, when it became necessary to reassert social or political boundaries. Thus, a series of texts occur at La Rejolla after the death of Kan II in A.D. 658; these monumental texts serve as a prelude to problems on the western border of the city that were brought to a head with Caracol's 160-day star-war with Naranjo in A.D. 680 (D. Chase and A. Chase 2003). Another late text, dating to ca. A.D. 835, comes from Hatzcap Ceel (Thompson 1931), suggesting that legitimization may have been necessary on

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Caracol's eastern boundary during the Terminal Classic Period.

A similar spatial distribution of texts is evident at Tikal, Guatemala. Most of the hieroglyphic texts are concentrated in Tikal's epicenter (Jones and Satterthwaite 1982). However, an early 8th Cycle text occurs at Uolantun (8.18.13.5.11), representing either an independent polity that was incorporated into Tikal or, again, an early form of political control and legitimization. An outlying text from El Encanto matches the time of Tikal's conquest by Caracol (9.7.0.0.0; Jones and Satterthwaite 1982:109). Later texts at Jimbal (10.2.10.0.0 and 10.3.0.0.0)and at Ixlu (10.1.10.0.0 and 10.2.10.0.0) that use the Tikal emblem may similarly be viewed as attempts at confirming Tikal's networks during the Terminal Classic Period, clearly a time of stress in the central Peten. Thus, while we are comfortable in using the hieroglyphic texts to provide an outline of ancient Maya history, the simple distribution of these texts in terms of the archaeological landscape is just as informative politically, potentially reflecting not the appearance of new political units but rather the reaffirmation of existing, but contested, political relationships.

The size of Maya sites and polities clearly varied. Some centers, like Copan or Piedras Negras, were rather small with a concentrated outlying settlement that was largely **isolated** in terms of the larger landscape. Other Maya centers – like Calakmul, Caracol, Chichen Itza, Dzibilchaltun, and Tikal – were examples of extensive continuous settlements that formed about **primate** centers and constitute New World tropical forms of low-density urbanism, Yet, another political form consists of administrative nodes located at some distance from each other that were **linked** to form a single political system; this form is seen in the Northern lowlands at the linked site cluster of Uxmal-Nohpat-Sayil, in the series of sites associated with Ake, and in Coba's causeway links to Ixil and Yaxuna (Shaw 2006). In the Southern lowlands, Mirador may have once formed

the hub of such a Late Preclassic Period system, but it does not appear that this expansive polity survived into the Late Classic Period.

Thus, both polities and cities within the Maya lowlands were structured in various ways. Many, however, consisted of networks of administrative nodes rather than single central entities. In some cases, like Coba, these architectural nodes were located amidst settlement, but directly intertwined with each other and the site epicenter through a system of causeways that linked a broader landscape into a single urban system (A. Chase and D. Chase 2003). In other cases, like Tikal, while some of the monumental architectural nodes were linked to each other in isolation from the broader settlement, causeways were not used to integrate the landscape. At Caracol the entire causeway network had been engulfed, or perhaps even conditioned, by continuous settlement and formed the framework for a sizeable example of low density urbanism. While this expansive settlement concentration would probably be labeled by some researchers as a "city-state" or polity, given the LiDAR data that shows continuous settlement beyond surveyed areas, it is more probable that other networked administrative nodes existed at an even a greater distance from the central metropolis.

Discussion

We have estimated that over 100,000 people occupied Caracol in the Late Classic Period (A. Chase and D. Chase 1994; A. Chase et al. 2011). This is far beyond the lower range of 2,000 to 5,000 people (Houston et al. 2003:234) to the higher range of 5,500 to 9,500 people (Rice and Culbert 1990:Table 1.3) argued to have existed in certain smaller Maya centers - like Piedras Negras, Dos Pilas, and Copan – where arguments have been made that larger population numbers "would undermine and endanger systems of patrimonial, morally authoritive rule" and communal meetings (e.g., Houston et al. 2003:234). Thus, some researchers have argued that Maya cities – and, in some cases, polities (Mathews 1991)
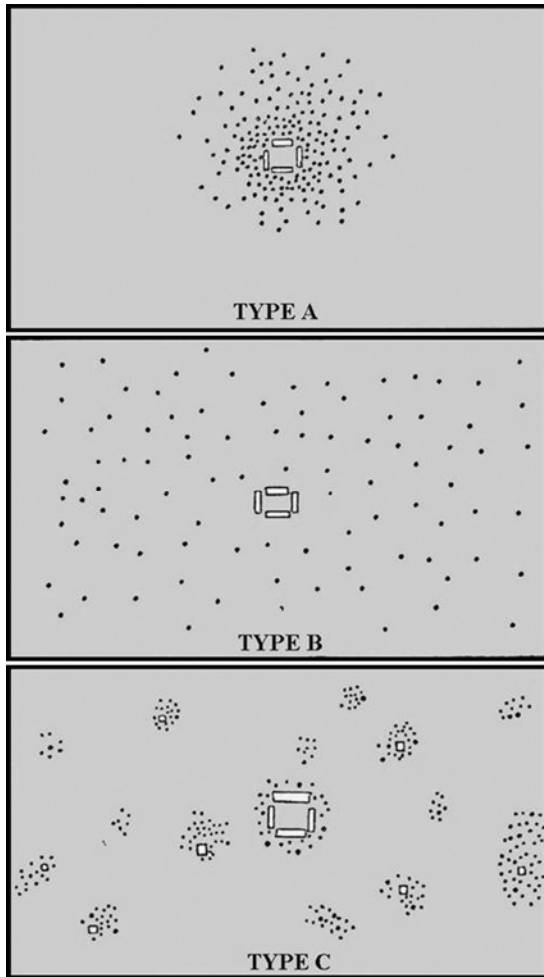
Figure 4. Gordon R. Willey's (1956) three potential models for the Maya landscape: Type A. settlement concentrated around monumental architecture; Type B. settlement dispersed and not associated with monumental architecture; and, Type C. one central area of monumental architecture and settlement with smaller monumental architecture and settlement dispersed over the landscape.

- are generally coterminous with royal courts (Houston et al. 2003:236; Webster 2001), implying that larger organizational structures were not characteristic of the Classic Period Maya. In this vein, sites like Caracol, Tikal, and Calakmul have been cast as anomalies; the implication is that they represent almost fringe "organizational arrangements" compared to the majority of Classic Period Maya centers (Houston et al. 2003:234). We would argue instead that these centers were not anomalous but rather represented examples of an organizational

structure that characterized the various larger polities found in the Maya lowlands.

Part of the issue for researchers dealing with the ancient socio-political structures of the Maya lowlands is our reliance on easily viewed data from site epicenters without a clear notion of the nature of the outlying settlement and landscape. Gordon Willey (1956) was the first individual to attempt to model Maya settlement in terms of the landscape. He conceived of three possible models (Figure 4): the first consisted of the site epicenter with residential settlement clustered around the central architecture (the European town model); the second was the site epicenter with residential settlement widely dispersed over the landscape (the vacant town model); and, the third was the site epicenter with some residential settlement and then smaller monumental architecture and associated residences dispersed over the landscape (a rural unstructured landscape). The linkages or networks that may have existed among the concentrated nodes of monumental architecture in this landscape were not addressed. Rather, the sites were viewed as largely autonomous and, because of the difficulty in undertaking large-scale settlement work in a tropical environment, considerations of relationships among sites were initially based on material culture and later on dynastic interactions.

This perspective of an unstructured universe still colors our archaeological interpretations. Even when epigraphers have suggested broader models of hegemonic integration, such as through political alliances with Calakmul or Tikal, our views of landscape have not been affected. However, the Caracol LiDAR DEM (Figure 1) explicitly shows how the ancient Maya universe was, in fact, structured and that at least in some cases, settlement areas may have been more dense, extensive, and interconnected than previously thought. Thanks to more than a quarter century of continuous research, it also is possible to gain some understanding of both how this structure evolved and operated over time.
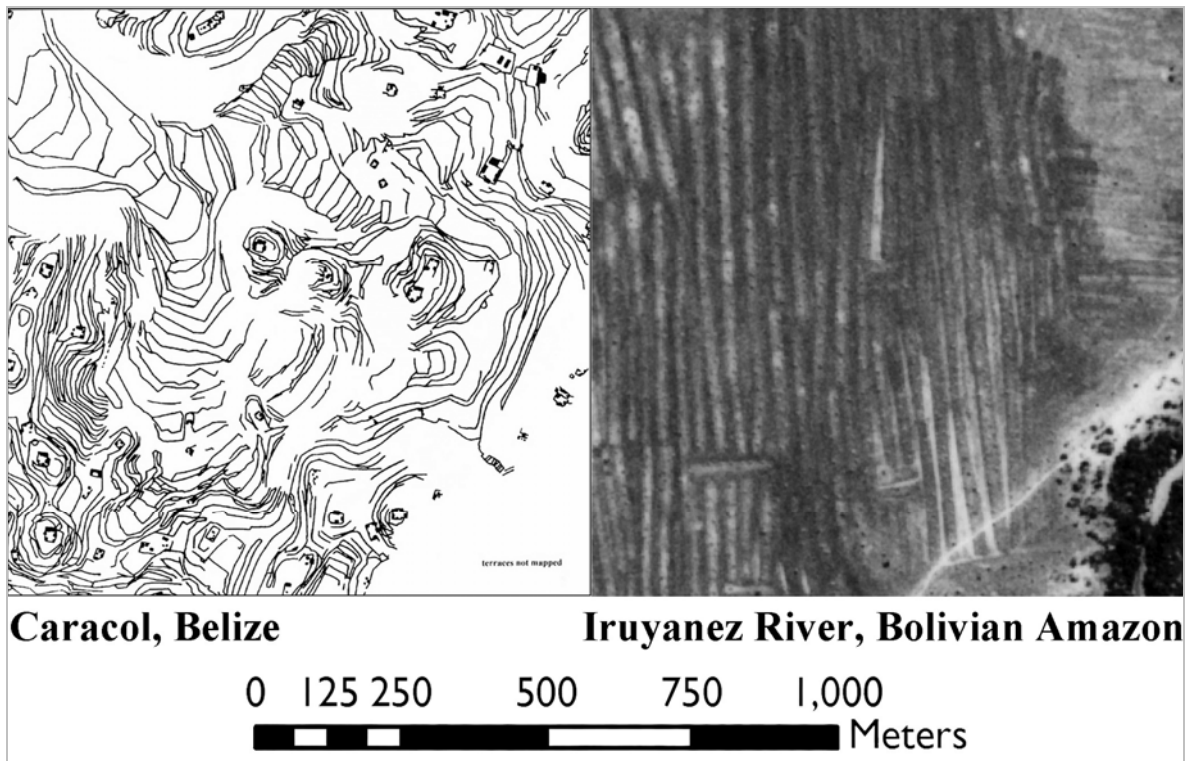
Figure 5. A comparison of Caracol's terraced landscape with its regularly interspersed residential groups (after A. Chase and D. Chase 1998: fig. 7) and a raised field landscape along the Iruyañez River in the Bolivian Amazon with settlement along the river levees; both landscapes represent one square kilometer.

The scale of the integrated Late Classic Period system at Caracol can be used to argue for an internal societal structure predicated on cooperation and not on conflict. We have previously described this cooperation as "shared identity" (D. Chase and A. Chase 2004a) and as "symbolic egalitarianism" (A. Chase and D. Chase 2009) – the management mechanisms geared towards increasing the material well-being of the population at large. Following "collective action theory" (Blanton and Fargher 2008, 2010), there must have been negotiation and/or benefits for conformity with leadership goals that extend beyond any "moral imperative" associated with simple dynastic rule. While early occupation at the site – a time associated with dynastic rule – is characterized by distinct and differentiated social status, Late Classic Caracol – a time when there is lessened evidence for dynasty – is marked by collaboration.

There are stresses associated with increased population density and settlement size (Fletcher 1995). We believe that Late Classic Caracol successfully managed these stresses through a series of collaborative adaptations. We suggest that the results of these actions can be seen in the Caracol landscape, particularly in physical manifestations that are different from a more typical Early Classic Period settlement norm. For example, settlement at Caracol does not focus on contiguous residential groupings as is the case at sites like Tikal and Copan. Rather, Late Classic Caracol settlement generally is evenly spaced across the landscape (Figure 3). While immediate and proximate access to relatives may have been lost in this settlement decision, enhanced access to productive terraced agricultural land was gained.

The full integration of ancient Maya household settlement with agricultural terraces that is found at Caracol appears to differ from patterns found in other tropical

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landscapes (Figure 5). In Southeast Asia, extensive terracing was constructed for use in rice cultivation (Conklin 1972, 1980), but these fields were separated from human settlement, which tended to coagulate in discrete villages. While Angkor Wat may have integrated households with rice cultivation (much like the Maya landscape) over some 900 square kilometers in a river basin (Fletcher et al. 2008; Pottier 2000), this is not the usual settlement pattern that occurs with the terraced rice fields. Similarly, in the Bolivian Amazon of South America, out of a wide variety of Pre-Columbian agricultural landscapes (Erickson 2006; Walker 2004), raised fields along the Iruyañez River were separated from areas used for human settlement along the river levees. While the suggestion has been made that the dispersed settlement of the Maya was undertaken for health reasons (Drennan 1988), the dispersed placement of Maya household groups in the midst of continuous agricultural fields also provided some privacy within their anthropogenic landscape – perhaps more than was found in other tropical regions where human habitation was clustered into more compact villages.

Caracol's roadways also easily integrated the dispersed settlement. The radiating causeway system at Caracol provided communication among residents and greater prosperity through access to goods at various localized termini market areas. This structure left household production in place, but increased distribution of trade items (such as polychrome pottery and obsidian) as well as local goods (such as Belize Red ceramics). Resulting from this negotiation were not only distinct physical features on the landscape – such as a unique causeway, settlement, and agricultural system – but also distinct ideological and social factors, especially as seen in mortuary and caching practices (A. Chase and D. Chase 2010; D. Chase and A. Chase 2010). Collective action led Late Classic Caracol to utilize a system of symbolic egalitarianism where

residents shared prosperity and identity (A. Chase and D. Chase 2009).

That these adaptations - along with Caracol's peak occupation, density, and territorial extent - occurred at a time when public dynastic records were not emphasized is likely not a coincidence. We postulate that the ensuing political reorganization that occurred at Caracol during the late Late Classic Period presaged the more collaborative Protohistoric Yucatec political structure, where political control changed every katun or 20 years (Restall 1997:65). In breaking with strict divine kingship, we believe that a system based on collective actions provided the framework for Caracol's growth and prosperity. However, at the onset of the Terminal Classic Period, political tensions re-emerged that can be correlated with a subsequent general decline in social prosperity and political stability at Caracol. Hieroglyphic records and archaeological data suggest a changing focus around A.D. 800 – one that did not favor the collective. As dynasty resurged on the monuments, general prosperity and symbolic egalitarianism deteriorated; population numbers and political unity also waned. Ultimately, Caracol was abandoned. Subsequent Late Postclassic site size and density elsewhere in the Maya area was lowered, returning to what are considered to be more typical levels (see Smith 2005). Late Postclassic artifact and caching practices suggest that some lessons may have been learned from the Classic Period Collapse (D. Chase and A. Chase 2004b). However, that is yet another story.

Conclusion

In conclusion, the addition of LiDAR to our existing tool kit of texts, excavation, and on-the-ground survey provides a significant advance to our understanding of ancient Maya socio-territorial organization. LiDAR effectively shows the scale of human modification of the Caracol landscape – in terms of residential settlement, agricultural terracing, and causeway construction – and more clearly defines ancient Maya urbanism. These data also point to the need

to look in depth at settlement systems in making interpretations about polity and territory. These combined data highlight the breadth of ancient Maya human-environment interaction, the adaptability of Late Classic culture, and the fragility of subsequent Terminal Classic period adaptations.

[1]The term "node" is used to refer to concentrations of monumental architecture or plaza groups at the end of causeways. While in some areas within the Maya lowlands, these locales might be referred to as "sites" or "minor centers," their location and context – embedded within a continuous settlement system – suggests that these value-laden terms are inappropriate.

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