

Orientation of Latin-American Pyramids and Temples

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ABSTRACT

The number of non-cardinally-orientated temples and pyramids in Latin-America, from Mexico down to Peru, is often attributed to be the result of possible orientations to the magnetic pole. It is argued by several researchers (Fuson 1969, Carlson 1975, Klokočník, 2010) that structures could have been oriented by means of a lodestone compass or a similar instrument.

However, by gathering and analyzing 157 separate sites in Latin-America, from Mexico down to Peru, it appears that there is, in contrast to former researches, no distinct relation between orientation and the location of the wandering magnetic pole (McElhinny and McFadden, 2000).

Over 90% of the ancient sites in Latin-America are oriented East of True North (clockwise oriented). Coincidence or topography cannot cause this. What possibly could have made researchers assume that magnetic compasses had been used to orient the structures? They reason that, because the magnetic pole wanders around the geographic pole, this could be the cause of such a deviant orientation.

Orientation	Amount
Clockwise oriented	238
Counterclockwise oriented	15
Cardinally oriented	10

A square or rectangular building can be uniquely oriented within a range of 90°. We cannot determine other than by an assumption which side of a pyramid or temple is the main side. It is argumentative to say that an alleged main side of a temple was, as an example, oriented to the East of the rising Sun. This kind of assumption pollutes many of the researches done in this field, making most conclusion useless. Therefore, our research is solely focused on the orientation of the Latin-American pyramids and temples as a square or rectangle

with respect to the Cardinals, without making assumptions or expecting certain conclusions.

It is safe to conclude that there is no correlation between the orientation of the Latin-American pyramids and temples and the wandering magnetic pole. Our research concludes that the Latin-American pyramids and temples were oriented to an astronomical or geological phenomenon other than the wandering magnetic pole.

INTRODUCTION

Our work on this subject shows that the remarkable number of clockwise-orientated pyramids and temples in the Americas is not due to builders' errors. The deviations are too large to be written off as an error, and in most cases the pattern cannot be the result of orientations to the magnetic pole.

Generally, there is no correlation between orientation and the position of the magnetic pole. The magnetic pole moved significantly and that would result in a counterclockwise orientation that could correlate with the supposed ages of these buildings. Moreover, the Latin-American sites are much more clockwise-oriented than the position of the magnetic pole, i.e. they do not correlate at all (79%). However, we found some cases (21%) that could be the result of an orientation to the magnetic pole.

The outcomes of this research show, in contrast to other, smaller researches, that the orientation of Mesoamerican and Andean buildings is not related to the positions of the magnetic pole.

To perform this research, the locations of 157 Mesoamerican and Andean sites were listed and measured as per their orientation in Google Earth. Traveling to the locations, as is often done by researchers, is a waste of time and resources. From each separate site, the larger structures were measured in relation to the geographic pole, and that resulted in a database of 263 buildings. The next step was to compare the orientation of the structures with the position of the magnetic pole. If the builders had oriented their structures to the magnetic pole, the age of the structures and their orientation should correlate with the position of the magnetic pole at that time. This relation is not present as also suggested by former researches.

Such results raise the question: what was the builders' rationale regarding the orientation of their structures? The complete answer to this question is beyond the scope of this paper. However, regardless of how we approach the matter, if there is an astronomical entity to which the builders oriented themselves to, it eventually leads to a

mathematical cross-linking of the orientations of the ancient sites.

The results of such cross-linking are so profound that it raises once more the question: which phenomenon did the builders oriented themselves to? Although we are certain that this question has been solved, it is also beyond the scope of this paper.

METHOD

We have used Wikipedia as the main source for the locations of ancient buildings in Latin-America.

Source:

https://en.wikipedia.org/wiki/List_of_archaeological_sites_by_country

Wikipedia provides GPS information for every separate location. The 157 sites were listed in an Excel spreadsheet to measure and judge their orientation later in Google Earth.

For example:

Site Name	Latitude	Longitude	Orientation
Teotihuacan	19.693°	-98.846°	15.5°

Table 1: noting uniformly oriented cities

Unlike Chichen Itza, the city of Teotihuacan is uniformly clockwise oriented which gives no reason to split the site further into separate buildings with their own specific orientations. This is, however, the case with Chichen Itza, where the buildings appear to be differently orientated. Only the largest buildings were examined.

The total database consists of 263 buildings.

Site Name	Latitude	Longitude	Orientation
Chichen Itza	20.683°	-88.569°	23.0°
Chichen Itza	20.679°	-88.571°	27.0°

Table 2: noting non-uniformly oriented cities

Measuring of the buildings is done according to the principle that a square or rectangle building can only be uniquely oriented within an angular range of 89.9°. There is no distinction made in “front”, “left”, “right”, or “back” of a structure because that would be an assumption.

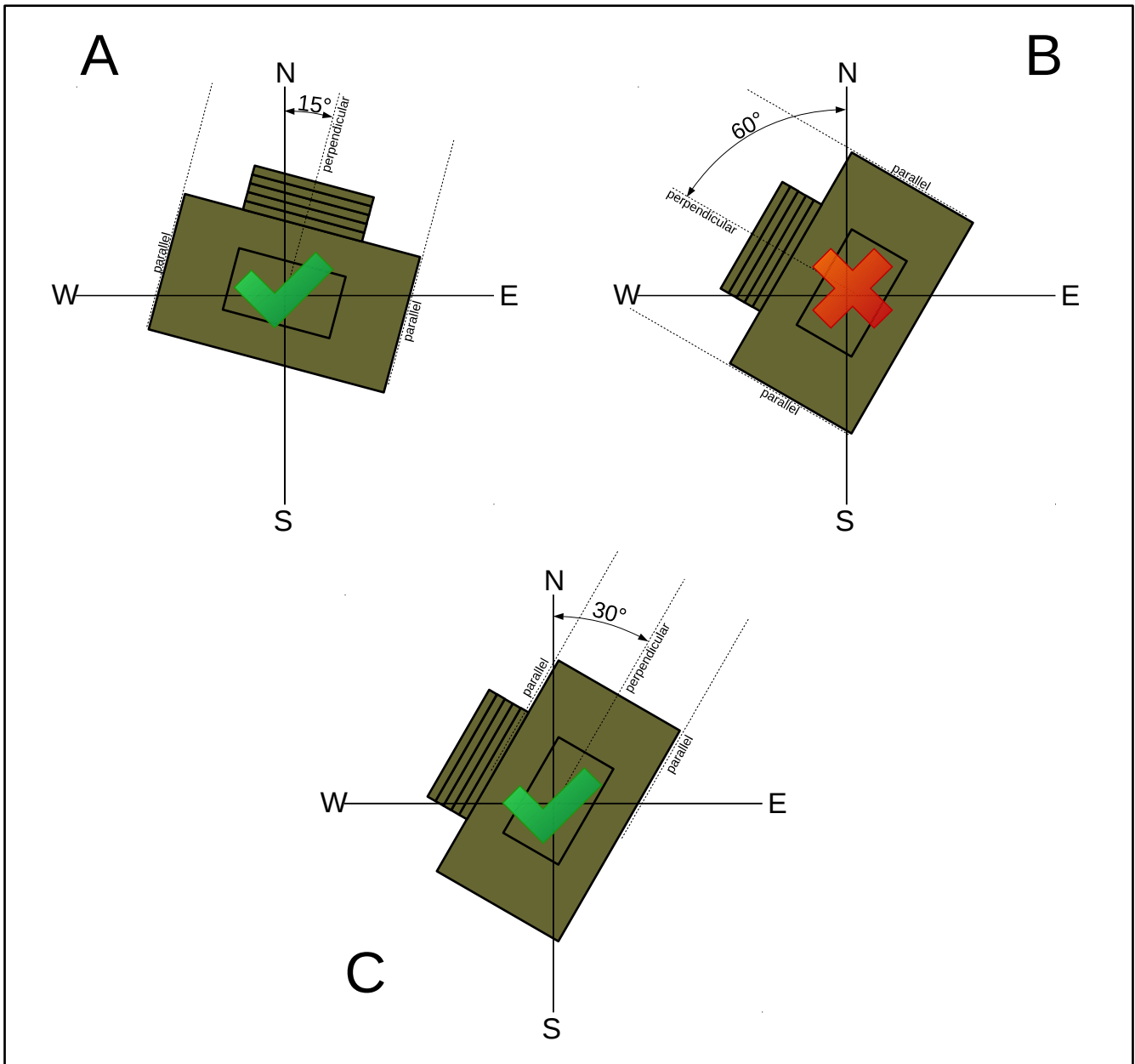


Fig 1: Buildings can be only uniquely positioned 44.9° on either side of True North. There are no assumptions made as “front”, “back”, “left, or “right” of a structure. Other methods lead to ambiguous, assumptive data. If we consistently use this method, it can be used to explore the orientation of any building in relation to the Cardinals.

The location (latitude, longitude) of the Latin-American temples or pyramids in combination with their orientations decides whether they correlate with the wandering position of the magnetic pole.

However, there is another factor playing a role in a possible correlation, and that is the official age of the ancient structure. It is generally believed that most of the Mesoamerican and Andean cultures built their structures between 1,000 BC and 1,500 AD. Any error in this official date could lead inevitably to a non-correlation.

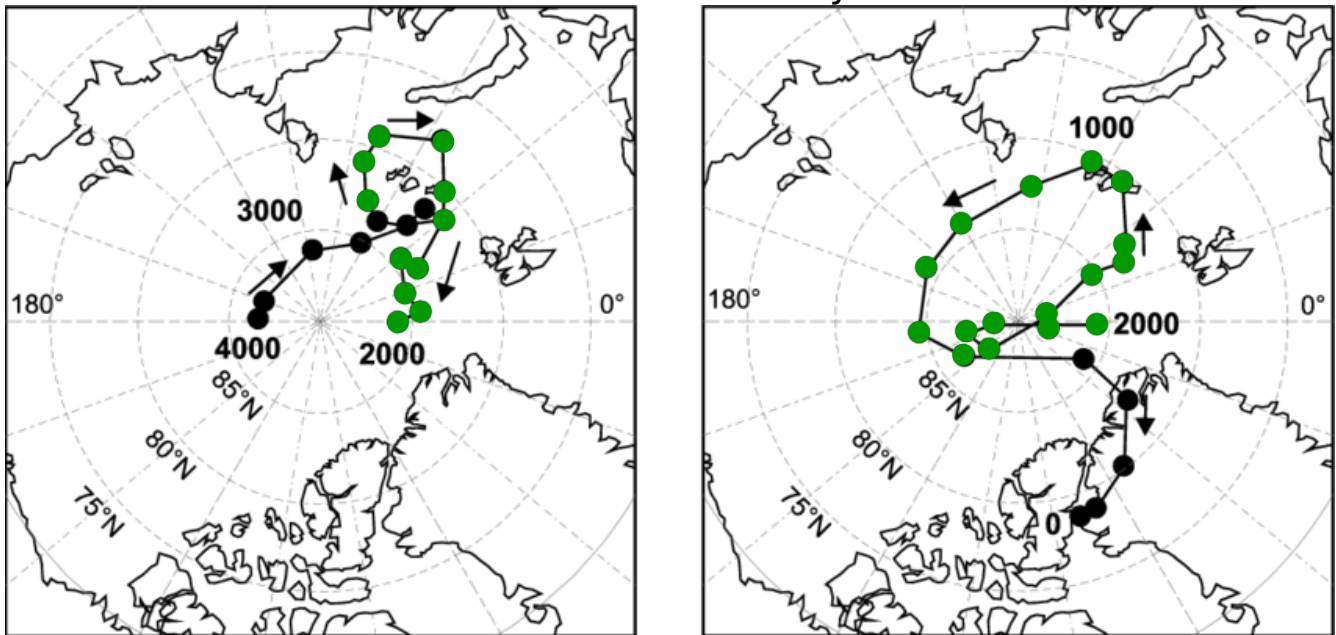


Fig 2: Magnetic pole positions during the last 4,000 years. The time between every dot is one hundred years. On the left, the movements between 2,000 BC and 0 (Year Zero). On the right, the movements between 0 (Year Zero) until today. The green dots are the locations of the magnetic pole during the supposed Mesoamerican and Andean eras. (source: McElhinny and McFadden, 2000).

From fig. 2 we can conclude that during the alleged high-rise period of the ancient Latin- American cultures between 500 and 1,500 AD the magnetic pole wandered around the geographic pole on both sides, as seen from the locations of Latin-American sites. In other words, buildings built between 1,200 and 1,500 AD should be counterclockwise oriented if the magnetic pole was used as a reference.

We can distinguish the location of two major clusters of the Latin-

American sites, namely a cluster around Mexico and a cluster around Peru. To make a more rational and accurate comparison with the wandering magnetic pole, the first step was to split the database of the 263 separate buildings into two parts.

If we had not been able to split the database into two parts, we would have found an average point somewhere in the middle between the two major clusters. That would present neither an average location of the Mesoamerican sites nor the locations of the Andean sites.

The main reason for grouping the sites into two major clusters is the following: if the builders would have used a simple compass, we would be dealing with reading errors of a non-sighting compass of $\pm 5^\circ$, which is a significant error. But if we group the buildings to a cluster, the errors of the group orientation are reduced to $\pm 0.35^\circ$ and $\pm 0.61^\circ$ for both the Mesoamerican sites and the Andean sites. This variance is due to the difference in group size between the Mesoamerican sites and the Andean sites. The Andean group is smaller, hence results in a larger variance.

$$\Delta E = \frac{\sqrt{(\Delta e_1)^2 + (\Delta e_2)^2 \dots + (\Delta e_n)^2}}{n} \quad (1)$$

ΔE : group error; Δe_n : individual error

The next step was to numerically list the locations of the magnetic pole between 1,000 BC and 1,500 AD and then to compare them with the orientation of the two major clusters 1 and 2. Due to the fact that the variance of both clusters is relatively small, the group should be correlating with the center region of the moving magnetic pole - if these correlate with each other. However, that is not the case.

$$\beta = \text{atan} 2(\cos \theta b * \sin \Delta L ; \cos \theta a * \sin \theta b - \sin \theta a * \cos \theta b * \cos \Delta L) \quad (2)$$

θa : latitude building or cluster; θb : latitude magnetic pole; ΔL : difference between longitudes;

Realizing that this might not be acceptable as sufficient evidence of a non-correlation between orientation and the locations of the magnetic pole, we did the same for each individual building. The comparison

with the individual buildings and the position of the magnetic pole requires also an accurate record of the official age of the separate buildings. Most of the ages were taken from Wikipedia, as a generally accepted source of information. If there would be a correlation between age, location, orientation, and the location of the wandering magnetic pole, it should be found in this data-gathering.

The final step was to cancel out possible errors in the dating of the buildings, by looking for other magnetic pole locations, in other periods, that would result in the found orientation of such buildings. In that case, the building could have been incorrectly dated and was oriented to the magnetic pole, which could lead to another date of the building.

RESULTS

The data of the locations and orientation of the 263 separate buildings can be found in appendix I. The work is performed according to the aforementioned method and is available for peer-review if that is deemed necessary.

Cluster	Avg latitude	Avg longitude	Avg orientation
Mesoamerican (1)	+17.1°	-92.4°	+12.8° ±0.35°
Andean (2)	-11.8°	-75.8°	+18.5° ±0.61°

Table 3: The locations and orientations of the two major clusters.

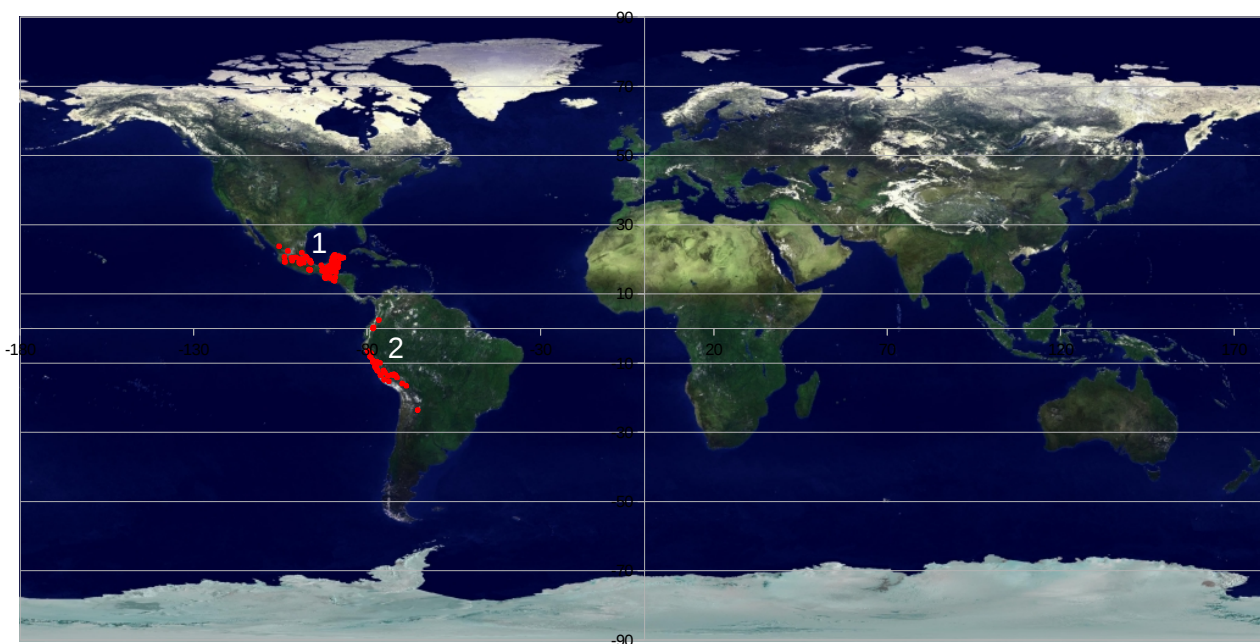


Fig 3: This map shows the clusters of both the Mesoamerican (1) and Andean (2) sites.

After numerically defining the positions of the magnetic pole from fig. 2, the theoretical orientations of cluster 1 and 2 were calculated by using formula 2. If there had been a relation between the magnetic pole and the orientation of the Latin-American sites, the numbers

would have been close to each other, but that is not the case. The differences are 10.6° for the Mesoamerican sites and 15.3° for the Andean sites, which is significantly too large to be correlative.

Cluster	Avg calculated orientation to wandering magnetic pole	Actual orientation
Mesoamerican (1)	+2.18°	+12.8°
Andean (2)	+3.23°	+18.5°

Table 4: The major orientation clusters show not a single correlation with the average position of the magnetic pole and the actual orientation of the two clusters.

The next phase was to look for patterns of the individual buildings - whether they would correlate with the magnetic pole. That was a much broader task and it took quite some time to work out. The table is listed in Appendix III. The results are listed in table 5 below.

Actual Orientation of Buildings

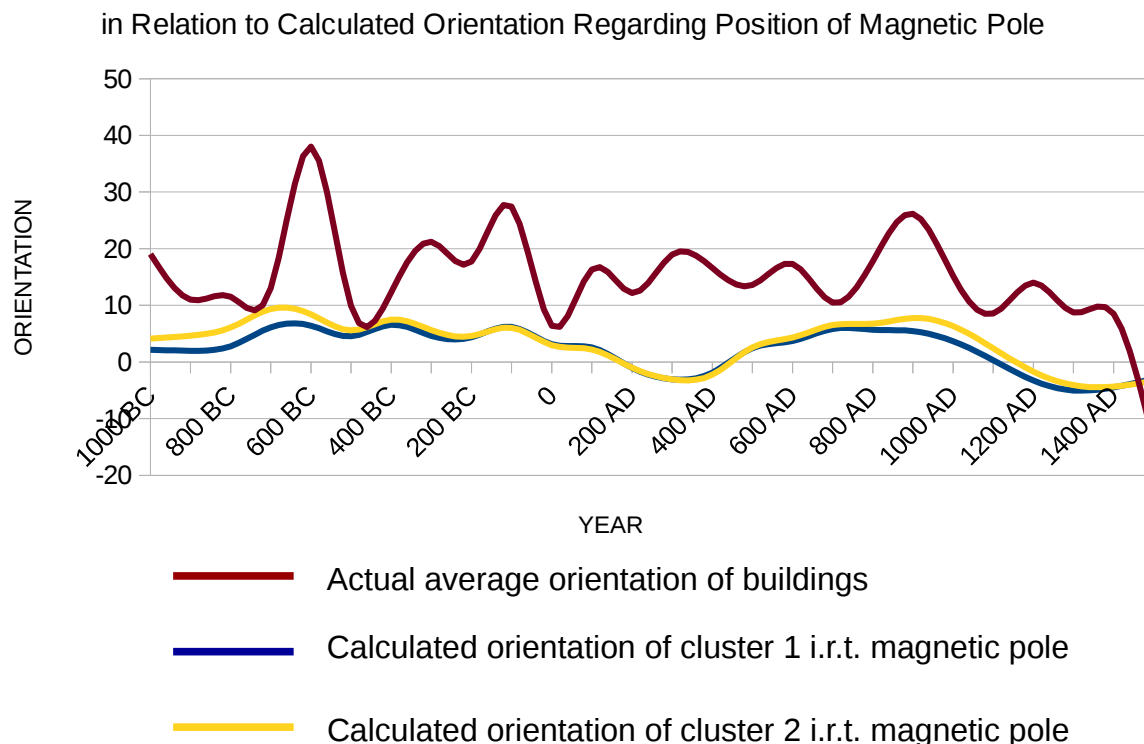


Fig 4: This graph shows no correlation between orientation and the location of the magnetic pole. The data of the brown line can be found in Appendix IV. The data of the yellow and blue lines can be found in Appendix II.

Correlates within an error of $\pm 5^\circ$?	Amount	%
YES	41	15.6%
NO	180	68.4%
OUT OF SCOPE	42	15.9%

Table 5: The separate buildings show also no correlation when their official dates are compared with the positions of the magnetic pole at that dates. The group "OUT OF SCOPE" is older than 1,000 BC.

Table 5 shows similar results: there is no correlation between the positions of the magnetic pole and orientation of the Mesoamerican and Andean sites.

Admittedly, it might be possible that official dating of the ancient buildings is incorrect, which on its turn would lead to a non-correlation with the magnetic pole in this research.

If ancient buildings had been dated incorrectly by the involved scientists, this could be one of the reasons for a non-correlation with the magnetic pole. That is the reason why the research has been expanded to look also for correlations in other time periods than the official ones. The errors of possible compass readings by the builders were limited to within $\pm 2^\circ$ (a double widened version of formula 1) because we are now dealing with the magnetic pole as a group and not with the individual poles. If we had kept the $\pm 5^\circ$ as the average reading error, it would have led to false correlations in the research, and therefore to incorrect conclusions.

Correlates in Other Periods?	New Cases	%
YES	15	5.7%
NO	211	80.2%

Table 6: This method brought 15 other cases to light. These buildings correlate with the position of a magnetic pole another period. This is caused by either coincidence or can be due to a wrong dating of these buildings. The missing 14.1% are the buildings that already correlated with the magnetic pole.

The results are listed in Appendix V. The database itself was too large to add to the appendix.

CONCLUSION

Three different methods were used to look for possible correlations between the position of the wandering magnetic North pole and the orientation of ancient pyramids and temples in Latin-America.

None of the methods leads to conclusive evidence of correlation. In other words: the structures were not oriented by means of a compass to the magnetic pole.

Only 41 (15.6%) of the 263 structures could have been possibly oriented to the magnetic pole. Even the method where other magnetic pole positions were reconstructed with orientation as the reference (which led to another time period of the structures) delivered only 15 (5.7%) additional results.

If we accept the idea that structures might have been incorrectly dated, it results in a total number of 56 structures (21.3%), which could have been oriented to the magnetic pole. The rest of the 207 (78.7%) structures do not correlate with the position of the magnetic pole.

The conclusion is that the majority of the builders did not orient their structures to the magnetic pole.

That raises a question: What was the rationale for locating and orienting their structures?

APPENDIX I – Location of Buildings and Their Orientation

NR	SITE	COUNTRY	LAT	LON	ORIENT
1	Pucará de Tilcara	Argentina	-23.5860	-65.4040	14.0
2	Altun Ha (A3)	Belize	17.7643	-88.3478	15.0
3	Altun Ha (B4)	Belize	17.7638	-88.3467	6.0
4	Caracol	Belize	16.7640	-89.1176	11.5
5	Lamanai	Belize	17.7650	-88.6530	20.0
6	Lamanai	Belize	17.7680	-88.6530	11.0
7	Lubaantun	Belize	16.2820	-88.9595	13.0
8	Nohmul pyramid	Belize	18.2174	-88.5847	41.0
9	Xunantunich	Belize	17.0890	-89.1415	-5.5
10	Puma Punku	Bolivia	-16.5615	-68.6800	3.5
11	Puma Punku	Bolivia	-16.5615	-68.6800	2.0
12	Tiwanaku	Bolivia	-16.5550	-68.6735	0.2
13	El morro del tulcán	Colombia	2.4440	-76.6000	22.0
14	Inca-Caranqui	Ecuador	0.3224	-78.1218	0.0
15	Pyramids of Cochasqui (nr. 14)	Ecuador	0.0546	-78.3060	32.0
16	Pyramids of Cochasqui (nr. 5)	Ecuador	0.0546	-78.3060	35.0
17	Pyramids of Cochasqui (nr. 9)	Ecuador	0.0546	-78.3060	35.0
18	Casa Blanca	El Salvador	13.9884	-89.6732	13.0
19	Casa Blanca	El Salvador	13.9894	-89.6725	13.0
20	El Tazumal	El Salvador	13.9790	-89.6740	18.5
21	San Andrés	El Salvador	13.8006	-89.3892	28.0
22	San Andrés	El Salvador	13.8025	-89.3875	20.0
23	Aguateca	Guatemala	16.3952	-90.2044	33.0
24	Ceibal	Guatemala	16.5136	-90.0613	8.0
25	El Mirador	Guatemala	17.7560	-89.9210	11.0
26	Holmul	Guatemala	17.3103	-89.2592	0.0
27	Iximche'	Guatemala	14.7358	-90.9962	36.5
28	Iximche'	Guatemala	14.7352	-90.9958	-36.0
29	Iximche'	Guatemala	14.7354	-90.9963	-43.0
30	Kaminal Juyu	Guatemala	14.6330	-90.5490	26.0
31	Kaminal Juyu	Guatemala	14.6310	-90.5475	20.0
32	Nakum	Guatemala	17.1760	-89.4051	6.0
33	Naranjo	Guatemala	17.1335	-89.2620	0.1
34	Q'umarkaj	Guatemala	15.0233	-91.1723	-4.0
35	Tikal	Guatemala	17.2220	-89.6240	11.0
36	Tikal	Guatemala	17.2220	-89.6230	10.0
37	Tikal	Guatemala	17.2205	-89.6275	4.0
38	Uaxactun	Guatemala	17.3936	-89.6345	44.5
39	Yaxha	Guatemala	17.0707	-89.4000	10.5
40	Yaxha	Guatemala	17.0758	-89.4025	7.5
41	Yaxha	Guatemala	17.0792	-89.4030	0.1
42	Zaculeu	Guatemala	15.3343	-91.4926	38.0
43	Zaculeu	Guatemala	15.3343	-91.4926	36.5
44	Zaculeu	Guatemala	15.3332	-91.4924	35.0
45	Zaculeu	Guatemala	15.3338	-91.4925	32.0
46	Copán	Honduras	14.8373	-89.1415	4.0
47	Acanceh	Mexico	20.8133	-89.4524	12.0
48	Acozac	Mexico	19.3296	-98.8897	40.0
49	Ake	Mexico	20.9475	-89.2995	10.0

50	Ake	Mexico	20.9470	-89.3005	5.5
51	Ake	Mexico	20.9468	-89.3018	2.5
52	Balamku	Mexico	18.5604	-89.9454	21.0
53	Becan	Mexico	18.5161	-89.4665	15.0
54	Becan	Mexico	18.5165	-89.4669	12.5
55	Becan	Mexico	18.5180	-89.4680	11.0
56	Becan	Mexico	18.5167	-89.4664	10.0
57	Becan	Mexico	18.5179	-89.4664	6.5
58	Bonampak	Mexico	16.7040	-91.0650	35.0
59	Cacaxtla	Mexico	19.2451	-98.3508	10.5
60	Cacaxtla	Mexico	19.2449	-98.3490	4.0
61	Cacaxtla	Mexico	19.2442	-98.3502	0.0
62	Calakmul	Mexico	18.1066	-89.8123	20.0
63	Calakmul	Mexico	18.1080	-89.8140	16.0
64	Calakmul	Mexico	18.1032	-89.8086	11.5
65	Calakmul	Mexico	18.1050	-89.8105	10.5
66	Castillo de Teayo	Mexico	20.7500	-97.6333	-3.0
67	Cempoala	Mexico	19.4470	-96.4056	13.5
68	Cempoala	Mexico	19.4466	-96.4056	12.0
69	Cempoala	Mexico	19.4475	-96.4054	8.0
70	Cempoala	Mexico	19.4473	-96.4035	4.0
71	Cerro de la Estrella	Mexico	19.3438	-99.0900	11.0
72	Chacchoben	Mexico	19.0013	-88.2304	15.0
73	Chacchoben	Mexico	19.0017	-88.2336	14.0
74	Chacmultun	Mexico	20.1701	-89.3448	16.0
75	Chiapa de Corzo	Mexico	16.7027	-93.0041	30.5
76	Chicanná	Mexico	18.5069	-89.4862	11.5
77	Chichen Itza	Mexico	20.6792	-88.5707	27.0
78	Chichen Itza	Mexico	20.6829	-88.5687	23.0
79	Chichen Itza	Mexico	20.6792	-88.5707	22.0
80	Cobá	Mexico	20.4929	-87.7242	-39.0
81	Cobá	Mexico	20.4960	-87.7205	37.0
82	Cobá	Mexico	20.4933	-87.7217	34.0
83	Comalcalco	Mexico	18.2780	-93.2006	22.0
84	Comalcalco	Mexico	18.2800	-93.2018	14.0
85	Dainzu	Mexico	17.0036	-96.5566	23.0
86	Dainzu	Mexico	17.0038	-96.5570	19.0
87	Dainzu	Mexico	17.0033	-96.5577	18.0
88	Dzibanche	Mexico	18.6384	-88.7587	17.0
89	Dzibilchaltun	Mexico	21.0910	-89.5900	0.3
90	Dzibilnocac	Mexico	19.5780	-89.5948	13.0
91	Edzna	Mexico	19.5981	-90.2304	16.0
92	Ek' Balam	Mexico	20.8907	-88.1361	11.0
93	Ek' Balam	Mexico	20.8910	-88.1363	8.0
94	Ek' Balam	Mexico	20.8907	-88.1361	0.1
95	Ek' Balam	Mexico	20.8924	-88.1360	2.5
96	El Cerrito	Mexico	20.5515	-100.4440	4.5
97	El Chanal	Mexico	19.2928	-103.7048	15.0
98	El Tajín	Mexico	20.4452	-97.3777	15.0
99	El Tajín	Mexico	20.4479	-97.3772	12.5

100	El Tajín	Mexico	20.4458	-97.3771	12.0
101	El Tajín	Mexico	20.4479	-97.3772	11.0
102	El Tajín	Mexico	20.4465	-97.3775	8.5
103	El Tajín	Mexico	20.4476	-97.3779	0.1
104	El Tepozteco	Mexico	19.0008	-99.1014	31.0
105	El Tigre	Mexico	18.1205	-90.8371	13.5
106	Great Pyramid of Cholula	Mexico	19.0575	-98.3019	24.0
107	Huapalcalco	Mexico	20.1170	-98.3625	-12.0
108	Izamal	Mexico	20.9373	-89.0166	15.0
109	Izapa	Mexico	14.9232	-92.1798	25.0
110	Izapa	Mexico	14.9234	-92.1801	18.0
111	Kabah	Mexico	20.2480	-89.6470	13.5
112	Kinichná	Mexico	18.6609	-88.7674	13.0
113	Kohunlich	Mexico	18.4195	-88.7915	10.0
114	Kohunlich	Mexico	18.4190	-88.7906	6.5
115	La Campana	Mexico	19.2680	-103.7260	25.5
116	La Joya	Mexico	19.0295	-96.1560	42.0
117	La Joya	Mexico	19.0280	-96.1540	38.5
118	La Quemada	Mexico	22.4588	-102.8226	42.0
119	La Quemada	Mexico	22.4592	-102.8233	27.0
120	La Quemada	Mexico	22.4579	-102.8216	25.0
121	La Quemada	Mexico	22.4573	-102.8217	19.0
122	La Quemada	Mexico	22.4552	-102.8210	12.0
123	La Quemada	Mexico	22.4577	-102.8207	7.5
124	Labna	Mexico	20.1730	-89.5790	23.0
125	Labna	Mexico	20.1712	-89.5783	12.0
126	Lagartero	Mexico	15.8284	-91.8834	36.0
127	Lagartero	Mexico	15.8282	-91.8840	33.0
128	Lagartero	Mexico	15.8272	-91.8841	28.0
129	Lambityeco	Mexico	16.9717	-96.4920	25.0
130	Mayapan	Mexico	20.6294	-89.4603	13.5
131	Mayapan	Mexico	20.6293	-89.4608	0.1
132	Mitla	Mexico	16.9270	-96.3595	11.0
133	Mixco Viejo	Mexico	14.8724	-90.6638	10.5
134	Mixco Viejo	Mexico	14.8741	-90.6625	0.1
135	Monte Alban	Mexico	17.0447	-96.7676	9.0
136	Monte Albán	Mexico	17.0455	-96.7676	7.5
137	Monte Albán	Mexico	17.0446	-96.7683	4.0
138	Moral Reforma	Mexico	17.7684	-91.2985	14.0
139	Moral Reforma	Mexico	17.7705	-91.2977	11.0
140	Moral Reforma	Mexico	17.7690	-91.2984	10.0
141	Oxkintok	Mexico	20.5613	-89.9527	8.5
142	Oxkintok	Mexico	20.5604	-89.9538	0.0
143	Palenque	Mexico	17.4828	-92.0459	29.0
144	Palenque	Mexico	17.4828	-92.0451	24.0
145	Palenque	Mexico	17.4835	-92.0470	23.0
146	Palenque	Mexico	17.4845	-92.0470	12.0
147	Peralta	Mexico	20.4705	-101.4160	-4.0
148	Plan de Ayutla	Mexico	16.7852	-91.2797	44.0
149	Plazuelas	Mexico	20.4040	-101.8270	-6.0

150	Quiahuiztlán	Mexico	19.6696	-96.4155	37.0
151	Quiahuiztlán	Mexico	19.6698	-96.4157	12.0
152	San Gervasio	Mexico	20.5000	-86.8453	19.0
153	Santa Cecilia Acatitlan	Mexico	19.5525	-99.1733	24.0
154	Sayil	Mexico	20.1780	-89.6525	15.0
155	Tamtoc	Mexico	21.9228	-98.8100	20.0
156	Tamtoc	Mexico	21.9252	-98.8151	13.5
157	Tamtoc	Mexico	21.9228	-98.8152	7.0
158	Templo Mayor	Mexico	19.4350	-99.1314	7.0
159	Tenam Puente	Mexico	16.1410	-92.1064	43.5
160	Tenam Puente	Mexico	16.1415	-92.1050	40.0
161	Tenam Puente	Mexico	16.1419	-92.1063	33.5
162	Tenayuca	Mexico	19.5320	-99.1680	17.0
163	Tenochtitlan	Mexico	19.4349	-99.1314	6.5
164	Teopanzolco	Mexico	18.9305	-99.2220	0.0
165	Teotenango	Mexico	19.1077	-99.5962	18.0
166	Teotenango	Mexico	19.1084	-99.5960	15.0
167	Teotihuacan	Mexico	19.6920	-98.8440	15.5
168	Tepeapulco	Mexico	19.8136	-98.5566	35.5
169	Texcotzingo	Mexico	19.4971	-98.8179	0.0
170	Tlatelolco	Mexico	19.4511	-99.1375	11.0
171	Toniná	Mexico	16.9022	-92.0095	18.0
172	Tula	Mexico	20.0642	-99.3404	16.5
173	Tula	Mexico	20.0642	-99.3404	15.5
174	Tula	Mexico	20.0632	-99.3403	13.5
175	Tzintzuntzan	Mexico	19.6240	-101.5740	41.5
176	Uxmal	Mexico	20.3583	-89.7720	21.0
177	Uxmal	Mexico	20.3601	-89.7710	11.0
178	Uxmal	Mexico	20.3608	-89.7696	8.5
179	Xcambo	Mexico	21.3138	-89.3539	14.0
180	Xelha	Mexico	20.3190	-87.3672	27.0
181	Xlapak	Mexico	20.1742	-89.6062	20.0
182	Xochicalco	Mexico	18.8050	-99.2974	16.5
183	Xochicalco	Mexico	18.8040	-99.2955	11.0
184	Xochicalco	Mexico	18.8033	-99.2963	0.0
185	Xochitecatl	Mexico	19.2450	-98.3500	4.5
186	Xpuhil	Mexico	18.5107	-89.4065	8.0
187	Yagul	Mexico	16.9584	-96.4505	26.0
188	Yagul	Mexico	16.9577	-96.4500	21.0
189	Yaxchilan	Mexico	16.8987	-90.9648	-34.5
190	Yaxchilan	Mexico	16.9001	-90.9675	43.5
191	Yaxchilan	Mexico	16.8989	-90.9642	36.0
192	Yaxchilan	Mexico	16.8998	-90.9645	30.0
193	Yaxchilan	Mexico	16.9002	-90.9660	29.0
194	Yaxchilan	Mexico	16.8993	-90.9655	13.0
195	Yaxchilan	Mexico	16.8993	-90.9655	11.0
196	Acaray	Peru	-11.0584	-77.5330	38.0
197	Allpacoto	Peru	-10.8805	-77.5156	32.0
198	Bandurria	Peru	-11.1871	-77.5885	0.0
199	Cahuachi	Peru	-14.8193	-75.1162	13.0

200	Cahuachi	Peru	-14.8188	-75.1166	6.0
201	Capilla	Peru	-10.9038	-77.3780	32.0
202	Caral	Peru	-10.8935	-77.5245	43.0
203	Caral	Peru	-10.8946	-77.5225	29.0
204	Caral	Peru	-10.8918	-77.5203	25.5
205	Caral	Peru	-10.8905	-77.5215	24.0
206	Caral	Peru	-10.8935	-77.5194	21.0
207	Caral	Peru	-10.8935	-77.5204	20.0
208	Cerro Colorado	Peru	-10.8712	-77.5308	14.0
209	Cerro del Gentil	Peru	-13.4953	-76.0374	11.5
210	Cerro Sechin	Peru	-9.4808	-78.2591	9.0
211	Chan-Chan	Peru	-8.1145	-79.0725	20.5
212	Chan-Chan	Peru	-8.1060	-79.0790	18.0
213	Chankillo	Peru	-9.5629	-78.2260	26.0
214	Chavín de Huantar	Peru	-9.5930	-77.1780	14.0
215	Chincha Paracas Mounds	Peru	-13.5024	-76.0450	41.0
216	Chincha Paracas Mounds	Peru	-13.5024	-76.0450	34.0
217	Chincha Paracas Mounds	Peru	-13.5024	-76.0450	27.0
218	Chincha Paracas Mounds	Peru	-13.5024	-76.0450	14.0
219	Choquequirao	Peru	-13.3930	-72.8740	17.0
220	Chupacigarro	Peru	-10.8914	-77.5324	19.0
221	El Paraíso	Peru	-11.9539	-77.1183	38.0
222	El Paraíso	Peru	-11.9539	-77.1180	36.5
223	Era de Pando	Peru	-10.8431	-77.5966	8.5
224	Era de Pando	Peru	-10.8416	-77.5971	5.0
225	Era de Pando	Peru	-10.8400	-77.5961	0.0
226	Huaca Bandera	Peru	-6.4064	-79.8995	10.0
227	Huaca del Luna	Peru	-8.1320	-78.9950	28.0
228	Huaca del Sol	Peru	-8.1345	-78.9900	28.0
229	Huaca Esmeralda	Peru	-8.1048	-79.0450	16.5
230	Inka Uyu	Peru	-15.8922	-69.8888	38.0
231	Inka Wasi	Peru	-15.2462	-73.7442	41.5
232	Kotosh	Peru	-9.9311	-76.2796	13.0
233	Kuntur Wasi	Peru	-7.1290	-78.8462	41.5
234	La Centinela	Peru	-13.4510	-76.1700	6.5
235	Las Haldas	Peru	-9.7010	-78.2964	28.5
236	Lurihuasi	Peru	-10.8762	-77.5505	28.5
237	Miraya	Peru	-10.8828	-77.5399	32.0
238	Ollantaytambo	Peru	-13.2573	-72.2655	21.0
239	Pachacamac	Peru	-12.2567	-76.9003	-30.0
240	Pallka	Peru	-9.5376	-77.9943	7.0
241	Pampa de Las Llamas	Peru	-9.5028	-78.2226	45.0
242	Pañamarca	Peru	-9.2065	-78.3755	44.5
243	Pando	Peru	-10.8558	-77.5734	24.5
244	Pikillaqta	Peru	-13.6130	-71.7170	40.0
245	Pomac Forest	Peru	-6.4714	-79.7935	20.0
246	Pomac Forest	Peru	-6.4659	-79.7975	7.5
247	Pomac Forest	Peru	-6.4709	-79.7922	6.0
248	Raqch'i	Peru	-14.1743	-71.3702	22.0
249	Raqch'i	Peru	-14.1752	-71.3692	20.0

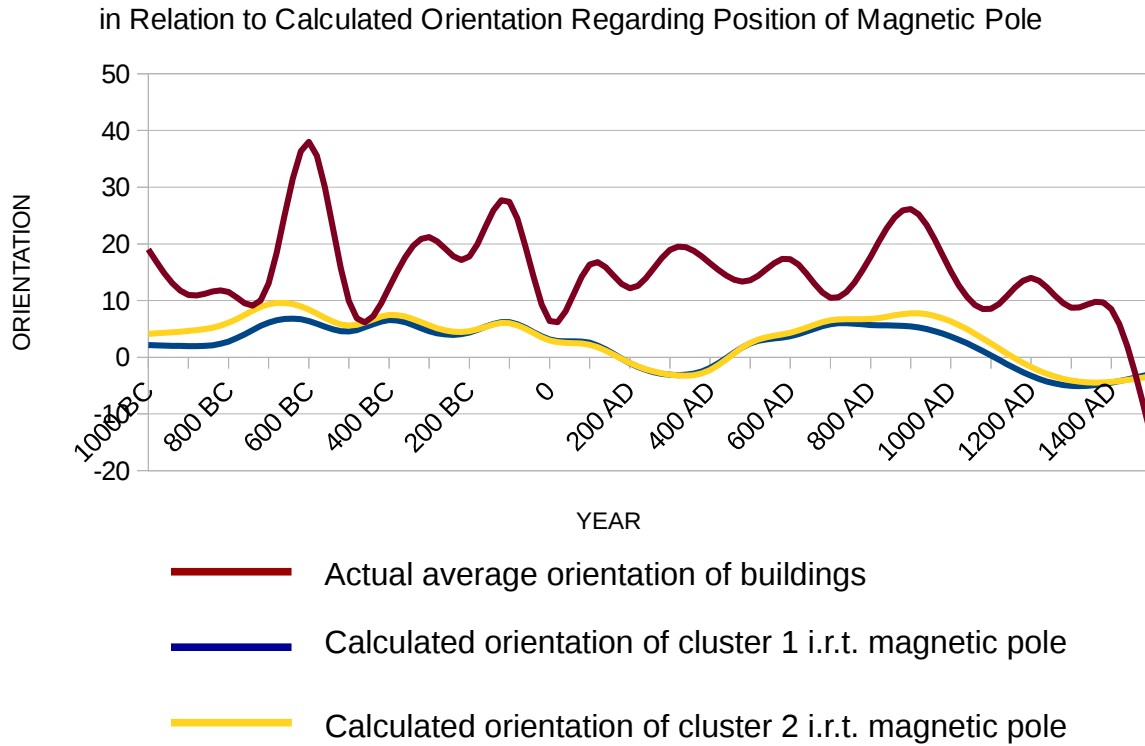
250	Saksaywaman	Peru	-13.5080	-71.9820	14.0
251	Sechin Alto	Peru	-9.4654	-78.2426	-23.0
252	Tarawasi	Peru	-13.4690	-72.4360	-37.0
253	Taukachi-Konkan	Peru	-9.4563	-78.2513	-25.0
254	Túcume	Peru	-6.5160	-79.8440	28.0
255	Túcume	Peru	-6.5120	-79.8395	15.0
256	Uchku Inkañan	Peru	-12.7376	-74.8580	-36.0
257	Usnu	Peru	-13.6522	-73.9567	23.0
258	Usnu	Peru	-13.6526	-73.9555	10.0
259	Usnu	Peru	-13.6527	-73.9550	4.0
260	Vichama	Peru	-11.0248	-77.6323	33.0
261	Wak'a Wallamarka	Peru	-12.0972	-77.0405	4.0
262	Wanuku Pampa	Peru	-9.8754	-76.8164	0.0
263	Wari Willka	Peru	-12.1176	-75.2061	31.0

APPENDIX II - Calculated Orientation i.r.t. Magnetic Pole

Age	Position magnetic pole (°lat, °lon)	Theoretical orientation cluster 1 (+17.1°, -92.4°)	Theoretical orientation cluster 2 (-11.8°, -75.8°)
1000 BC	83.0, 70.0	2.15	4.12
900 BC	81.0, 75.0	1.98	4.65
800 BC	79.0, 73.0	2.77	6.08
700 BC	78.0, 57.0	6.12	9.33
600 BC	80.5, 46.0	6.39	8.42
500 BC	82.0, 40.0	4.54	5.57
400 BC	84.0, 28.0	6.57	7.46
300 BC	84.5, 38.0	4.62	5.62
200 BC	85.5, 19.0	4.38	4.59
100 BC	84.0, 05.0	6.20	6.03
0	86.5, 00.0	3.13	2.96
100 AD	87.5, -15.0	2.56	2.22
200 AD	89.0, -175.0	-1.04	-1.01
300 AD	87.0, -170.0	-3.08	-3.06
400 AD	87.5, -138.0	-1.89	-2.25
500 AD	87.5, 18.0	2.44	2.55
600 AD	85.5, 35.0	3.69	4.32
700 AD	83.5, 27.0	5.83	6.51
800 AD	83.0, 35.0	5.70	6.75
900 AD	80.5, 53.0	5.45	7.76
1000 AD	80.5, 65.0	3.68	6.34
1100 AD	83.0, 85.0	0.32	2.42
1200 AD	84.0, 120.0	-3.28	-1.71
1300 AD	84.5, 150.0	-5.03	-4.09
1400 AD	85.7, -175.0	-4.47	-4.35
1500 AD	86.5, -145.0	-2.94	-3.33

APPENDIX II (continuation)

Actual Orientation of Buildings



This graph shows the large differences between the actual orientations, called “Orientation Cluster 1” and “Orientation Cluster 2” and the orientations if they would have been oriented towards the wandering magnetic pole, the yellow and blue lines. The brown line shows the average orientation of the researched buildings that correspond with the specific age.

APPENDIX III - List of Sites With Calculated Orientation to Magnetic Pole

NR	Site Name	Country	Lat	Lon	Orient	Age	Pole	Pole lat	Pole lon	Orient Loc → to → Pole	Correlation?
1	Pucará de Tilcara	Argentina	-23.5860	-65.4040	14.0	1200 AD	23	84	120	-0.65	NO
2	Altun Ha (A3)	Belize	17.7643	-88.3478	15.0	600 AD	17	85.5	35	3.90	NO
3	Altun Ha (B4)	Belize	17.7638	-88.3467	6.0	600 AD	17	85.5	35	3.90	YES
4	Caracol	Belize	16.7640	-89.1176	11.5	600 AD	17	85.5	35	3.84	NO
5	Lamanai	Belize	17.7650	-88.6530	20.0	600 AD	17	85.5	35	3.88	NO
6	Lamanai	Belize	17.7680	-88.6530	11.0	600 AD	17	85.5	35	3.88	NO
7	Lubaantun	Belize	16.2820	-88.9595	13.0	600 AD	17	85.5	35	3.84	NO
8	Nohmul pyramid	Belize	18.2174	-88.5847	41.0	300 BC	8	84	39	4.91	NO
9	Xunantunich	Belize	17.0890	-89.1415	-5.5	700 AD	18	83.5	27	6.02	NO
10	Puma Punku	Bolivia	-16.5615	-68.6800	3.5	500 AD	16	87.5	18	2.60	YES
11	Puma Punku	Bolivia	-16.5615	-68.6800	2.0	500 AD	16	87.5	18	2.60	YES
12	Tiwanaku	Bolivia	-16.5550	-68.6735	0.2	0	11	87	0	2.90	YES
13	El morro del tulcán	Colombia	2.4440	-76.6000	22.0	1000 BC	1	83	70	3.85	NO
14	Inca-Caranqui	Ecuador	0.3224	-78.1218	0.0	1200 AD	23	84	120	-1.87	YES
15	Pyramids of Cochasqui (nr. 14)	Ecuador	0.0546	-78.3060	32.0	1200 AD	23	84	120	-1.89	NO
16	Pyramids of Cochasqui (nr. 5)	Ecuador	0.0546	-78.3060	35.0	1200 AD	23	84	120	-1.89	NO
17	Pyramids of Cochasqui (nr. 9)	Ecuador	0.0546	-78.3060	35.0	1200 AD	23	84	120	-1.89	NO
18	Casa Blanca	El Salvador	13.9884	-89.6732	13.0	300 AD	14	87	-170	-3.05	NO
19	Casa Blanca	El Salvador	13.9894	-89.6725	13.0	300 AD	14	87	-170	-3.05	NO
20	El Tazumal	El Salvador	13.9790	-89.6740	18.5	400 AD	15	87.5	-138	-1.94	NO
21	San Andrés	El Salvador	13.8006	-89.3892	28.0	600 AD	17	85.5	35	3.78	NO
22	San Andrés	El Salvador	13.8025	-89.3875	20.0	600 AD	17	85.5	35	3.78	NO
23	Aguateca	Guatemala	16.3952	-90.2044	33.0	200 BC	9	85.5	18	4.42	NO
24	Ceibal	Guatemala	16.5136	-90.0613	8.0	400 BC	7	82.5	29	6.72	YES
25	El Mirador	Guatemala	17.7560	-89.9210	11.0	200 BC	9	85.5	18	4.46	NO
26	Holmul	Guatemala	17.3103	-89.2592	0.0	700 BC	4	78	57	6.68	NO
27	Iximche'	Guatemala	14.7358	-90.9962	36.5	1500 AD	26	86.5	-145	-2.96	NO
28	Iximche'	Guatemala	14.7352	-90.9958	-36.0	1500 AD	26	86.5	-145	-2.96	NO
29	Iximche'	Guatemala	14.7354	-90.9963	-43.0	1500 AD	26	86.5	-145	-2.96	NO
30	Kaminal Juyu	Guatemala	14.6330	-90.5490	26.0	1000 BC	1	83	70	2.35	NO
31	Kaminal Juyu	Guatemala	14.6310	-90.5475	20.0	1000 BC	1	83	70	2.35	NO
32	Nakum	Guatemala	17.1760	-89.4051	6.0	800 AD	19	83	35	5.93	YES
33	Naranjo	Guatemala	17.1335	-89.2620	0.1	500 BC	6	84	40	4.77	YES
34	Q'umarkaj	Guatemala	15.0233	-91.1723	-4.0	1400 AD	25	85.7	-175	-4.44	YES
35	Tikal	Guatemala	17.2220	-89.6240	11.0	300 BC	8	84	39	4.82	NO
36	Tikal	Guatemala	17.2220	-89.6230	10.0	300 BC	8	84	39	4.82	NO
37	Tikal	Guatemala	17.2205	-89.6275	4.0	300 BC	8	84	39	4.82	YES
38	Uaxactun	Guatemala	17.3936	-89.6345	44.5	200 AD	13	89	-175	-1.04	NO
39	Yaxha	Guatemala	17.0707	-89.4000	10.5	300 AD	14	87	-170	-3.10	NO
40	Yaxha	Guatemala	17.0758	-89.4025	7.5	300 AD	14	87	-170	-3.10	NO
41	Yaxha	Guatemala	17.0792	-89.4030	0.1	300 AD	14	87	-170	-3.10	YES
42	Zaculeu	Guatemala	15.3343	-91.4926	38.0	300 AD	14	87	-170	-3.06	NO
43	Zaculeu	Guatemala	15.3343	-91.4926	36.5	300 AD	14	87	-170	-3.06	NO
44	Zaculeu	Guatemala	15.3332	-91.4924	35.0	300 AD	14	87	-170	-3.06	NO
45	Zaculeu	Guatemala	15.3338	-91.4925	32.0	300 AD	14	87	-170	-3.06	NO
46	Copán	Honduras	14.8373	-89.1415	4.0	300 BC	8	84	39	4.81	YES
47	Acanceh	Mexico	20.8133	-89.4524	12.0	200 AD	13	89	-175	-1.07	NO
48	Acozac	Mexico	19.3296	-98.8897	40.0	900 AD	20	80.5	53	4.54	NO
49	Ake	Mexico	20.9475	-89.2995	10.0	300 AD	14	87	-170	-3.18	NO

50	Ake	Mexico	20.9470	-89.3005	5.5	300 AD	14	87	-170	-3.18	NO
51	Ake	Mexico	20.9468	-89.3018	2.5	300 AD	14	87	-170	-3.18	NO
52	Balamku	Mexico	18.5604	-89.9454	21.0	400 AD	15	87.5	-138	-1.98	NO
53	Becan	Mexico	18.5161	-89.4665	15.0	500 AD	16	87.5	18	2.50	NO
54	Becan	Mexico	18.5165	-89.4669	12.5	500 AD	16	87.5	18	2.50	NO
55	Becan	Mexico	18.5180	-89.4680	11.0	500 AD	16	87.5	18	2.50	NO
56	Becan	Mexico	18.5167	-89.4664	10.0	500 AD	16	87.5	18	2.50	NO
57	Becan	Mexico	18.5179	-89.4664	6.5	500 AD	16	87.5	18	2.50	YES
58	Bonampak	Mexico	16.7040	-91.0650	35.0	600 AD	17	85.5	35	3.75	NO
59	Cacaxtla	Mexico	19.2451	-98.3508	10.5	500 AD	16	87.5	18	2.36	NO
60	Cacaxtla	Mexico	19.2449	-98.3490	4.0	500 AD	16	87.5	18	2.36	YES
61	Cacaxtla	Mexico	19.2442	-98.3502	0.0	500 AD	16	87.5	18	2.36	YES
62	Calakmul	Mexico	18.1066	-89.8123	20.0	300 AD	14	87	-170	-3.12	NO
63	Calakmul	Mexico	18.1080	-89.8140	16.0	300 AD	14	87	-170	-3.12	NO
64	Calakmul	Mexico	18.1032	-89.8086	11.5	300 AD	14	87	-170	-3.12	NO
65	Calakmul	Mexico	18.1050	-89.8105	10.5	300 AD	14	87	-170	-3.12	NO
66	Castillo de Teayo	Mexico	20.7500	-97.6333	-3.0	1000 AD	21	80.5	65	2.88	NO
67	Cempoala	Mexico	19.4470	-96.4056	13.5	1000 AD	21	80.5	65	3.07	NO
68	Cempoala	Mexico	19.4466	-96.4056	12.0	1000 AD	21	80.5	65	3.07	NO
69	Cempoala	Mexico	19.4475	-96.4054	8.0	1000 AD	21	80.5	65	3.07	YES
70	Cempoala	Mexico	19.4473	-96.4035	4.0	400 AD	15	87.5	-138	-1.78	NO
71	Cerro de la Estrella	Mexico	19.3438	-99.0900	11.0	300 AD	14	87	-170	-3.02	NO
72	Chacchoben	Mexico	19.0013	-88.2304	15.0	700 AD	18	83.5	27	6.12	NO
73	Chacchoben	Mexico	19.0017	-88.2336	14.0	700 AD	18	83.5	27	6.12	NO
74	Chacmultun	Mexico	20.1701	-89.3448	16.0	800 AD	19	83	35	6.01	NO
75	Chiapa de Corzo	Mexico	16.7027	-93.0041	30.5	100 AD	12	87.5	-15	2.56	NO
76	Chicanná	Mexico	18.5069	-89.4862	11.5	700 AD	18	83.5	27	6.04	NO
77	Chichen Itza	Mexico	20.6792	-88.5707	27.0	800 AD	19	83	35	6.09	NO
78	Chichen Itza	Mexico	20.6829	-88.5687	23.0	800 AD	19	83	35	6.09	NO
79	Chichen Itza	Mexico	20.6792	-88.5707	22.0	800 AD	19	83	35	6.09	NO
80	Cobá	Mexico	20.4929	-87.7242	-39.0	200 AD	13	89	-175	-1.07	NO
81	Cobá	Mexico	20.4960	-87.7205	37.0	200 AD	13	89	-175	-1.07	NO
82	Cobá	Mexico	20.4933	-87.7217	34.0	200 AD	13	89	-175	-1.07	NO
83	Comalcalco	Mexico	18.2780	-93.2006	22.0	500 AD	16	87.5	18	2.44	NO
84	Comalcalco	Mexico	18.2800	-93.2018	14.0	500 AD	16	87.5	18	2.44	NO
85	Dainzu	Mexico	17.0036	-96.5566	23.0	300 AD	14	87	-170	-3.02	NO
86	Dainzu	Mexico	17.0038	-96.5570	19.0	300 AD	14	87	-170	-3.02	NO
87	Dainzu	Mexico	17.0033	-96.5577	18.0	300 AD	14	87	-170	-3.02	NO
88	Dzibanche	Mexico	18.6384	-88.7587	17.0	400 AD	15	87.5	-138	-2.02	NO
89	Dzibilchaltun	Mexico	21.0910	-89.5900	0.3	1000 BC	1	83	70	2.52	YES
90	Dzibilnocac	Mexico	19.5780	-89.5948	13.0	200 AD	13	89	-175	-1.06	NO
91	Edzna	Mexico	19.5981	-90.2304	16.0	200 AD	13	89	-175	-1.06	NO
92	Ek' Balam	Mexico	20.8907	-88.1361	11.0	700 AD	18	83.5	27	6.19	YES
93	Ek' Balam	Mexico	20.8910	-88.1363	8.0	700 AD	18	83.5	27	6.19	YES
94	Ek' Balam	Mexico	20.8907	-88.1361	0.1	700 AD	18	83.5	27	6.19	NO
95	Ek' Balam	Mexico	20.8924	-88.1360	2.5	700 AD	18	83.5	27	6.19	YES
96	El Cerrito	Mexico	20.5515	-100.4440	4.5	400 AD	15	87.5	-138	-1.65	NO
97	El Chanal	Mexico	19.2928	-103.7048	15.0	1100 AD	22	83	85	-1.08	NO
98	El Tajín	Mexico	20.4452	-97.3777	15.0	600 AD	17	85.5	35	3.48	NO
99	El Tajín	Mexico	20.4479	-97.3772	12.5	600 AD	17	85.5	35	3.48	NO

100	El Tajín	Mexico	20.4458	-97.3771	12.0	600 AD	17	85.5	35	3.48	NO
101	El Tajín	Mexico	20.4479	-97.3772	11.0	600 AD	17	85.5	35	3.48	NO
102	El Tajín	Mexico	20.4465	-97.3775	8.5	600 AD	17	85.5	35	3.48	NO
103	El Tajín	Mexico	20.4476	-97.3779	0.1	600 AD	17	85.5	35	3.48	YES
104	El Tepozteco	Mexico	19.0008	-99.1014	31.0	1400 AD	25	85.7	-175	-4.44	NO
105	El Tigre	Mexico	18.1205	-90.8371	13.5	100 BC	10	84	5	6.26	NO
106	Great Pyramid of Cholula	Mexico	19.0575	-98.3019	24.0	500 AD	16	87.5	18	2.36	NO
107	Huapalcalco	Mexico	20.1170	-98.3625	-12.0	100 AD	12	87.5	-15	2.65	NO
108	Izamal	Mexico	20.9373	-89.0166	15.0	500 BC	6	84	40	4.87	NO
109	Izapa	Mexico	14.9232	-92.1798	25.0	200 BC	9	85.5	18	4.34	NO
110	Izapa	Mexico	14.9234	-92.1801	18.0	200 BC	9	85.5	18	4.34	NO
111	Kabah	Mexico	20.2480	-89.6470	13.5	900 AD	20	80.5	53	5.89	NO
112	Kinichná	Mexico	18.6609	-88.7674	13.0	100 AD	12	87.5	-15	2.54	NO
113	Kohunlich	Mexico	18.4195	-88.7915	10.0	400 AD	15	87.5	-138	-2.01	NO
114	Kohunlich	Mexico	18.4190	-88.7906	6.5	400 AD	15	87.5	-138	-2.01	NO
115	La Campana	Mexico	19.2680	-103.7260	25.5	100 AD	12	87.5	-15	2.65	NO
116	La Joya	Mexico	19.0295	-96.1560	42.0	900 AD	20	80.5	53	4.94	NO
117	La Joya	Mexico	19.0280	-96.1540	38.5	900 AD	20	80.5	53	4.94	NO
118	La Quemada	Mexico	22.4588	-102.8226	42.0	600 AD	17	85.5	35	3.20	NO
119	La Quemada	Mexico	22.4592	-102.8233	27.0	600 AD	17	85.5	35	3.20	NO
120	La Quemada	Mexico	22.4579	-102.8216	25.0	600 AD	17	85.5	35	3.20	NO
121	La Quemada	Mexico	22.4573	-102.8217	19.0	600 AD	17	85.5	35	3.20	NO
122	La Quemada	Mexico	22.4552	-102.8210	12.0	600 AD	17	85.5	35	3.20	NO
123	La Quemada	Mexico	22.4577	-102.8207	7.5	600 AD	17	85.5	35	3.20	YES
124	Labna	Mexico	20.1730	-89.5790	23.0	900 AD	20	80.5	53	5.90	NO
125	Labna	Mexico	20.1712	-89.5783	12.0	900 AD	20	80.5	53	5.90	NO
126	Lagartero	Mexico	15.8284	-91.8834	36.0	100 BC	10	84	5	6.17	NO
127	Lagartero	Mexico	15.8282	-91.8840	33.0	100 BC	10	84	5	6.17	NO
128	Lagartero	Mexico	15.8272	-91.8841	28.0	100 BC	10	84	5	6.17	NO
129	Lambityeco	Mexico	16.9717	-96.4920	25.0	700 BC	4	78	57	5.36	NO
130	Mayapan	Mexico	20.6294	-89.4603	13.5	1200 AD	23	84	120	-3.06	NO
131	Mayapan	Mexico	20.6293	-89.4608	0.1	1200 AD	23	84	120	-3.06	YES
132	Mitla	Mexico	16.9270	-96.3595	11.0	900 BC	2	81	75	1.36	NO
133	Mixco Viejo	Mexico	14.8724	-90.6638	10.5	1100 AD	22	83	85	0.53	NO
134	Mixco Viejo	Mexico	14.8741	-90.6625	0.1	1100 AD	22	83	85	0.53	YES
135	Monte Alban	Mexico	17.0447	-96.7676	9.0	500 BC	6	84	40	4.21	YES
136	Monte Albán	Mexico	17.0455	-96.7676	7.5	500 BC	6	84	40	4.21	YES
137	Monte Albán	Mexico	17.0446	-96.7683	4.0	500 BC	6	84	40	4.21	YES
138	Moral Reforma	Mexico	17.7684	-91.2985	14.0	700 AD	18	83.5	27	5.91	NO
139	Moral Reforma	Mexico	17.7705	-91.2977	11.0	700 AD	18	83.5	27	5.91	NO
140	Moral Reforma	Mexico	17.7690	-91.2984	10.0	700 AD	18	83.5	27	5.91	YES
141	Oxkintok	Mexico	20.5613	-89.9527	8.5	500 AD	16	87.5	18	2.53	NO
142	Oxkintok	Mexico	20.5604	-89.9538	0.0	500 AD	16	87.5	18	2.53	YES
143	Palenque	Mexico	17.4828	-92.0459	29.0	500 AD	16	87.5	18	2.45	NO
144	Palenque	Mexico	17.4828	-92.0451	24.0	500 AD	16	87.5	18	2.45	NO
145	Palenque	Mexico	17.4835	-92.0470	23.0	500 AD	16	87.5	18	2.45	NO
146	Palenque	Mexico	17.4845	-92.0470	12.0	500 AD	16	87.5	18	2.45	NO
147	Peralta	Mexico	20.4705	-101.4160	-4.0	300 AD	14	87	-170	-3.00	YES
148	Plan de Ayutla	Mexico	16.7852	-91.2797	44.0	100 BC	10	84	5	6.21	NO
149	Plazuelas	Mexico	20.4040	-101.8270	-6.0	300 AD	14	87	-170	-2.99	YES

150	Quiahuiztlán	Mexico	19.6696	-96.4155	37.0	300 AD	14	87	-170	-3.07	NO
151	Quiahuiztlán	Mexico	19.6698	-96.4157	12.0	300 AD	14	87	-170	-3.07	NO
152	San Gervasio	Mexico	20.5000	-86.8453	19.0	1000 AD	21	80.5	65	4.57	NO
153	Santa Cecilia Acatitlan	Mexico	19.5525	-99.1733	24.0	500 BC	6	84	40	4.06	NO
154	Sayil	Mexico	20.1780	-89.6525	15.0	800 AD	19	83	35	5.99	NO
155	Tamtoc	Mexico	21.9228	-98.8100	20.0	200 AD	13	89	-175	-1.05	NO
156	Tamtoc	Mexico	21.9252	-98.8151	13.5	200 AD	13	89	-175	-1.05	NO
157	Tamtoc	Mexico	21.9228	-98.8152	7.0	200 AD	13	89	-175	-1.05	NO
158	Templo Mayor	Mexico	19.4350	-99.1314	7.0	1400 AD	25	85.7	-175	-4.45	NO
159	Tenam Puente	Mexico	16.1410	-92.1064	43.5	300 AD	14	87	-170	-3.06	NO
160	Tenam Puente	Mexico	16.1415	-92.1050	40.0	300 AD	14	87	-170	-3.06	NO
161	Tenam Puente	Mexico	16.1419	-92.1063	33.5	300 AD	14	87	-170	-3.06	NO
162	Tenayuca	Mexico	19.5320	-99.1680	17.0	1200 AD	23	84	120	-3.92	NO
163	Tenochtitlan	Mexico	19.4349	-99.1314	6.5	1300 AD	24	84.5	150	-5.39	NO
164	Teopanzolco	Mexico	18.9305	-99.2220	0.0	1200 AD	23	84	120	-3.91	YES
165	Teotenango	Mexico	19.1077	-99.5962	18.0	700 AD	18	83.5	27	5.40	NO
166	Teotenango	Mexico	19.1084	-99.5960	15.0	700 AD	18	83.5	27	5.40	NO
167	Teotihuacan	Mexico	19.6920	-98.8440	15.5	200 BC	9	85.5	18	4.21	NO
168	Tepeapulco	Mexico	19.8136	-98.5566	35.5	300 AD	14	87	-170	-3.04	NO
169	Texcotzingo	Mexico	19.4971	-98.8179	0.0	1400 AD	25	85.7	-175	-4.46	YES
170	Tlatelolco	Mexico	19.4511	-99.1375	11.0	1300 AD	24	84.5	150	-5.39	NO
171	Toniná	Mexico	16.9022	-92.0095	18.0	200 AD	13	89	-175	-1.04	NO
172	Tula	Mexico	20.0642	-99.3404	16.5	400 BC	7	82.5	29	6.09	NO
173	Tula	Mexico	20.0642	-99.3404	15.5	400 BC	7	82.5	29	6.09	NO
174	Tula	Mexico	20.0632	-99.3403	13.5	400 BC	7	82.5	29	6.09	NO
175	Tzintzuntzan	Mexico	19.6240	-101.5740	41.5	1000 AD	21	80.5	65	2.23	NO
176	Uxmal	Mexico	20.3583	-89.7720	21.0	800 AD	19	83	35	5.99	NO
177	Uxmal	Mexico	20.3601	-89.7710	11.0	800 AD	19	83	35	5.99	NO
178	Uxmal	Mexico	20.3608	-89.7696	8.5	800 AD	19	83	35	5.99	YES
179	Xcambo	Mexico	21.3138	-89.3539	14.0	100 AD	12	87.5	-15	2.60	NO
180	Xelha	Mexico	20.3190	-87.3672	27.0	100 AD	12	87.5	-15	2.55	NO
181	Xlapak	Mexico	20.1742	-89.6062	20.0	700 AD	18	83.5	27	6.08	NO
182	Xochicalco	Mexico	18.8050	-99.2974	16.5	700 AD	18	83.5	27	5.42	NO
183	Xochicalco	Mexico	18.8040	-99.2955	11.0	700 AD	18	83.5	27	5.42	NO
184	Xochicalco	Mexico	18.8033	-99.2963	0.0	700 AD	18	83.5	27	5.42	NO
185	Xochitecatl	Mexico	19.2450	-98.3500	4.5	1000 BC	1	83	70	1.44	YES
186	Xpuhil	Mexico	18.5107	-89.4065	8.0	400 BC	7	82.5	29	6.82	YES
187	Yagul	Mexico	16.9584	-96.4505	26.0	600 AD	17	85.5	35	3.47	NO
188	Yagul	Mexico	16.9577	-96.4500	21.0	600 AD	17	85.5	35	3.47	NO
189	Yaxchilan	Mexico	16.8987	-90.9648	-34.5	400 AD	15	87.5	-138	-1.93	NO
190	Yaxchilan	Mexico	16.9001	-90.9675	43.5	400 AD	15	87.5	-138	-1.93	NO
191	Yaxchilan	Mexico	16.8989	-90.9642	36.0	400 AD	15	87.5	-138	-1.93	NO
192	Yaxchilan	Mexico	16.8998	-90.9645	30.0	400 AD	15	87.5	-138	-1.93	NO
193	Yaxchilan	Mexico	16.9002	-90.9660	29.0	400 AD	15	87.5	-138	-1.93	NO
194	Yaxchilan	Mexico	16.8993	-90.9655	13.0	400 AD	15	87.5	-138	-1.93	NO
195	Yaxchilan	Mexico	16.8993	-90.9655	11.0	400 AD	15	87.5	-138	-1.93	NO
196	Acaray	Peru	-11.0584	-77.5330	38.0	600 BC	5	80.5	46	8.24	NO
197	Allpacoto	Peru	-10.8805	-77.5156	32.0	>1000 BC	-	-	-	-	-
198	Bandurria	Peru	-11.1871	-77.5885	0.0	>1000 BC	-	-	-	-	-
199	Cahuachi	Peru	-14.8193	-75.1162	13.0	0	11	87	0	2.99	NO

200	Cahuachi	Peru	-14.8188	-75.1166	6.0	0	11	87	0	2.99	YES
201	Capilla	Peru	-10.9038	-77.3780	32.0	>1000 BC	-	-	-	-	-
202	Caral	Peru	-10.8935	-77.5245	43.0	>1000 BC	-	-	-	-	-
203	Caral	Peru	-10.8946	-77.5225	29.0	>1000 BC	-	-	-	-	-
204	Caral	Peru	-10.8918	-77.5203	25.5	>1000 BC	-	-	-	-	-
205	Caral	Peru	-10.8905	-77.5215	24.0	>1000 BC	-	-	-	-	-
206	Caral	Peru	-10.8935	-77.5194	21.0	>1000 BC	-	-	-	-	-
207	Caral	Peru	-10.8935	-77.5204	20.0	>1000 BC	-	-	-	-	-
208	Cerro Colorado	Peru	-10.8712	-77.5308	14.0	700 BC	4	78	57	9.03	YES
209	Cerro del Gentil	Peru	-13.4953	-76.0374	11.5	800 BC	3	79	73	6.11	NO
210	Cerro Sechin	Peru	-9.4808	-78.2591	9.0	>1000 BC	-	-	-	-	-
211	Chan-Chan	Peru	-8.1145	-79.0725	20.5	800 AD	19	83	35	6.51	NO
212	Chan-Chan	Peru	-8.1060	-79.0790	18.0	800 AD	19	83	35	6.51	NO
213	Chankillo	Peru	-9.5629	-78.2260	26.0	300 BC	8	84	39	5.46	NO
214	Chavín de Huantar	Peru	-9.5930	-77.1780	14.0	>1000 BC	-	-	-	-	-
215	Chincha Paracas Mounds	Peru	-13.5024	-76.0450	41.0	300 BC	8	84	39	5.65	NO
216	Chincha Paracas Mounds	Peru	-13.5024	-76.0450	34.0	300 BC	8	84	39	5.65	NO
217	Chincha Paracas Mounds	Peru	-13.5024	-76.0450	27.0	300 BC	8	84	39	5.65	NO
218	Chincha Paracas Mounds	Peru	-13.5024	-76.0450	14.0	300 BC	8	84	39	5.65	NO
219	Choquequirao	Peru	-13.3930	-72.8740	17.0	1400 AD	25	85.7	-175	-4.34	NO
220	Chupacigarro	Peru	-10.8914	-77.5324	19.0	>1000 BC	-	-	-	-	-
221	El Paraíso	Peru	-11.9539	-77.1183	38.0	>1000 BC	-	-	-	-	-
222	El Paraíso	Peru	-11.9539	-77.1180	36.5	>1000 BC	-	-	-	-	-
223	Era de Pando	Peru	-10.8431	-77.5966	8.5	>1000 BC	-	-	-	-	-
224	Era de Pando	Peru	-10.8416	-77.5971	5.0	>1000 BC	-	-	-	-	-
225	Era de Pando	Peru	-10.8400	-77.5961	0.0	>1000 BC	-	-	-	-	-
226	Huaca Bandera	Peru	-6.4064	-79.8995	10.0	100 BC	10	84	5	6.01	YES
227	Huaca del Luna	Peru	-8.1320	-78.9950	28.0	400 AD	15	87.5	-138	-2.16	NO
228	Huaca del Sol	Peru	-8.1345	-78.9900	28.0	400 AD	15	87.5	-138	-2.16	NO
229	Huaca Esmeralda	Peru	-8.1048	-79.0450	16.5	700 AD	18	83.5	27	6.34	NO
230	Inka Uyu	Peru	-15.8922	-69.8888	38.0	>1000 BC	-	-	-	-	-
231	Inka Wasi	Peru	-15.2462	-73.7442	41.5	1200 AD	23	84	120	-1.53	NO
232	Kotosh	Peru	-9.9311	-76.2796	13.0	>1000 BC	-	-	-	-	-
233	Kuntur Wasi	Peru	-7.1290	-78.8462	41.5	1000 BC	1	83	70	3.71	NO
234	La Centinela	Peru	-13.4510	-76.1700	6.5	>1000 BC	-	-	-	-	-
235	Las Haldas	Peru	-9.7010	-78.2964	28.5	>1000 BC	-	-	-	-	-
236	Lurihuasi	Peru	-10.8762	-77.5505	28.5	>1000 BC	-	-	-	-	-
237	Miraya	Peru	-10.8828	-77.5399	32.0	>1000 BC	-	-	-	-	-
238	Ollantaytambo	Peru	-13.2573	-72.2655	21.0	>1000 BC	-	-	-	-	-
239	Pachacamac	Peru	-12.2567	-76.9003	-30.0	200 AD	13	89	-175	-1.01	NO
240	Pallka	Peru	-9.5376	-77.9943	7.0	>1000 BC	-	-	-	-	-
241	Pampa de Las Llamas	Peru	-9.5028	-78.2226	45.0	>1000 BC	-	-	-	-	-
242	Pañamarca	Peru	-9.2065	-78.3755	44.5	>1000 BC	-	-	-	-	-
243	Pando	Peru	-10.8558	-77.5734	24.5	>1000 BC	-	-	-	-	-
244	Pikillaqta	Peru	-13.6130	-71.7170	40.0	500 AD	16	87.5	18	2.57	NO
245	Pomac Forest	Peru	-6.4714	-79.7935	20.0	>1000 BC	-	-	-	-	-
246	Pomac Forest	Peru	-6.4659	-79.7975	7.5	>1000 BC	-	-	-	-	-
247	Pomac Forest	Peru	-6.4709	-79.7922	6.0	>1000 BC	-	-	-	-	-
248	Raqch'i	Peru	-14.1743	-71.3702	22.0	>1000 BC	-	-	-	-	-
249	Raqch'i	Peru	-14.1752	-71.3692	20.0	>1000 BC	-	-	-	-	-

250	Saksaywaman	Peru	-13.5080	-71.9820	14.0	900 AD	20	80.5	53	8.21	NO
251	Sechin Alto	Peru	-9.4654	-78.2426	-23.0	>1000 BC	-	-	-	-	-
252	Tarawasi	Peru	-13.4690	-72.4360	-37.0	>1000 BC	-	-	-	-	-
253	Taukachi-Konkan	Peru	-9.4563	-78.2513	-25.0	>1000 BC	-	-	-	-	-
254	Túcume	Peru	-6.5160	-79.8440	28.0	800 AD	19	83	35	6.44	NO
255	Túcume	Peru	-6.5120	-79.8395	15.0	800 AD	19	83	35	6.44	NO
256	Uchkus Inkañan	Peru	-12.7376	-74.8580	-36.0	>1000 BC	-	-	-	-	-
257	Usnu	Peru	-13.6522	-73.9567	23.0	>1000 BC	-	-	-	-	-
258	Usnu	Peru	-13.6526	-73.9555	10.0	>1000 BC	-	-	-	-	-
259	Usnu	Peru	-13.6527	-73.9550	4.0	>1000 BC	-	-	-	-	-
260	Vichama	Peru	-11.0248	-77.6323	33.0	>1000 BC	-	-	-	-	-
261	Wak'a Wallamarka	Peru	-12.0972	-77.0405	4.0	200 BC	9	85.5	18	4.59	YES
262	Wanuku Pampa	Peru	-9.8754	-76.8164	0.0	1400 AD	25	85.7	-175	-4.33	YES
263	Wari Willka	Peru	-12.1176	-75.2061	31.0	>1000 BC	-	-	-	-	-

APPENDIX V - List of Buildings Which Correlate With Other Pole Positions in Unofficial Periods

NR	Site Name	Country	Lat	Lon	Orient	Official Date	New Estimate
9	Xunantunich	Belize	17.0890	-89.1415	-5.5	700 AD	1300 AD
26	Holmul	Guatemala	17.3103	-89.2592	0.0	700 BC	200 AD
40	Yaxha	Guatemala	17.0758	-89.4025	7.5	300 AD	600 BC
50	Ake	Mexico	20.9470	-89.3005	5.5	300 AD	300 BC
51	Ake	Mexico	20.9468	-89.3018	2.5	300 AD	100 AD
66	Castillo de Teayo	Mexico	20.7500	-97.6333	-3.0	1000 AD	300 AD
70	Cempoala	Mexico	19.4473	-96.4035	4.0	400 AD	500 BC
94	Ek' Balam	Mexico	20.8907	-88.1361	0.1	700 AD	1100 AD
96	El Cerrito	Mexico	20.5515	-100.4440	4.5	400 AD	900 AD
114	Kohunlich	Mexico	18.4190	-88.7906	6.5	400 AD	100 BC
141	Oxkintok	Mexico	20.5613	-89.9527	8.5	500 AD	400 BC
157	Tamtoc	Mexico	21.9228	-98.8152	7.0	200 AD	400 BC
158	Templo Mayor	Mexico	19.4350	-99.1314	7.0	1400 AD	100 BC
163	Tenochtitlan	Mexico	19.4349	-99.1314	6.5	1300 AD	100 BC
184	Xochicalco	Mexico	18.8033	-99.2963	0.0	700 AD	200 AD