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REVISTA DE ARQUEOLOGÍA AMERICANA

número 35

•

2017

ÍNDICE

Nota Editorial	5
Sección I	
Artículos Temáticos	
<i>Paleoambientes y Arqueología: la perspectiva micropaleontológica</i>	9
Manuel R. Palacios-Fest	
<i>Cambios paleoclimáticos y su influencia sobre el desarrollo cultural en el sur del Área Central Andina</i>	33
Bertil Mächtle	
Karsten Schittek	
Markus Reindel	
Bernhard Eitel	
<i>La construcción del paisaje Chalchihuiteño en la cuenca del Santiago Bayacora, Durango, México</i>	51
David Arturo Muñiz García	
Kimberly Sumano Ortega	
Sección II	
Otras Contribuciones	
<i>San Catequilla de Pichincha: lightning huacas, ancient astronomy and inca expansion</i>	87
John E. Staller	
<i>Occidentalismo académico, lapsus americanus, y los incas arqueológicos</i>	129
Albert Meyers	
<i>Instructivo para autores</i>	151

SAN CATEQUILLA DE PICHINCHA: LIGHTNING HUACAS, ANCIENT ASTRONOMY AND INCA EXPANSION

*John E. Staller**

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Abstract

The sanctification of the natural world and concepts and beliefs surrounding the sacred places or *huacas* are ancient in the Andes. Scholars have emphasized the importance of religious cults to the early spread of ancient technologies, ethnogenesis or cultural horizons, and appearance of distinct kinds of *huacas* and ceremonial centers. One of the most important *huacas* associated with Inca expansion was Sant Catequilla de Pichincha situated on a cliff top in the Pomasqui Valley of northern highland Ecuador. Its importance is related to its cosmological and symbolic associations to the Catequil religious cult to lightning (*Illapa*). It is the only known Inca *huaca* to be located directly under the equator at precisely 0°0'02" South Latitude. Locations with toponyms of Catequil or Catequilla in Colonial Peru and Ecuador are generally sacred places located high hills or cliffs and where natural springs occur which have stone platforms and pillars or gnomes. Research presented here represents an analysis of the astronomical functions of the circular and rectangular stone platforms at this site and how they relate to the surrounding landscape with regard to calculating solar and lunar cycles. Spanish chroniclers stated the platform at San Catequilla was given ritual offerings and highly venerated by indigenous communities during the Late Horizon and early Colonial Period

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because of its association to lightning and importance to the reckoning of astronomical cycles.

Key words: *Andes, Inca, Lightning, Ancient Astronomy.*

Resumen

San Catequilla de Pichincha: Rayos, huacas, astronomía antigua, y expansión Inca

La santificación del mundo natural y los conceptos y creencias que rodean los lugares sagrados o *huacas* son antiguos en los Andes. Los estudiosos han enfatizado la importancia de los cultos religiosos para la propagación temprana de tecnologías antiguas, la etnogénesis o los horizontes culturales y la aparición de distintos tipos de *huacas* y centros ceremoniales. Una de las *huacas* más importantes asociadas con la expansión inca fue Sant Catequilla de Pichincha, situada en un acantilado en el valle de Pomasqui, en el norte de las tierras altas de Ecuador. Su importancia está relacionada con sus asociaciones cosmológicas y simbólicas con el culto religioso de Catequil al rayo (Illapa). Es la única *huaca* inca conocida que se encuentra directamente debajo del ecuador a exactamente 0° 0'02" latitud sur. Las ubicaciones con topónimos de Catequil o Catequilla en el Perú y Ecuador coloniales son generalmente lugares sagrados ubicados en altas colinas o acantilados y donde ocurren manantiales naturales que tienen plataformas de piedra y pilares o gnomos. La investigación presentada aquí representa un análisis de las funciones astronómicas de las plataformas circulares y rectangulares de piedra en este sitio y cómo se relacionan con el paisaje circundante con respecto al cálculo de los ciclos solares y lunares. Los cronistas españoles declararon que la plataforma en San Catequilla recibió ofrendas rituales y fue muy venerada por las comunidades indígenas durante el Horizonte tardío y el Período Colonial temprano debido a su asociación con el rayo y su importancia para el cálculo de los ciclos astronómicos.

Palabras clave: *Andes, Inca, Rayo, astronomía antigua.*

Résumé

San Catequilla de Pichincha: Huacas de foudre, astronomie ancienne et expansion de l'Inca

La sanctification du monde naturel et les concepts et croyances entourant les lieux sacrés ou *huacas* sont anciens dans les Andes. Les spécialistes ont souligné l'importance des cultes religieux pour la diffusion précoce des

technologies anciennes, de l'ethnogenèse ou des horizons culturels, ainsi que pour l'apparition de types distincts de *huacas* et de centres cérémoniels. Sant Catequilla de Pichincha, située au sommet d'une falaise dans la vallée de Pomasqui, dans le nord de l'Équateur, est l'une des plus importantes *huacas* associées à l'agrandissement d'Inca. Son importance est liée à ses associations cosmologiques et symboliques au culte religieux de Catequil à la foudre (Illapa). C'est la seule Inca *huaca* connue à être située directement sous l'équateur à une latitude de $0^{\circ} 0'02''$. Les lieux portant les toponymes de Catequil ou Catequilla dans le Pérou colonial et en Équateur sont généralement des lieux sacrés situés sur de hautes collines ou falaises et où se trouvent des sources naturelles dotées de plates-formes et de piliers en pierre ou de gnomes. Les recherches présentées ici représentent une analyse des fonctions astronomiques des plates-formes de pierre circulaires et rectangulaires de ce site et de leur lien avec le paysage environnant en ce qui concerne le calcul des cycles solaire et lunaire. Les chroniqueurs espagnols ont déclaré que la plate-forme de San Catequilla avait reçu des offrandes rituelles et était fort vénérée par les communautés autochtones à la fin de l'horizon et au début de la période coloniale en raison de son association avec la foudre et de son importance pour la prise en compte des cycles astronomiques.

Mots-clés: *Andes, Inca, Foudre, Astronomie Antique.*

Resumo

San Catequilla de Pichincha: relâmpago Huacas, antiga astronomia e expansão inca

A santificação do mundo natural e os conceitos e crenças que cercam os lugares sagrados ou *huacas* são antigos nos Andes. Estudiosos enfatizaram a importância dos cultos religiosos para a disseminação precoce de tecnologias antigas, etnogenese ou horizontes culturais, e surgimento de tipos distintos de *huacas* e centros cerimoniais. Uma das *huacas* mais importantes associadas à expansão inca foi Sant Catequilla de Pichincha, situada num penhasco no vale de Pomasqui, no altiplano norte do Equador. Sua importância está relacionada às suas associações cosmológicas e simbólicas ao culto religioso de Catequil ao relâmpago (Illapa). É a única *huaca* inca conhecida a ser localizada diretamente sob o equador a $0^{\circ} 0'02''$ latitude sul. Locais com topônimos de Catequil ou Catequilla no Peru Colonial e no Equador são geralmente locais sagrados localizados em altas colinas ou falésias e onde nascem fontes naturais que possuem plataformas de pedra e pilares ou gnomos. A pesquisa apresentada aqui representa uma análise das funções astronômicas das plataformas de

pedra circulares e retangulares neste local e como elas se relacionam com a paisagem circundante no que diz respeito ao cálculo dos ciclos solar e lunar. Cronistas espanhóis declararam que a plataforma em San Catequilla recebeu oferendas rituais e altamente venerada pelas comunidades indígenas durante o Horizonte Tardio e o início do período colonial por causa de sua associação a relâmpagos e importância para o cálculo dos ciclos astronômicos.

Palavras-chave: *Andes, Inca, Relâmpago, Astronomia Antiga.*

Introducción

Interdisciplinary evidence on the cultural and historical significance and the rituals and beliefs surrounding lightning veneration are presented. Natural features, mountains, subterranean springs, caves etc., designated as 'Catequilla' or 'Catequil' were considered sacred places or *huacas* associated with lightning veneration during the early Colonial Period. Various ethnohistorians have suggested that lightning was worshiped from Quito to Cuzco during the Conquest Period. Lightning and its role in Inca cosmogony and cosmology are briefly addressed as are the symbolic and cultural significance to the celestial realm and Inca astronomy during different points in the annual cycle. Many Inca *huacas* and *ushnus* had astronomical significance. Those celestial elements of primary veneration during the Inca expansion such as the principal *huaca* associated with lightning, Catequil de Huamacucho are also discussed as are the various concepts and meteorological phenomena associated symbolically and literally to thunder and lightning in Inca culture. These associations are presented to provide a basis for understanding how astronomical calculations were generated and how they related to lightning during different parts of the annual cycle. Lightning *huacas* along the equator were particularly venerated in the context of Inca expansion because of their importance to astronomical calculation. The hilltop lightning *huaca* San Catequilla de Pichincha in the Pomasqui Valley of northern highland Ecuador is the focus of this study. This is the only known Inca *huaca* located at precisely 0°0'00" S. Latitude, and various accounts suggest it was highly venerated during the Colonial Period. Previous research in this region indicates extensive Inca presence during the Contact Period. The archaeological remains at San Catequilla are analyzed with regard to their geometric configuration and with relation to the surrounding landscape in order to establish their astronomical function.

Lightning and the Celestial Realm

Liquid and light symbolize two images of uniqueness and indivisibility in the celestial realm. The principal manifestations of heavenly light include sound forms and visions of light and in Inca cosmogony and Andean religious thought, lightning was perceived as an absolute manifestation of the heavens that displays and evokes the meaning of *eternity*, “a state that suppresses differences in that even pairs of opposites coincide” (Sullivan, 1988: 32, 115-116 [emphasis mine]). It was perhaps such qualities and characteristics that explain why lightning was such an important agent of transformation and powerful entity throughout the ancient world. Heavenly fluids such as the celestial river, the Milky Way, and the dark cloud constellations usually had reference to ‘different parts of the celestial river, the Milky Way, and thus, were used in combinations with sight lines to refer to different parts of the annual cycle¹ (Urton, 1981; Zuidema, 2011; Dearborn and Bauer, 1995). These dark cloud constellations provide symbolic connections between the heavens and the underworld (*ukhu pacha*) realm through concepts such as *Pachatira* (Sullivan, 1988). *Pachatira* refers to earthly or subterranean fecundity in that all of the celestial animals (dark cloud constellations) are made up of “earth” (Nuñez del Prado, 1973: 36; 1974: 246-247). So there is a relationship between animals and earthly or subterranean water, i.e., the cosmic layers through their symbolic representations.

Animal familiars are symbolically linked to celestial phenomena such as dark constellations in the center of the Milky Way or Celestial River during certain points in the rainy season (October through April, especially December through February). When visible in the night sky during the rainy season they are sometimes referred to as “the serpent”. There is an association among dark cloud constellations, serpents, and water. Since meteorological serpents (rainbows/*amarus*) appear only during the rainy part of the year, they exhibit a seasonal activity cycle similar to terrestrial reptiles. During the dry season the dark constellations are perceived as below the ground. Water in the form of rain returns to earth, where in its continuous cosmic cycle it flows in the tributaries of the terrestrial streams. Therefore, the celestial and terrestrial rivers act in concert to continuously recycle water, the source of fertilization, throughout the universe (Urton, 1981: 172). Quechua speakers describe rainbows as serpents (*amarus*) that rise out of springs (*puqyos*) when it begins to rain (Urton, 1981:

¹ Dark cloud constellations are dark cloud particles of interstellar matter within the Milky Way that were often symbolic of animals (Magli, 2005). The Andean fox and llama were often referred to in the accounts along the North Coast.

88). Multicolored rainbows are visible during the day, while the black serpent at night and associated with dark cloud constellations. Rainbow serpents have two heads regardless if they are thought of as circles or arcs. They rise from one spring and set into another. When they do this the two springs are said to be the “same spring” (Urton, 1981: 88-89). This may be seen as evidence that they are thought of as complete circles, which is how they appear high in the mountains.

The disposition of heavenly space among Quechua speaking populations reflects the fact that their destiny is shaped by the manipulation of water. Such perceptions are evident in customs such as ritual washings, ritual beverages, and the manipulation of irrigation technology. Human knowledge affords control over items in this water, that originate in and that define the nature of heavenly space (Sullivan, 1988: 118). The human ability to manage life-giving water stems from the symbolic foundations of human knowledge, based upon what is no doubt ancient sacred symbolism. The importance of lightning *huacas* or *ushnus* to channeling fluids and the ideology surrounding water is evidenced by the underground channels or cut stone canals and drains often associated with truncated platforms and subterranean springs as well as carved rocks, fountains, and basins which channel fluids across their carved surfaces at such sites (Staller, 2008; Topic *et al.*, 2002).

Among Andean societies, dark cloud constellations are called *Pachatierra* and seen as an ambivalent intermediate female manifestation (fluidity) within the realm of structure. Light, the primary visual characteristic of lightning, is structure and associated, among Quechua and Aymara speakers, with the male generating principle² (Nuñez del Prado, 1974; Urton, 1981, 1985; Classen, 1993; Staller, 2008). The Milky Way is seen as a celestial river that moves water from the earth to the underworld and through the sky (Urton, 1988: 93). The Milky Way is called ‘*Mayu*’ and had significance to Inca cosmology, as it was perceived as the celestial counterpart to the Vilcanota River (Magli, 2005: 26; Zuidema, 2011). This symbolic association was so powerful that the water in the Vilcanota River was seen as the ‘same’ water flowing in the celestial river and returning to earth in the rainy season (Urton, 1981). Perhaps it is the essential characteristics of thunder and lightning and the degree to which bolts effect human lives and consciousness that make it such an important religious icon. The transcendental qualities of lightning are manifest in a syncretism of folk

² *Pachatierra* embodies an oppositional duality at once generative and destructive of earth, mountain, and ancestral spirits. *Pachatierra* is not synonymous with earth or *tierra* because *pacha* denotes a temporal and spatial dimension lacking in the concept of *tierra* (Allen, 1988: 48; see also Staller, 2008: 269-270).

practices and religious beliefs whose high degree of cultural integration has emerged from a veneration of the natural world (Gade, 1983: 771; Sullivan, 1987). Veneration of the natural world perceives a sacred landscape fed through ritual offerings and transformed or civilized through human action (Sullivan, 1985: 103-109; Pease, 1973; Classen, 1993; Pachacuti Yamqui, 1950 [1613]). Ritual performance and offerings impose a moral order of being intrinsic to the ethical order expressed by Inca ontology and cosmogony (Sullivan, 1985).

The underlying goal of Inca expansion was the imposition of an ethical order on the natural and celestial realm, through the modification and demarcation of sacred places, *huacas* and shrines in the natural world. The rituals and rites associated with lightning veneration appear to have been wide spread throughout the Andes related in part to the spread of the Quechua and Aymara linguistic families (Torero, 1974, 2002; Cerrón Palomino, 2000a, 2000b, 2003; Heggarty, 2007, 2008; Heggarty and Beresford-Jones, 2010). Lightning has a natural and cosmological association with twins related in part to the close visual and auditory association or simultaneous occurrence of thunder and lightning in nature. Binary and triadic classification is prevalent in Inca culture and apparent with regard to lightning, which is classified by the lightning bolt, as well as the light and sound (thunder) emanating from it (Garcilaso de la Vega, 1960 [1609]: 50-51; Gade, 1983: 772; Zuidema, 1982: 151-153). Some 16th century accounts describe this spirit as a trinity composed of father (*Chuki Illa*) and two twin sons, *Katu Illa* and *Inti Illapa* (Polo de Ondegardo, 1916 [1561]: 6; Acosta, 1962 [1589]: 2210). *Inti* the Sun, Thunder (*Sallallaya*) and Lightning (*Illapa*) have three manifestations (Classen, 1993: 16). Among contemporary indigenous Peruvian cultures, the moon has three names, *Mama Quilla* ("Mother Moon," or "Mother Month"), *Mamacha* (The Virgin Mary and [female] saint), and *Coya/Colla Capac* (principal or noble Queen) (Urton, 1981: 80). Similarly, rainbows are classified as male rainbows (*wankur k'uychi*), female rainbows (*k'uychu*), and androgynous rainbows (*urkuchinantin*), the latter being particularly dangerous to women (Urton, 1981: 89). Hail (*chikchi*) was perceived as anthropomorphic, three brothers endowed with malevolent and terrible knowledge and power and intimately associated with crop failures and sterility (Condori Mamani and Quispe Huamán, 1996: 44-45, 156 f. 4). Lightning essentially represents a transcendence of the binary duality of sound and light. Light is related to the apprehension of categories, while sound refers to animating essences or life force (Classen, 1993: 18; Sullivan, 1988: 32). Such concepts are also directly relevant to Inca cosmogony and to the creator Viracocha, implying the existence earlier forms of lightning veneration, which predate the Inca expansions (see e.g., Staller, 2007).

Lightning and its related *Huacas* and Shrines

The Inca constructed over 100 ceremonial platforms and shrines (*villcas*), some on mountain passes (*apachitas*) others on the summits of the highest mountains in the empire in the context of expansion, between 1438 and the Spanish Conquest in 1532 (Ceruti, 2004: 104; Reinhard, 1983, 1985; Reinhard and Ceruti, 2010). Recent research has indicated some Colonial Period *huacas* or shrines (*villca*) were associated with the lightning cult Catequil (Topic *et al.*, 2002). The Aymara term *villca* can mean both 'sun' and 'shrine' (Bertonio, 1956 [1612]: 386). It may also refer to someone who has entered into the society of *huacas* by achievement or marriage —a very important *cacique* or chief (Zuidema, 1973: 19; cf. Salomon and Urioste, 1991: 46). Salomon and Urioste (1991: 46) suggest *villca* is used to refer to a person who partakes of the status of a *huaca*, a superhuman person (see also Condori Mamani and Quispe Huamán, 1996). Pre-Hispanic religions of the New World were inherently telluric, that is naturalistic and spatial. Origins and creations were from previous conditions or states, rather than out of nothing (*creatio ex nihilo*) or first beginnings. Andean worldview generally regards the natural world as an expression of an intrinsic relationship between matter and spirit. The sanctification of the natural world and concepts and beliefs surrounding sacred places or *huacas* are ancient, particularly hilltops and cliffs cleft by bolts of lightning. *Huaca* [Aymara] (also spelled *waká*) and *Apacheta* [Quechua] refer to the sacred and extraordinary. For example, a superhuman person, place, object, or image embodying an extraordinary quality³ (Garcilaso de la Vega, 1966 [1609]: 77, 76-77). In the current vernacular, *huaca* generally refers to ancient shrines or archaeological sites that have cultural and/or religious ties to indigenous Andean populations. Inca culture created a symbolic connection to sacred places in the landscape through fictive kin relationships to *huacas* and oracles. Such associations were between rulers to sacred places or among polities, communities (*ayllus*) to (*huacas*) in the natural world.

The spread of the Catequil thunder and lightning cult and its associated symbols, rituals, and rites throughout most of the Andes is thought to have occurred in the context of Inca expansion. Lightning was represented in the

³ According to Garcilaso de la Vega, "...a *huaca* is... a sacred place... "a sacred thing" such as ... idols, rocks, great stones, or trees which the enemy [Devil] entered to make the people believe he was a god... They also gave the name *huaca* to things they offered to the Sun, such as figures of men [figurines and statues], birds, and animals made of silver, gold or wood..." (1966 [1609] pp. 73, 76-77).

natural world by sacred places, *huacas* and *ushnus* and associated with a religious cult called Catequil or Catequilla in the Late Horizon Period. In modern Quechua, Catequilla is associated with mountain essences with masculine attributes (*Wamanis*) and to fertility – sources of water and streams. “*Apu Catequil*” refers to mountain spirits, thunder and lightning, “fathers” as well as founding ancestors, and cliff/mountains (Topic *et al.*, 2002: 310-311). The significance of summits and hilltops to lightning as *apu* or mountain lord has reference to the male generating principle as mountain summits are the sources of streams, and to the channeling of fluids (Topic *et al.*, 2002; von Hagen and Morris, 1998). Ritual offerings commonly found at such lightning *huacas* include worked and unworked *Spondylus/Strombus* shell, sling stones or river-rolled pebbles sometimes covered in ocher, and evidence of maize beer (*aqha* or *chicha*) or drinking vessels (*queros*) (Staller, 2007: Table 1; Topic *et al.*, 2002: 326). The association of sling stones to lightning veneration and ritual may be related to their shape, which closely approximates hail.

Inca rulers beginning with Pachacuti Yupanqui had fictive kin ties to *Illapa* and its associated oracles and *huacas*, adopting this force of nature as his brother or alter ego (Salomon, 1987; Salomon and Urioste, 1991 [c. 1598-1608]; von Hagen and Morris, 1998). The most important *huaca* associated with *Illapa* according to Spanish chroniclers was the Oracle of Catequil de Huamachuco in northern Peru (Gose, 1994: 209, 223; Topic *et al.*, 2002: 310-311). The Oracle of Catequil de Huamachuco was such an important *huaca* because it was a *yañca*, believed to make other *huacas* “speak” and only the divine ruler or Sapa Inca was believed to have this power⁴ (San Pedro, 1992 [1560]: 177-178; Guaman Poma (1980 [1583-1615])). The Oracle at Catequil de Huamachuco was also of considerable interest to colonial officials and clerics because it was said to have predicted the coming of the Spanish and the conquest of the Inca.⁵ The chroniclers Cristobál de Albornoz and Pedro Sarmiento referred to Catequil as the *huaca* of Cajamarca and Huamachuco, rather than specifically Huamachuco, although Albomoz (1989 [1584]) emphasized the *huaca* of the “*indios*

⁴ The most detailed information on the oracle at Huamachuco comes from Fray Juan de San Pedro in his *Relaciones de Primeros Agustinos* written in Spain in 1560 or 1561 (Topic *et al.*, 2002). Significantly, the other *huaca* believed to have been a *yañca* was the ancient oracle at Pachacamac because of its presumed power to predict or foresee coming earthquakes (Rostworowski and Morris, 1999: 793-794).

⁵ Cristobál de Molina “*El Almagrista*” (1968 [1552]) describes it in the context of the Inca civil war and Spanish *entrada*, stating Atahualpa destroyed the oracle because it had foreseen the Christian victory.

guamachucos” as being “one of the most important in the Inca Kingdom” (Figure 1). The combining of Huamachuco and Cajamarca into a single unit reflects Inca administrative organization *Hanan/Hurin* upper and lower (Cieza de León, 1984 [1553]: 226, 234; Pizarro, 1978 [1571]: 210-220; Zuidema, 1980, 1989, 2011; Topic, 1992, 1998), which was then adopted by the Spanish colonial government in 1565-1566 when the *corregimientos* were set up (Topic *et al.*, 2002: 306-307). With regard to the destruction of the lightning oracle, both Betanzos (1987 [1551]: 250) and San Pedro (1992 [1560]: 176) state that the last Inca ruler Atahualpa destroyed Catequil de Huamachuco by fire and that after the stone idol had been destroyed, the priest still continued to venerate the cliffs (San Pedro, 1992 [1560]: 178). Betanzos (1987 [1551]: 250) also states Atahualpa systematically destroyed the oracle at Huamachuco because of a ‘response’ he received while “consulting” with it and that he considered Catequil his enemy. Atahualpa is said to have spent three months supervising the destruction of the *huaca* at Huamacucho (Betanzos, 1987 [1551]: 251). Juan de San Pedro (1992 [1560]: 177-178) and Juan Betanzos (1987 [1551]: 250) emphasize the cliff and the hill itself was burned, while the chronicler priest Pedro Sarmiento (1907 [1572]: 176) states the hill was leveled, and thus, portraying the elemental battle between supernatural protagonists employing fire and water the essential elements associated with lightning. Their emphasis on the hill confirms that the mountain was the vitalizing force or animating essence of the *huaca*.

During the turn of the 17th century chroniclers briefly mention Cati Quillay a *huaca* described as an emissary of the Inca (Salomon and Urioste, 1991: 100-101) or as having been given to the Andean community of Llacsá Tampa the Inca emissary in Huarochiri (Taylor, 1987: 293). Although this document is clearly based on local rather than Cuzco informants, it is possible the term Cati Quillay may represent an Aymara variant of Catequil, as the Huarochiri region was originally Aymara and adjoins Yauyos Province where Central Aymara is still spoken in the present. Lightning received such widespread religious veneration and representation in the Andes because of its essential qualities and natural association to the heavens, and also to the underworld through lightning bolts that penetrate bodies of water. During Inca expansion and early Colonial Period lightning veneration referred to *Illapa* among the Inca and was related to the Catequil cult throughout their empire (Topic *et al.*, 2002). Andean periodicities have particular reference to *huacas*, which in some cases were used to calculate celestial cycles particularly those associated with the coming of climatic or seasonal events (Zuidema, 1982, 1995, 2011). The transformation of



Figure 1. Land of the Four Corners The approximate locations of the four corners of the Inca Empire or Tawantinsuyu showing important lightning *huacas* and other sites mentioned in this study. The Inca state was divided into four parts; *Chinchasuyu* and *Antisuyu* associated with *hanan* or upper, and *Collasuyu* and *Chinchasuyu* association with *hurin* or 'lower' and these divisions had important implications for the organization and administration of non-Inca populations, particularly regarding tribute and redistribution.

the term “Catequil” to “Cati Quillay” or “Catequilla,” the more common term used in northern Ecuador, is believed to have originally been from the Culle language and can also be translated as “follower of the moon”⁶ (Topic *et al.*, 2002: 306-308).

Lightning: Material and Cultural Manifestations

Lightning was the major theophany of weather in Inca religion in Colonial Ecuador and Peru, known as *llapa*, now usually spelled as *Illapa*, and regarded as the animating essence controlling thunder, and by extension, all celestial bodies and climatic forces, particularly rain, hail, and rainbows (Rostworowski and Morris 1999: 792). Synonyms were *Liviac* (*Libiac*) or *Chuki Illa*, terms that have not survived in current Quechua usage (Rostworowski 1983: 24 *if.*; Topic *et al.*, 2002: 308). Among the Aymara, *qhaqya* is more common than *Illapa* (Sullivan, 1996: 184). Catequil religious veneration was symbolically and metaphorically associated with the natural world through mountain summits, mountain passes, subterranean springs and caves.

Lightning also had symbolic connections to precious metals and the metallurgical arts as evident by its associations with archaeological centers involved in their manufacture. Such associations are particularly evident in the 16th century accounts from the Augustinians⁷ in Cuenca, Ecuador, and colonial officials and clergy in northern Peru and highland Bolivia, particularly around Potosí (San Pedro, 1992 [1560]; Cobo, 1990 [1653]; Gade, 1983; Gose, 1996; Staller, 2007). These are the regions of the Andes where the geological sources of precious metal ores most commonly occurred (see e.g., Lechtman, 1976, 1984). A symbolic association to precious metals is particularly apparent when observing that the Inca referred to *Illapa* as *Choqui Ylla Uillca* (*el noble del rayo, o de oro*) the ‘noble bolt or gold’ and that the idol dedicated to *Illapa* was represented by a faceless gold statue, kept in the Coricancha along with idols to *Inti*, the Sun and *Quilla*, the Moon (Acosta, 1962 [1590]: 221; San Pedro, 1992

⁶ The Culle language is unknown linguistically. However, some lightning *huacas* or *ushnus* were used for astronomical purposes that may have involved recording lunar cycles or eclipses. Moreover, most all Inca palace estates included a house to the *mamaconas* supporting such symbolic associations (see Cieza de León, 2005 [1553]).

⁷ The Augustinians are the monastic order credited with bringing the holy relics of St. James (Santiago) to their monastery at Uclés in the 12th century (Madariaga, 1947; Topic, 1992, 1993). Augustinian monks in southern highlands around Cuenca, Ecuador were central in converting beliefs surrounding *Illapa* to Catholic orthodoxy and to the cult of Santiago who was called Santiago Illapa by indigenous Andeans (San Pedro, 1992 [1560]; Cardinale, 1983).

[1560]; Cobo, 1990 [1653]; Alborno, 1989 [c. 1584]). It is perhaps this symbolic association to precious metals and the metallurgical arts which explains why lightning (*Illapa*) remains the least known and studied of the four primary sources of veneration in Inca culture, the sun, moon and Pacarquitambo, the place of their mythological origins (see Guaman Poma (1980 [1583-1615]: 62, fol. 79).

One of the so-called superstitions associated with the cult involves lunar eclipses, a second superstition same-sex twin births (San Pedro, 1992 [1560]: 174; Cobo, 1990 [1653]; Alborno, 1989 [c. 1584]). Single sex twins considered 'divided' by a thunderbolt had a symbolic significance that a male-female set did not possess (Mariscotti de Görlitz, 1978: 366). An individual conceived or born during a thunderstorm was *ipso facto* a child of lightning and also a candidate for ritual sacrifice in the Capac Hucha rite (Cobo, 1990 [1653]: 224; Krappe, 1932). Sacrifices included the most beautiful children of the realm, as well as males born feet first (*chaqpa*), with cleft palates or harelips (*ghaqa sinqa*), head hair (*chaki wawa*) as well as single-sex twins (*Illapa kuri*), who were thought to have been divided by a *rayo* or thunderbolt (cf. Gade, 1983: 776; Murúa 1922 [1590]: 234; Mariscotti de Görlitz, 1978: 366; Besom, 2010: 401; see also Cobo, 1990 [1653]; Guaman Poma, 1980 [1583-1615]). Victims of the Capac Hucha rites were usually buried in a special place, the *chucicancha* (Molina, 1959 [1575]: 94). When twins of individuals with such abnormalities died, they would be placed in ceramic urns and interred at *Illapa huacas*, sacred places struck by bolts of lightning (Gade, 1983: 776; see also Arriaga, 1968 [1621]: 205; Garcilaso de la Vega 1966 [1609]: 76-77). These human remains formed the primary focus of cultic veneration wherever they were buried, most commonly on high mountain summits (Reinhard, 1983, 1985; Reinhard and Ceruti, 2010). Protective rites made at rural *huacas* varied from regular libations of *chicha*, to periodic sacrifices of llamas, guinea pigs, and children. Male twins were ascribed status as sons of lightning or *Illapa huacacuna* (Staller, 2007; Reinhard and Ceruti, 2010; Topic *et al.*, 2002). Lightning is still believed to cause twin births, thus a strong symbolic association to twins, the principles of rebirth and renewal cycles, and particularly lunar eclipses (Staller, 2007; Topic *et al.*, 2002). Lunar associations are also inferred from the repeated presence of thorny oyster (*Spondylus* spp.) to ritual practices involving *Illapa*. Such practices appear to be ancient in this region and in the Andes in general. *Illapa* was also associated with mythic origins, mountain lords, fathers, founding ancestors, water, celestial and agricultural cycles (Topic, 1992, 1998; Staller, 2007).

Lightning is still a primary agent of transformation and known to transmit the decisions of major spirits (Valderrama and Escalante, 1977).

Lightning was so highly venerated among the Inca that Guaman Poma de Ayala included it in the illustration of the Inca Coat of Arms along with the sun, moon, and Paqariqtambo, the place of their mythological origins (Figure 2). The location and placement of the primary symbols and sources of Inca cultural identity and religious veneration may be examined with regard to Inca cosmogony, which perceives lightning or *Illapa* as son of *Inti* the Sun, while the Moon (*Quilla*) had symbolic associations to *Pachamama* or Earth Mother, who was according to Inca creation myths, the 'sister' of *Illapa* (Sullivan, 1985). In his drawing of the Inca Coat of Arms, Guaman Poma depicts *Illapa* below the sun and beside Paqariqtambo the place of their mythological origins. It was from the three caves or windows that the original mythological Inca ancestors emerged into a 'wild' landscape in order to impose an ethical order upon the natural world and celestial realm or the systematic creation of civilization (*camachisqa*) over people (*camachicuna*) and lands (*patachana*), through the cultivation of valley bottomlands, construction of artificial terraces along the steep cordillera, channeling water through irrigation canals, and cultural modifications of sacred places in the natural landscape (Classen, 1993: 11; Salomon and Urioste, 1991: 43-44; Sullivan, 1985, 1988; Urton, 1990).

The various symbolic associations associated with this indigenous lightning cult are also apparent in the related symbolism and iconography surrounding rainbows, felines and serpents, underground springs, and caves among contemporary Andean societies and are linguistically categorized by a triadic classification. There are intrinsic relationships between light, color, and water, as all these phenomena are regarded as manifestations of celestial forces that by their emergence from the earth or sky or water, establish an interconnection among the various levels of the universe. The Andean universe was generally perceived as a tripartite cosmos with the earth in the center as a mirror that alternately reflects the celestial and underworld order across and through itself (Urton, 1981: 63, 93; Lechtman, 1999: 227; Staller, 2008: 287). It is perhaps in part from Native American worldview that astronomical calculations of the heavens and of lunar and solar cycles played such an important role in cultural perceptions regarding the interrelatedness of the cultural and natural world – particularly among cultures with agricultural economies. In the Andes, the natural world exists in multiple temporal cycles, some tied to an annual subsistence round and others to the periodicity of cosmological and mythological (creation or world) cycles (Zuidema, 1982: 159-161; Rostworowski,

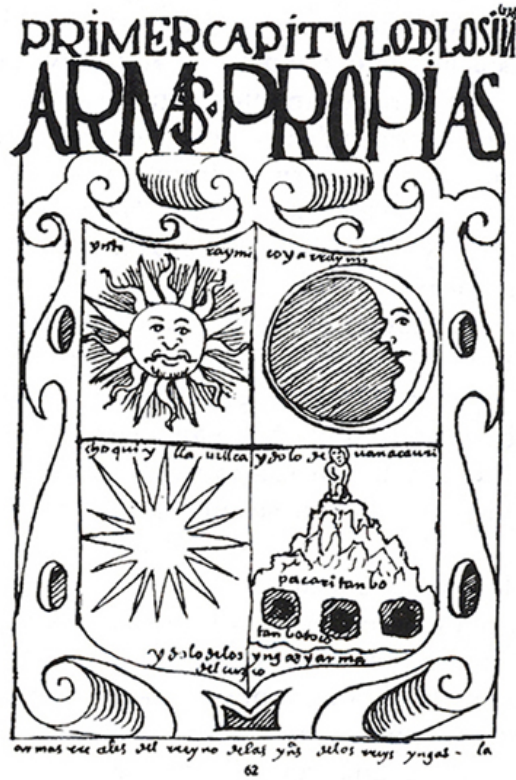


Figure 2. Inca Coat of Arms as illustrated by Felipe Guaman Poma de Ayala. The primary symbols include *Inti* the sun, *Quilla* the moon, *Illapa* lightning and the place of their mythological origins Pacariqtambo. Above and below the symbol of lightning he wrote, “Choqui Ylla Uillca” (*el noble del rayo, o de oro*) or ‘the noble bolt or gold’ in reference to the golden idol without a face that stood in the Coricancha or Temple of the Sun in imperial capital of Cuzco (from Guaman Poma, 1980 [1583-1615]: 62, fol. 79).

1983: 31; Classen, 1993: 143, 194-195; Urton, 1999: 40-44; Sullivan, 1996: 27, 2002). Therefore, multiple modes of a historical and mythological past are “real” in that they coexist and continually contribute to the ongoing process of life (Zuidema, 1982; Allen, 1988; Sullivan, 1985, 1987, 1988; Staller, 2008, 2010). Divisions of time are related to the divisions of space in Inca culture and the most obvious examples are seasonal cycles and *ceque* lines that radiated from the main plaza haucaypata, in Cuzco (Urton, 1981: 195; Zuidema, 1964, 1977, 1995, 2008, 2011). Rainy and dry seasons are not only related to the solar

cycles, but also to the position of the Milky Way, while periods or phases of the moon determine the planting of the crops with respect to the position of the sun. According to chroniclers, *Illapa* was symbolized by a constellation outlining a man wielding a club in his left hand and a sling in his right (Polo de Ondegardo, 1916 [1561] Morúa, 1922 [1590]: 234; Cobo, 1964 [1653]: 160; von Hagen and Morris, 1998: 125; Rostworowski and Morris, 1999: 792). *Illapa* was perceived as a anthropomorphic celestial constellation dressed in shining garments that projected flashes or bolts of lightning when he whirled his sling to bring on the coming rain among the Inca (Cobo, 1990 [1653]: 32). This description of celestial lightning and its triadic classification suggest the celestial configuration formed by the stars Alnilam, Saiph, and Rigel on the belt of Orion and may provide a basis for understanding why sling stones were left as offerings at some Inca *huacas*. The constellation of Orion may have had reference to Catequil with regard to the Capac Raymi festival during the winter solstice festival usually around December 7th ⁸ (Rostworowski and Morris, 1999; Staller, 2006).

Lightning in Pre-Columbian and Colonial Ecuador

Pre-Columbian Andean religion involves a worship of the natural world, what has come to be called a concept of a sacred landscape (Sullivan, 1987, 1988; Townsend, 1992). Such cultural concepts and religious beliefs are widespread and very ancient throughout the Andes (Rowe, 1946; Burger, 1992; Zuidema, 1964, 1982, 1989, 1995, 2008, 2011). Quechua is stated to have entered early on into the highland regions of northern Ecuador and with the Panzaleo culture complex in the context of long-distance exchange and came to dominate this region with later Inca expansion⁹ (Torero, 1974: 80-84, 1984: 371-373, 2002; Rostworowski, 1975: 340-342). Northern highland Ecuador refers to the provinces of Pichinche, Cotopaxi, Tungurahua, Northern Chimborazo and

⁸ The existing calendric reference is July 25th, the feast day of Santiago, the patron saint of New Spain or as he is referred to by many indigenous populations, Santiago *Illapa*. Sling stones are also associated Inca mythology and imposing an ethical order on the sacred Valley of Cuzco. Santa Barbara, the patron of miners, also has a close association to lightning in some regions of the Andes. Her feast day is December 4th corresponding to the onset of the rainy season and part of the annual cycle when thunderstorms are most intense (Gade, 1983).

⁹ At the time of the Spanish Conquest, there were probably some thirty indigenous languages spoken in Ecuador, and of these languages, only twelve remain (Stark, 1985: 157). Colorado, Cayapa and Coaiquer remain spoken in the western littoral and a total of nine, Siona, Secoya, Tetete, Cofan, Huaorani, Shuar, Achuar, Quichua, and Zápara continue to be spoken in the eastern lowlands or *Oriente* (*ibid.*).

Guaranda and cultures such as the Cayapa, Chimbu, Canelos, etc. (Rowe 1974). The southern highlands and northernmost highland Peru were non-Quechua speaking regions occupied by the Cañari, on the west side of the cordillera and the Jívaro on the east and Palta and Malacato to the south (Rowe, 1974). Lightning *huacas* in these regions were given different place names. During the later Inca incursion into northern Ecuador lightning *ushnus*, hilltops, springs etc., were only given Catequilla toponyms in Quechua speaking regions of northern and central highland Ecuador (Staller, 2007: Figure 2). Other lightning *huacas* with Catequilla toponyms in the Ecuadorian highlands and associated with Quechua and Aymara and Inca expansion included: two hills in northern Ecuador with Catequilla toponyms, San Catequilla de Pichinche near San Antonio, and Catequilla de Guachalá located in nearby Cayambe (Almeida 2002). In the central highlands are numerous lightning related *huacas* with Catequilla toponyms, including four subterranean springs around Ríobamba, Latacunga, Tisaleo, Quero, and Chambo (Figure 3). Spanish Conquistadores passed through this region in 1547 and compared regions of northern highland Ecuador to Spain while following the *Camino Real* or Inca highway. The climate and astronomical significance of this region of the northern Andes is described by Pedro Cieza de León:

... In parts of the mountains of the Andes there are ravines and dales, which open onto into deep valleys of such width as often to form great plains between the mountains, and, although the snow falls, it all remains on the higher part. As these valley are closed in, they are not molested by the winds, nor does the snow reach them, and the land is so fruitful that all things which are sown yield abundantly, and there are trees and many birds and animals. The land being so fertile is well peopled by the natives. They make their villages with rows of stones roofed with straw, and live healthily and in comfort. Thus the mountains of the Andes form these dales and ravines, in which there are populous villages, and rivers of excellent water flow near them... The climate of these plains is more hot than cold, and in some seasons more so than in others, and the plains are so low, that the sea is almost as high as the land. The season of greatest heat is when the sun has passed by and reached the tropic of Capricorn, which is on the 11th of December, and then it turns again towards the equinoctial line. In the mountains, although there are provinces with a warm climate, yet the contrary may be said of them, that there is more cold weather than hot... (2005 [1553] pp. 129-131).

Most thunderstorms in the Northern and Central Andes occur between December and February and are common along the coast and particularly in the puna and altiplano of the high sierra. Significantly, *Illapa* was venerated each year in early December during the Inca festival of *Capac Raymi* (Cobo, 1990 [1653]; Zuidema, 1980, 1992, 2011). In Cuzco, three idols of the *Illapa* trinity were brought out of the Coricancha with the three idols representing *Inti* the

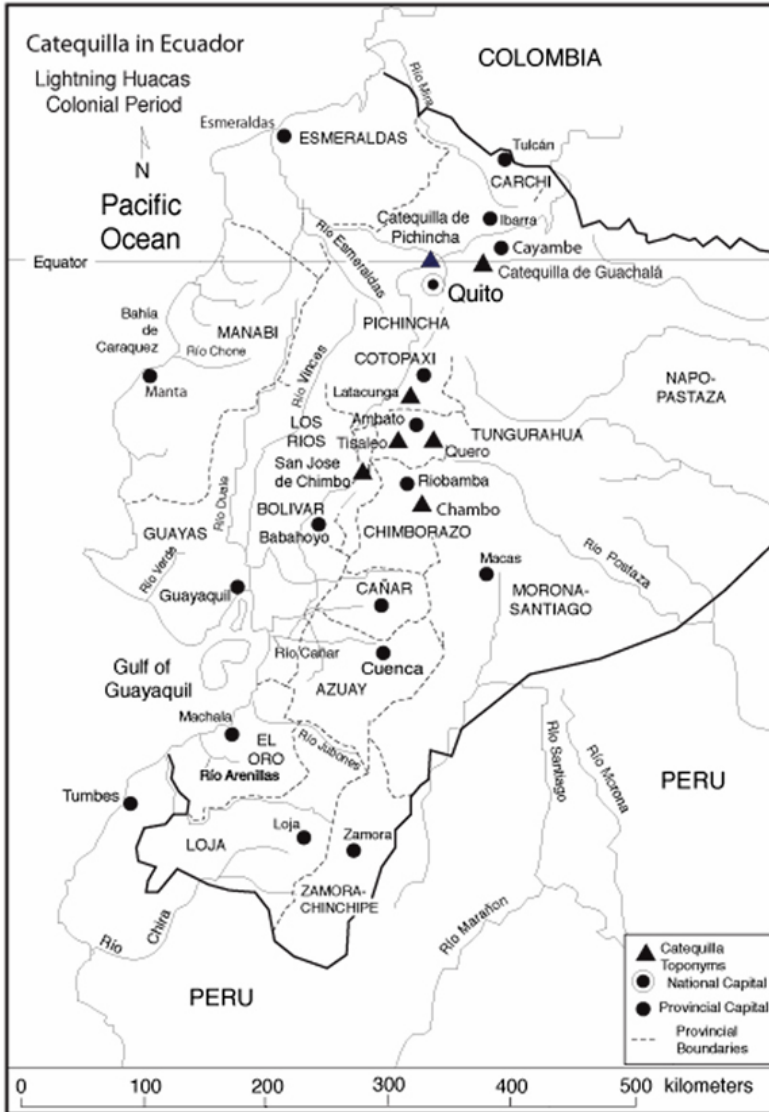


Figure 3. Map of Inca lightning *huacas* in the early Colonial Period (c. AD 1531-1580) Ecuador. Lightning *huacas* in the Quichua and Aymara speaking areas of northern and central highlands were designated with the geographic toponym “Catequilla.” There are many lightning related *huacas*, and *ushnus* in the southern highlands of Cañar, Azuay, and Loja province, however most of these sites have different toponyms in the non-Quechua regions of the cordillera.

Sun during the *Capac Raymi*¹⁰ (Acosta (1962 [1589]: 268). *Capac Raymi* rituals and rites were focused upon penitence and blood sacrifice (Cobo, 1990 [1653]; Staller, 2006; Zuidema, 1992, 2011). *Illapa* and the Catequil cult had metaphorical and symbolic connections to lunar cycles and eclipses related to the December solstice, which has celestial associations to dark cloud constellations and symbolic reference in the natural world to felines, serpents, and foxes. The exploitation and reproductive cycles of terrestrial foxes are governed by lunar cycles, and the word *atoq* (fox) has a free association to “*wañumarka*” or “storehouse of the dead” and is the name attributed to the principal *apu* in Misminay, Peru (Urton, 1981: 70). Thus, such animal familiars are also linked symbolically to celestial phenomena as well as mountain summits. Fox and serpent shaped dark constellations in the center of the Milky Way are particularly associated with certain points in the rainy season, especially December through February. Inca festivals held in early December sometimes referred to dark cloud constellations such as Machacuay “the serpent” which was visible in the night sky during this time in the annual cycle (Magli, 2005).

San Catequilla de Pichincha: Inca Expansion and Ancient Astronomy

San Catequilla de Pichincha is located in the Valley of Pomasqui, approximately 40 km to the north of the city of Quito. The valley is situated between the western and eastern Andean cordillera, and therefore part of the *Callejón Interandino* or central intermountain valley of the parroquia of San Augustin de Pichincha. Catequilla stands 2638 masl (Almeida, 2002). The southern terminus of the summit is situated directly on the *Mitad del Mundo* at the equator, 0°0'00" South Latitude, and 78°25'43" West Longitude, making this the paradigmatic place of the astral positioning. (Figures 4a-4b). The region is essentially *terra incognita* with the exception of the Inca fortress, Pucará de Rumicucho (Almeida, 1996, 1998, 1999, 2000; Almeida and Holguer, 1984; Ortiz and Castillo, 2006). Cerro Catequilla is relatively low, compared to the surrounding mountains, its summit extends a little over 200 meters SW to NE and it is the southwestern terminus of the hill directly at the equator, where the archaeological remains of the astronomical site on San Catequilla is situated (Figure 5). The setting is ideally suited for astronomical purposes as to the west

¹⁰ Triadic associations and classifications are common to *Illapa* veneration and in post colonial times came to later have an association with the Holy Trinity of Christian dogma (Cardinale, 1983).

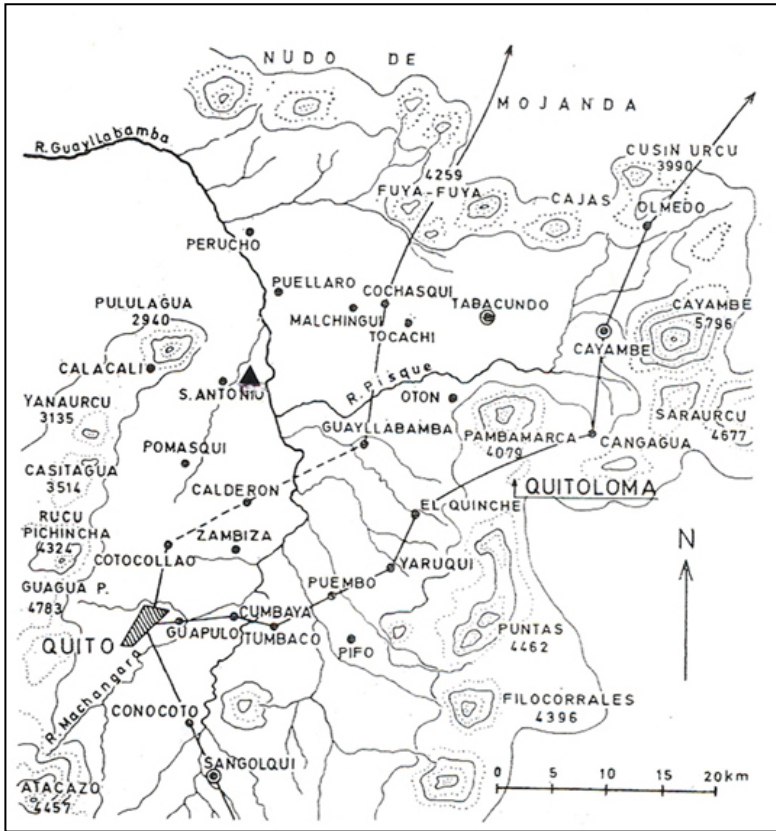


Figure 4a. Map of the highland regions north of Quito showing Catequilla, indicated by the triangle, and the surrounding terrain. Note that the various mountains and volcanoes west of the hilltop *huaca* range between c. 2940 to 4783 masl, making the hill an ideal location for astral positioning. The lightning *huaca* is beside the Río Guayllabamba, which directly connects the northern highlands with the Esmeraldas coastline along northern Ecuador. The lines extending from Quito show the approximate location of the Inca road or *Camino Real*. This region of the Andes is ideally suited for cultivation and many of the communities and towns date back to the Colonial Period (from Oberem, 1969: Figure 1).

of San Catequilla are Rucu Pichincha, Casitagua, Yanaurcu, Calacali, and Pululagua, all significantly taller mountains, ranging between 3000 to 4100 masl, and therefore suitable for casting sightlines in measuring the passing of lunar or solar cycles on the horizon (see e.g., Zuidema, 1964, 1982, 2008; Ziolkowski and Sadowski, 1992). Mt Fuya Fuya is to the NE and clearly visible



Figure 4b. Superimposed earthen platforms on San Catequilla, Pichincha Province, Ecuador showing their relationship to the equator. The configuration of the various architectural features is most visible from aerial images. The small stone circular enclosures or platforms tangent to the large circular platform on the NW side was constructed, according to 16th century chroniclers, at places where lightning bolts hit the summit. The small stone enclosure to the NW of the large circular platform is constructed of fieldstone. This and other enclosures on the hilltop and surrounding valley have been found in this study to have a role to calculating sightlines associated with the reckoning of astronomical cycles. The architectural remains appear to be buried under a 20-30 cm humus layer (Courtesy of Google Earth).

from the platform as are Mt. Puntas and Mt Filocorrales to the SE. Lightning veneration extended from Quito to Cuzco during the early Colonial Period (Acosta, 1962 [1590]: 221; San Pedro, 1992 [1560]: 174; Rostworowski, 1983: 24 if; Espinosa Soriano, 1988a-1988b). Spirits associated with lightning are known to have an ancient origin in Andean cosmology and religion and are symbolically depicted in various cultural traditions (Gade, 1983; Espinosa Soriano, 1988b; MacCormack, 1991). Catequilla can also refer to “apu” or mountain lord (Albornoz, 1989 [c. 1584]: 210; San Pedro, 1992 [1560]: 176; cf. Topic *et al.*, 2002: 310-311). San Catequilla is located beside a series of natural springs and ethnohistoric accounts suggest that this Inca platform was provided

ritual offerings and highly venerated by Andean societies during the Late Horizon and early Colonial Period because of its association to lightning and importance to the reckoning of astronomical cycles (Espinosa Soriano, 1988a; Staller, 2007; Topic *et al.*, 2002).



Figure 5. Topography of the region surrounding the San Catequilla platform showing the extent of the hill indicated by the large raised oval. The raised hexagon provides the location of the architectural remains on the SW edge of the hilltop summit, located at precisely $0^{\circ} 00'00''$ South Latitude. Architecture consists of superimposed circular/rectangular earthen platforms. The *Camino Real* or Inca Highway passes to the east of this valley to Imbabura Province and beyond to the Colombian border. The Pumasqui Valley has since ancient times been a primary trade route between the northern highlands and the Esmeraldas coast. The Inca fortress of Pucará de Rumiucucho indicated by the raised rectangle in the top of the image has been excavated, and includes a site museum. The rest of this valley is from an archaeological standpoint *terra incognita* (Courtesy of Google Earth).

The Pomasqui Valley is a hydrographic basin formed by two major rivers; the Río Monjas, which runs along the western slopes and empties into the primary river in this region the Río Guayllabamba. The Río Guayllabamba originates along the eastern cordillera of northern Ecuador, and empties into the sea in coastal Esmeraldas Province and has since ancient times been a critical link between highland and coastal populations. The geology and geomorphology of northern highland Ecuador is tectonic and volcanic (Hall and Mothes, 1998: 18-19; Almeida, 2002: 5). The volcano Cerro Pululagua is located just west of San

Catequilla and was used in shadow casting and to measuring sightlines during different parts of the annual cycle. In geographical terms, the Pomasqui Valley represented a major intermountain pass into northern Ecuador and to the north to Imbabura and Carchi Province. The stratigraphy is complex at San Catequilla: consisting of an uppermost layer is a clear coffee color stratum the result of humus buildup, with an average thickness of between 20 and 30 cm (Almeida, 2002; Erazo, 2007). This layer is rich in organics and compact with fine granular inclusions, ideally suited for cultivation. Indigenous populations in the surrounding valley have cultivated certain landraces of maize in the northern slope of the San Catequilla hill for centuries.¹¹ The second stratum is characterized as volcanic tephra composed of earth, ash, sand and medium sized to large granules of volcanic pumice associated with eruption of the Pululagua volcano dated to 300 B.C. (Hall and Mothes, 1998: Figure 7). According to geologists, this was a particularly intense eruption in which; “powerful flows with much piroclastics consisting of large blocks and ash that covered the plains of San Antonio of Pichincha to Pomasqui” (Hall and Mothes, 1998: 19; see also Villalba and Alvarado, 1998). The fluvial protoclast layer of volcanic ash is distinguished by well-defined interface, its khaki green color and a very fine and compact ash essentially free of inclusions contrast sharply with surrounding matrix (Villalba and Alvarado, 1998). Such sediments, and ash cover the San Catequilla platforms as well as the surrounding landscape and make this region ideally suited for cultivation. Many of the towns in the Pomasqui valley and regions to the north in Cayambe and Imbabura Province date back to the early Colonial Period. Andean towns dot the slopes of the Pomasqui Valley, including San Antonio de Pichinche, Lulumbamba, Cala Calí, and Perucho. This region is characterized by low levels of precipitation, totaling to less than 500 mm per annum, and the natural vegetation is classified as xerophytic equinoctial (Almeida, 2002: 5). In his description of the geography around Quito Cieza de León describes the climate and agriculture of the region as ideally suited to pastoralism and agriculture:

The climate is healthy, and more cold than warm... The city of Quito is under the equinoctial line, indeed only seven leagues distant from it. The surrounding country appears to be sterile, but in reality it is very fertile, and all kinds of cattle are bred in it plentifully, besides other provisions, corn and pulse, fruit and birds. The country is very pleasant, and particularly resembles Spain in its pastures and its climate, for the summer begins in April, and lasts until November, and, though it is cold, the land is no more injured by it than in Spain... “The natives are in general more gentle and better disposed, and have fewer vices than any of

¹¹ Such maize was sometimes used in the manufacture of maize beer or *chicha* that is consumed in the context of festivals during different parts of the annual cycle.

those we have passed, and indeed than all the Indians of the greater part of Peru. This, at least, is what I myself have seen and understood, although others have formed a different opinion... There are many warm valleys where fruit trees and pulses are cultivated all the year round. There are also vineyards in these valleys, but as the cultivation has only lately commenced, I can only mention the hope that they will yield; but they already have large orange and lime trees. The pulses of Spain yield abundantly, and all other provisions may be had that man requires... (Cieza de León, 2005 [1553], pp. 140-142).

San Catequilla is located where the Río Monjas empties into the Río Guayllabamba just north of the area described in this passage. The site is made up of superimposed platforms, a buried rectangular platform measuring about 100 meters N-S and about 80 meters E-W, under a large circular earthen platform measuring 60 meters in diameter (Almeida, 2002: 4). The rectangular platform is apparent on aerial photos by the vegetation that grows upon it, which is distinct from the surrounding vegetation on the hilltop. This is significant as many chroniclers and ethnohistorians have stated that the Inca brought cut stone and earth from sacred places in the empire in their constructions in the *huacas*, *ushnus*, and palace estates in this part of the Andes, as well as in the construction of the *Tambos* all along the *Camino Real* (Betanzos, 1987 [1551]; Cieza de León, 2005 [1553]; Garcilaso de la Vega, 1966 [1609]; see also Fresco, 1982, 1983). The location of these superimposed platforms on the SW slope of Cerro Catequilla are situated at the only place on the 200-meter long hilltop where the equator is directly overhead (Figures 6a-6b). This location has broader implications for, and is an indirect reflection of, the profound esoteric knowledge of Inca astronomers regarding shadow casting and astronomical calculation – particularly with regard to the solar and lunar cycles. The architectural remains are earthen rather than cut stone constructions indicating they were probably constructed with the context of earlier Panzaleo culture, as most Inca construction and landscape modification throughout this part of the Andes was made by stonemasonry. Archaeologists have identified both Inca and Late Panzaleo pottery in their excavations on the base and parts of the summit (Almeida, 2002). One such Inca site is located nearby to the southeast of San Catequilla, what appears to be an unexcavated truncated platform on the summit of a hill called Bilobano. Below this feature along the lower slopes of nearby the Bilobano hill are Inca irrigation terraces fed by underground springs (Figure 7a). The Inca fortress Pucará de Rumicucho is visible from the hilltop (Figure 7b) and it represents the only Inca site in the valley that has been the subject of intensive archaeological research (Almeida, 1996, 1999). The mountains that close the valley to the south include: Cushinjeros, Loma Velasco, Carcelén, Voladero and Providencia (Almeida, 1999). All of these mountains and volcanoes are substantially larger than Catequilla (>3000 masl) and thus ideally suited as sightlines for astronomical purposes.



Figure 6a. Close up of the superimposed platforms at San Catequilla. The platform architecture on includes various small circular paved stone platforms surrounded enclosed by upright stones. The large circular platform measures 60 meters in diameter and the rectangular platform underneath measures approximately 100 by 80 meters (Courtesy of Google Earth).



Figure 6b. These platforms are situated over the SW edge of the Cerro Catequilla at the only location on the 214 meter long hilltop where the equator passes, as indicated by Google Earth. The SE edge of the rectangular platform is approximately 10 meters higher than the NW corner, making it ideal for calculating sightlines with the surrounding topography (Courtesy of Google Earth).



Figure 7a. Ushnu platform NE of San Catequilla de Pichinche located on the southern extent of the Pomasqui valley. The unexcavated site consists of a truncated platform on the summit of the hill above the green vegetation, which is watered by ancient irrigation canals fed by subterranean springs. This photo was taken from the summit of the southwestern edge of superimposed platforms at San Catequilla (East) (Photo by John E. Staller).



Figure 7b. The Inca fortress at Pucará de Rumicucho is visible from San Catequilla as indicated by this image. The site is on the summit of a small hill located in the foreground where the Río Monjas flows into the Río Guayallabamba (Northwest) (Photo by John E. Staller).

There is very little information in the Spanish chronicles or from the Audiencia de Quito, on the essential theme of how temporal cycles were recorded in and around Quito during the Contact Period. Most scholars have found that astronomical calculation regarding the solar calendar was achieved through shadow casting (Zuidema, 1982, 1997, 2008, 2011). This is brought out by various 16th century accounts that state that such pillars in general, and those associated with *huacas* near the equator in particular were highly venerated by both Inca and local societies in these regions of the cordillera. Their religious importance is no doubt related to the fact that such features had increasingly diminished shadow along the equator. While visiting San Catequilla in July 2008, I photographed stone rubble on the platform that appears to have been the foundation for the pillar (Figure 8). Columns or pillars approaching Quito near the equator had diminished shadow, and were for this reason said to be the most highly revered by the Inca as well as indigenous populations in this region. The chronicler Garcilaso de la Vega (1966 [1609]: 118) stated that the pillars and columns around Quito and to the north in Cayambe and Ibarra were “*broken to pieces*” by the Conquistador Sebastián de Benalcázar who tore them all down because the Andeans worshiped them idolatrously (see also Ramos Gómez, 1988). The pillars essentially functioned as gnomons, and Inca astronomers would make records of changes in the shadow cast by the sun on them during certain times of the year (Zuidema, 1980: 317-318, 1964, 1980, 2011; see also Ziolkowski and Sadowski, 1992).

Many lightning *huacas* around the equator and regions to the north have circular stone enclosures or platforms which were said by local Andean informants to have been places where lightning struck and therefore sanctified by such features (Figure 9). Such features have also been identified archaeologically in and around the Inca fortress at Rumicucho (Almeida, 2002: 6). These circular enclosures or platform features generally measure between 3 to 4 meters in diameter and are found dispersed throughout this region. These features were not destroyed as the pillars because they were not venerated in an “idolatrous” manner and some are located in indigenous towns (see Almeida, 1998, 2002). Such enclosures are visible from San Catequilla in the nearby town of San Antonio. The research presented in this study indicates that such features also had astronomical function in association with sight lines to the surrounding horizon, solar cycles and constellations in the night sky (Figures 10a-10b). The Ecuadorian government sought to recreate the ancient Lunar-Solar calendar of Quito. Reconstruction of a larger enclosure feature was carried out at Quitsato by Instituto Nacional Patrimonio Cultural-Quito in June 1997 near the lightning *huaca* of Catequilla de Guachalá in neighboring Cayambe. These researchers combined research and satellite technology with the goal of identifying the relationship of the circular stone enclosures or



Figure 8. Remains of what appears to have been the foundation of a pillar at San Catequilla (Photo by John E. Staller).



Figure 9. Northwest circular stone enclosure on NW of the large circular earthen platform is still visible on the summit of the hilltop. Note the upright stone slabs that form the outer edge of the stone circle. The enclosure measures approximately three meters in diameter. The town of San Antonio is visible at the base of the hill (Southwest) (Photo by John E. Staller).



Figure 10a. Close up of one of several circular enclosures, measuring twenty meters in diameter, and located in the nearby town of San Antonio due west of San Catequilla de Pichinche. This enclosure and others in the town are visible from the earthen platforms on San Catequilla and may have been used with the lightning *huaca* for astronomical purposes. Such small circular stone paved platforms or enclosures within and also tangent with the large circular platform were, according to some 16th century chroniclers, constructed where lightning hit the summit. Survey of these features indicates they were constructed of worked stone masonry. The image shows how such features may have been used in shadow casting. (North) (Courtesy of <www.quitsato.org>).

platforms with the geographic environment of the equinoctial Andes. In that case, the original Inca enclosure associated with the platforms was destroyed and the reconstruction was hypothetical. The following study seeks to document how the platform geometry at San Catequilla and its associated stone enclosures may have been used to measure and record solar and lunar cycles in association with natural landscape features in the surrounding landscape.

Archaeological investigations at Rumicucho document two major periods of occupation associated with San Catequilla and the surrounding landscape; Integration Period and the Late Horizon Period Inca expansion. Almeida (2002) has reported archaeological remains primarily ceramics on and around San Catequilla and at an archaeological site located on the NW base of the hill pertain to two cultural groups: late Quito-Panzaleo and Inca culture. This



Figure 10b. Individual on the edge of the enclosure with the sun setting behind the Mt. Pululagua Volcano (West) (Courtesy of <www.quitsato.org>).

suggests that the religious significance of the lightning *huaca* is asserted to have been in association with Inca expansion in that local chiefdoms venerated the *huaca* as symbolic recognition of Inca authority and conquest of this region of northern Ecuador (Almeida, 2002: 7). However, the architecture at San Catequilla may have been initially constructed by the Panzaleo and then modified in the context of Inca expansion. This is implied by the construction of the large circular earthen platforms or enclosures during the period of Inca expansion, lightning *huacas* or *Illapa ushnus* were given piles of sling stones as ritual offerings¹² (Topic *et al.*, 2002; Staller, 2007). Preliminary research at the equatorial lightning *huaca* of San Catequilla de Pichincha has indicated that

¹² Most archeologists working in the northern Andes have reported the presence of such sling stones as evidence of conflict and presented evidence to suggest that such sites had a defensive function.

sling stones may have been mixed into the clay used to construct the circular platform on the summit (Figure 11). The use of sling stones in the construction of a lightning *huaca* and its importance as ritual offerings that were commonly placed on artificial terraces associated with truncated platforms, suggests that sling stones had associations to Inca culture beyond their use as weapons. Such associations have already been addressed with regard to Inca cosmology and lightning veneration and imply that this large circular earthen mound may represent an Inca modification or reconstruction to this important lightning *huaca*. Chroniclers mention that sling stones were symbolically associated with lightning (*Illapa*) through death, and these associations are particularly emphasized with the religious cult to Santiago during the Conquest and Colonial periods (Cardinale, 1983). This is apparent in Inca mythology where a mythological Inca used a sling to impose an ethical order of in the transformation of the Cuzco valley. The shape of sling stone closely approximates hail and thus its symbolic association to *Illapa* through death and the destruction of crops.



Figure 11. The large circular platform at San Catequilla is approximately 1.5 meters above the associated rectangular earthen platform. Animal burrows along this circular platform indicate that it was constructed of fine yellow clay with sling stone inclusions. Sling stone offerings have symbolic associations to *Illapa* in Inca mythology and cosmology, and have been reported at other Catequilla sites and Inca *huacas* near and along the equator (Photo by John E. Staller).

Discussion and conclusions

In the following analysis of the astronomical function of the San Catequilla platforms I will solely address solstice cycles and present these data with the understanding that the various hilltop architectural features at this *huaca* and their position to one another also have reference to the surrounding landscape (Figure 12). The dashed lines that demarcate the rectangular platform indicate that it is oriented 6° west of astronomical north. The rectangular platform measures 100 meters N-S and about 80 meters E-W. The orientation of 6° west of astronomical north has also been recorded in the context of archaeological fieldwork by the author at the Inca palace estate of the last ruler Huayna Capac at Incahuasi de Caranqui in Imbabura Province. This orientation was recorded in association with a 20 by 10 meter cut stone basin at the NE corner of that site (see Figure 1). Significantly, it is the SE corner of the rectangular platform that is presently the closest point to 0° latitude and that this part of the site stands some 10 meters higher than the NW corner along the slope. Supporting the interpretation that this was a primary location for casting sight lines. The closest and largest mountains in the Pomasqui valley are west of the site, and would have been coordinated with solar and lunar passage over the course of the annual cycle. Another important point regarding the geometric configuration of the superimposed large circular platform it is situated precisely so that the axis of Zenith solar passage would have been just above and at the middle of the platform (see Figure 12). Astronomical North is midway between the SE-SW corner and it runs between the two central platforms or enclosures, implying the slightly overlapping platforms were constructed to center the rectangular platform with respect to the large circular platform.

Point X marks the approximate location of the SE corner of the rectangular platform and also the primary location for sightline calculations (Figure 13). Line C-D represents the path of the solar zenith passage, in other words, the path of the sun on the days of the spring and fall equinox. On these days, the sun rises in the East and sets in the West. Because of the locations of the site directly under the equator this line simultaneously is the day of Zenith Passage or vertical transit. In this case, the sun is directly overhead on these days, essentially dividing the earth and sky into two equal parts (North and South). Thus, solar zenith passage would have been at the point where those lines meet over the middle of the large circular platform. The distance from NE corner of the dashed rectangle to point X in the SE corner is approximately 100 meters, perhaps reflecting units of measure. The small circular platforms dispersed in different parts of the superimposed platforms cluster primarily around the NW corner and demarcate both the sight lines A-C and the solar

solstice paths, suggesting these were deliberately placed in these areas of the platform for the purposes of refining astronomical calculation. The alignments with regard to the edges and center of such enclosures would have given astronomers some leeway in predicting the coming of different parts of the annual cycle, particularly during the rainy season, when continuous cloud cover would have made such calculations difficult.

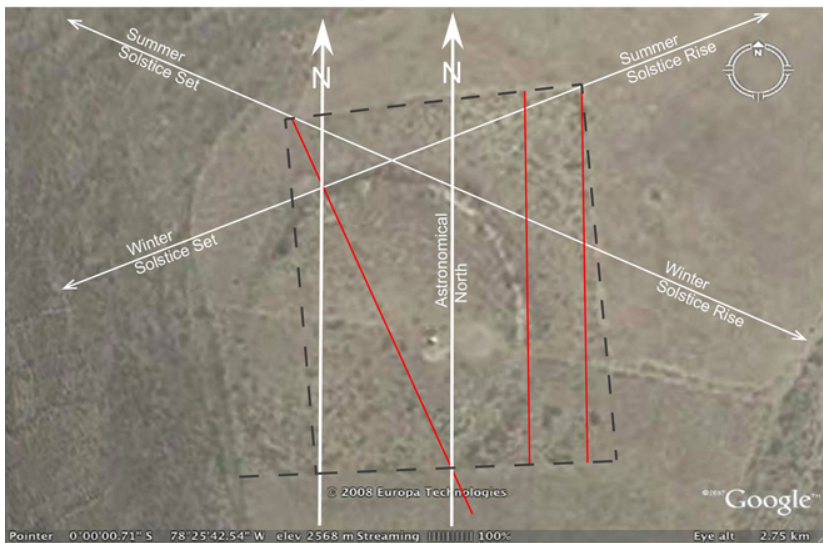


Figure 12. Aerial view of the superimposed platforms at San Catequilla and their reference to sightlines and the organization of the platforms to astronomical calculation to the spring and fall equinox. Note that Astronomical North is at the center of the lower portion of the rectangular platform and the two circular enclosures align this platform with the center of the large oval platform indicating that such circular enclosure features had an astronomical function with regard to sightlines and orienting the superimposed platforms to one another (Courtesy of Google Earth).

In conclusion, although what is presented here provides a basis for understanding the interrelationship of various architectural elements contained within the archaeological remains, further research needs to be undertaken to understand how these geometric interrelationships refer to the surrounding landscape. It would have been the relationship of various landscape features to the surrounding geography, particularly mountains and volcanoes that would have astronomical reference to solar and lunar cycles and celestial bodies in the night sky. There is a strong possibility that these superimposed earthen

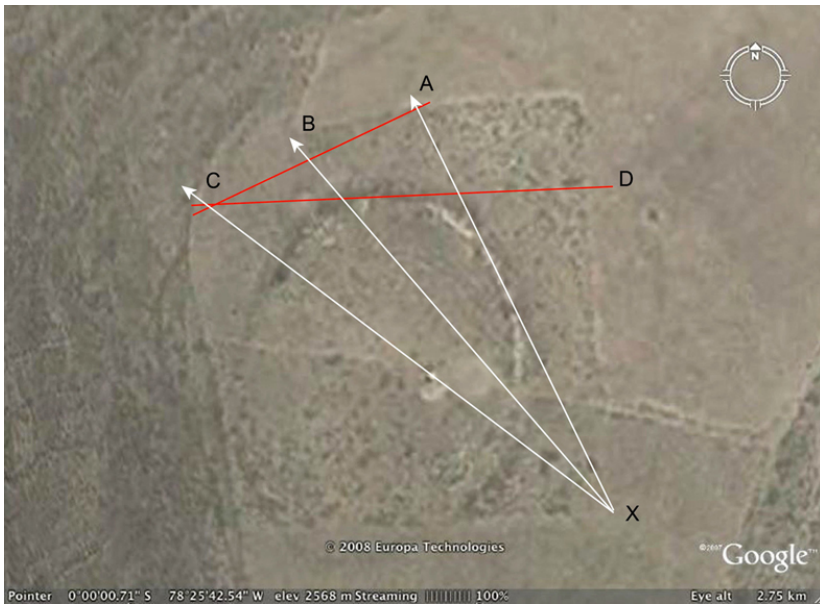


Figure 13. Probable location of sightlines with regard to the other architectural elements. The points marked A to D, and X, contains one horizontal red line (line C-D) that is the path of the sun on the days of the spring and fall equinox. On these days, the sun rises in the East and sets in the West. The geometric organization of the superimposed platforms clearly suggests an astronomical function with regard to calculation of solar cycles and the solstices (Courtesy of Google Earth).

platforms were initially constructed by Panzaleo culture given the nature of the architecture. The inclusion of what appears to be sling stones and river cobbles with the fine yellow clay related to the construction of the large circular platform may be reflecting later Inca modifications to what was an already important lightning *huaca* before the Inca expanded into this area of the Andes. After the Inca constructed the Pucará de Rumicucho and the truncated platform on the summit of nearby the Bilobano hill it would have been later venerated by local populations through religious veneration of *Illapa* through the Catequil cult. The Inca fortress at Pucará de Rumicucho and another potential Inca *ushnu* at Bilobona suggests strong Inca presence in this part of the Andes. All these sites were within direct access to the Inca highway, and such astronomical *huacas* would have been critical to the agricultural societies in these regions and particularly to recognition of Inca authority.

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