Seeking Synchronicity : Re-examining the Peruvian Early Horizon through Bayesian Modeling of 14C Dates

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6. Seeking Synchronicity: Re-examining the Peruvian Early Horizon through Bayesian Modeling of ^{14}C Dates

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1. Introduction: Returning to an Old Question

An enduring problem in the archaeology of the Central Andes has been the nature − and even existence − of a putative early horizon. Though the topic is not so central to the field as it was when the basic parameters of Central Andean culture history were still being established, nevertheless regional patterns are still topical and controversial, (e.g., Beresford-Jones and Heggarty 2011; Burger 2008, 2012; Kaulicke 2010a). The debate is in part culture-historical and chronological (what happened in the Central Andes, and when?), and in part theoretical and processual (what constitutes a horizon, and what produces such a phenomenon?). While the problem of interpreting widespread and relatively synchronic commonalities in material culture is common to archaeology globally, in the Central Andes it is motivated particularly by analogy to the ethnohistorically-documented Late Horizon produced by the Inca Empire.

Attempts to define an early horizon in the Central Andes are nearly as old as archaeology itself in the region. While Uhle's horizons were confined to the Inca and one earlier phenomenon (Uhle 1902), by the 1930s and 1940s, building particularly on Julio C. Tello's work (e.g., Tello 1943), Chavín-related iconography was argued to relate to an earlier horizon (e.g., Bennett 1943; Tello 1930, 1980[1932]; Willey 1945). Such proposals were at least partly theoretical in nature, part of a broader trend in cultural evolutionary thought that proposed horizon phenomena as a common and recurrent stage in cultural development (e.g., Phillips and Willey 1953; Willey 1948; see Ramón Joffré 2005 for a detailed history of chronology-building in the Central Andes). At the same time, in the period before absolute dating methods were available, and in a region whose culture history was little known, such efforts were as much attempts to develop methodological tools as they were attempts at explanation of cultural phenomena. That is, horizons were chronological markers that could be used to temporally locate strata and contexts in subsequent excavations as much as they were proposals of wide and rapid diffusion of an ideology or incorporation into an imperial sphere.

In order for an early Central Andean horizon to serve either methodological or interpretative roles, researchers had to contend with linked definitional, temporal, spatial, and processual questions: which material culture defines this horizon, when was that material in use (keeping in mind that one of the definitional characteristics of a horizon is relative brevity), over what territory, and what behaviors produced the distributions of material culture that can be used to identify that horizon archaeologically? Varying answers to these questions nourished debates about the definition, timing, character, and even existence of an early horizon. Rowe's (1962) proposal of an early horizon that demarcated a distinct block of time rather than describing a particular cultural phenomenon (the florescence of Chavín-related material culture and iconography) was an attempt to sidestep these debates, but as Burger (1988, 1993) observed, a purely chronological early horizon left pending the questions about whether there were *cultural* underpinnings to an early horizon and how those related to Chavín-related material and iconography.

This paper focuses on new Bayesian modeling of ^{14}C dates from janabarroid[1)] phases at nine sites spread over a wide area of the Central Andes suggests that these phases have a high probability of being contemporary and of short duration (<300 years, and possibly <200 years), falling approximately within the period 850–550 BCE. Although attention to local trajectories and attempts at nuanced explanation of single-site or single-valley dynamics have largely supplanted previous interest in regional patterns of the first millennium BCE (i.e., the "Early" or "Chavín" horizon), this new chronology suggests that it is time to revive the idea of a period of heightened regional interaction as a subject of research.

2. The Importance of Chronology

The primary research problem with respect to an early horizon became one of defining membership, resulting in a persistent debate over which sites were part of a Chavín phenomenon (e.g., Carrion Cachot 1948; Kroeber 1953; Tello 1943; Willey 1951). Debate over the existence and character of such a horizon continued over subsequent decades (e.g., Burger 1988, 1993; Lumbreras 1972; Rowe 1962). However, some of the most salient questions (e.g., regional contemporaneity of developments or time-transgressive spread? Sphere of interaction or diffusion from a founding site?) were dependent for their answers on more precise chronologies that were not available, even after two radiocarbon revolutions (Taylor 1995). Even in the late 1990s Bischof (1998: 69) observed with frustration (and an implicit critique of various proposed scenarios) that, "EI estado de las investigaciones simplemente no permite todavía fijar con precisión las fechas terminales de tantos sitios monumentales y fases constructivas, de manera que es imposible saber si se trata de eventos aislados, debidos a causas locales, o más bien de los síntomas de un fenómeno sincrónico en el área cultural." Discussions of the nature (or even existence) of the Early Horizon (e.g., Bischof 1998, 2000; Burger 1988, 1993, 2008; Kaulicke 1999a, 1999b, 2010a; Kembel and Rick 2004) have been structured by this limitation, as so many questions about regional relationships are contingent upon the chronological relationships between the various sites (or, more precisely, between the janabarroid phases at those sites). These include most obviously the divide between models of an origin center or region from which some phenomenon diffused outward (and related discussions of directions and rates of spread), and ideas of generally heightened interaction that produced a relatively synchronous florescence of shared iconographic and architectural tropes (and possibly sociopolitical changes as well).

Imprecision notwithstanding, chronology has routinely influenced interpretation in profound ways. For instance, Burger's identification of the ceramic style he defined − Janabarriu − with a discrete time period (390–200 BCE)[2)] was critical to his definition of the way in which Chavín and other ceremonial centers in the Central Andean region articulated. It led, for instance, to Burger's iconoclastic suggestion (1981) that Chavín was a late and synthetic center, and more recently (2008: 699) has underpinned his interpretation of hostile relationships between Chavín and the coastal sites of Huambacho and Chankillo. The lack of concordance between this span and janabarroid dates at other sites has also been a source of puzzlement (Inokuchi 1999: 175−176). Conversely, theoretical considerations about cultural process have shaped the kinds of questions asked about chronology in the Central Andes, most notably as much of the field has pointedly abandoned chronological terminology that employs the term "horizon", adopting instead the terminology (proposed by Lumbreras [1969, 1989] and revised and developed by Kaulicke [1994, 2010b]) that encompasses the first two millennia BCE within a "Formative Period". Though free of the culture-historical baggage of "horizon" terminology, this approach has been criticized as inherently culturally evolutionist (though in practice those who use it rarely espouse such a viewpoint). More saliently here, the implicit uniformity of the Formative Period and its subdivisions have made it difficult to discuss any period of heightened interaction *within* that period of time − i.e., if there *is* any kind of horizon phenomenon, it is difficult to describe using such terminology (Shibata [2004] and Inokuchi [2014] both wrestle with the problem of needing chronological vocabulary with which to describe the interaction represented by widely shared janabarroid features within the Middle and/or Late Formative Periods).

Two developments make it possible to revisit this problem: the increasing numbers of well published and provenienced ^{14}C dates published from first millennium BCE sites, and the development of Bayesian methods for modeling ^{14}C data (see Bayliss et al. 2007; Bronk Ramsey 2009). Although Bayesian methods of modeling ^{14}C data have only begun to be applied in the Central Andes (e.g., Koons and Alex 2014; Marsh 2012; Marsh et al. 2019; Unkel et al. 2012), clearly documented architectural and material culture sequences have the potential to provide significant improvements in ^{14}C chronologies in the region. An increasingly large corpus of ^{14}C dates from secure excavated contexts, with clear material culture associations, is now available from first millennium BCE sites. Synthesizing these data from sites linked by material culture associations provides a means of reassessing the question of the existence of a Central Andean early horizon and opens possibilities of addressing some of the questions about relationships between the sites involved.

3. Bayesian Modeling of ^{14}C Data

Bayesian approaches to radiocarbon data (e.g., Bayliss et al. 2007; Bronk Ramsey 2009;

Buck 2004; Buck et al. 1991; Litton and Buck 1995) are increasingly common in archaeology and have had dramatic success in refining archaeological chronologies (e.g., Bronk Ramsey et al. 2010; Manning et al. 2006; Meadows et al. 2007). These Bayesian approaches formalize the recognition that the ranges of the probability of calibrated radiocarbon dates do not exist in isolation but in relation to other radiocarbon dates and to other types of chronological information − primarily relative chronological information derived from stratigraphy and/or other relative chronologies. Given the relative ease of the relevant calculations in programs such as OxCal (Bronk Ramsey 2009), it is increasingly possible to explicitly incorporate such information into chronological models, and hence archaeological interpretations, of the past (see Bayliss et al. 2007; Bronk Ramsey 2009). To the degree that archaeologists have confidence in relative chronological information, that information may serve as a Bayesian *prior*, used to constrain the *likelihood* of the calendar date information associated with radiocarbon date(s) and to calculate their *posterior* probabilities. In practical terms, this generally means allowing the assertion of the calendar date associated with a given sample with higher precision, as the range of probability may be constrained with other information.

The approach developed here is that of bounded phase models elaborated in OxCal (Bronk Ramsey 2009: 343–347). Phases in OxCal are simply groups of dates believed to relate to one another whose internal ordering is unknown; these might correspond for instance to ^{14}C dates from archaeologically defined phases, as they do here. Boundaries are more conceptually complex, as they correspond less directly to commonly employed archaeological practice. Deployed in pairs to demarcate groups of dates, boundaries specify that those dates should be considered as a sample from a coherent population (of hypothetically possible dates) whose distribution may be specified (it is by default considered to be uniform). This assertion is often more an assumption than a defensible argument, but has the advantage of rendering explicit the mooted relationship between the available ^{14}C dates and the implied population of *potential* calendar dates constituent of the phase in question. Such a relationship underpins *any* interpretation of archaeological ^{14}C dates, but outside of Bayesian modeling contexts is rarely made explicit.

As Bayliss and colleagues (2007: 9) point out, in addition to improving precisions Bayesian modeling also generally has the effect of limiting the common tendency to overestimate the span of time represented by a series of radiocarbon dates, and forces an explicit consideration of when date ranges represent spans of time and when they represent ranges of uncertainty. The difficulty of distinguishing ranges of probability from spans of time is exacerbated by reporting conventions that list only numerical date ranges without accounting for uneven probability distributions within these ranges. The results reported here, which describe a phase notably shorter than other published chronologies (e.g., Beresford-Jones and Heggarty 2011: Fig. 17.1; Conklin and Quilter 2008: Fig. 1.2; Inokuchi 2014; Shibata 2004) likely represent a correction to such overestimation.

4. The Data and Models

The analysis presented is based on published ^{14}C data from selected sites that are geographically widespread and relatively securely dated. Sites were selected to maximize geographic spread (see Figure 6-1), focusing specifically on those that have been linked to Chavín (or to a Chavín phenomenon more generally) on the grounds of iconography, ceramics, lithic art, etc. The nine sites selected all have at least four ^{14}C dates from the relevant phases (Table 6-1).

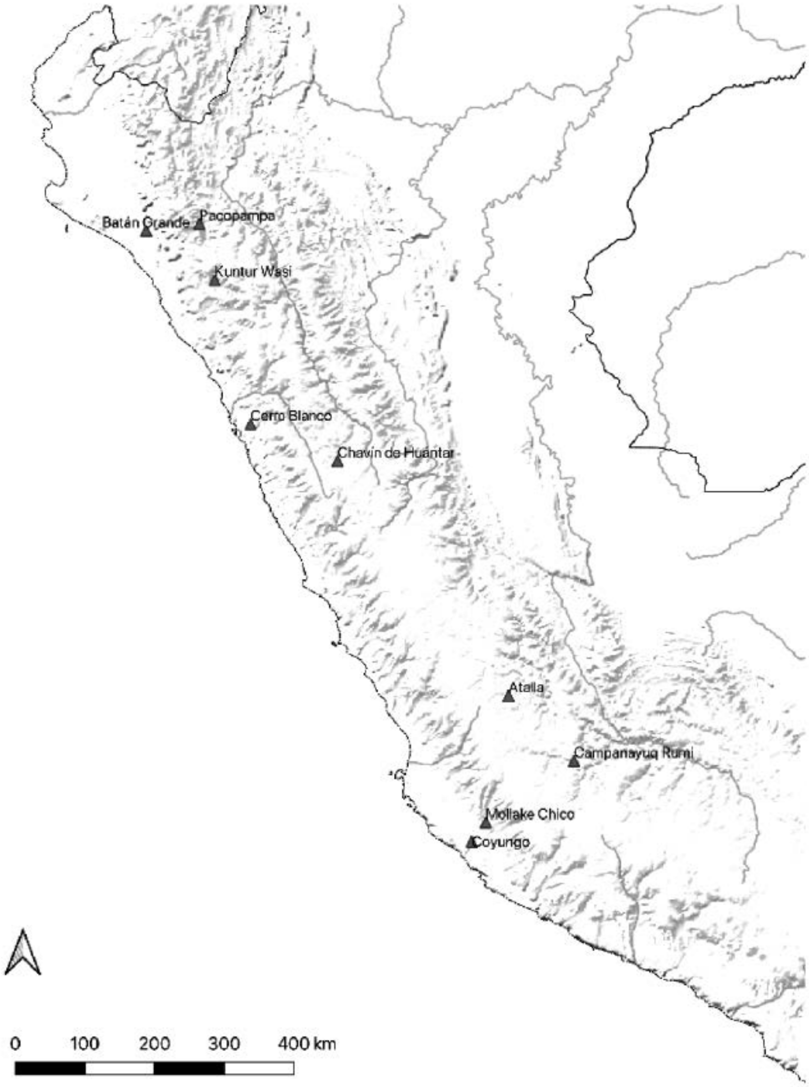


Figure 6-1 Sites included in this analysis (produced by Daniel Contreras)

Table 6-1 All ^{14}C dates included in the janabarroid phases from the nine sites, with their sources (produced by Daniel Contreras)

Lab #	^{14}C age	±	Associated Phase/Ceramics	Source	Notes
Chavín de Huántar					
AA74571	2741	32	janabarroide	Rick et al. 2010	
AA74565	2461	34	janabarroide	Rick et al. 2010	outlier
AA74566	2403	34	janabarroide	Rick et al. 2010	
AA74572	2599	35	janabarroide	Rick et al. 2010	
Beta224480	2660	40	janabarroide	Rick et al. 2010	
Beta224479	2450	40	janabarroide	Rick et al. 2010	
Beta224482	2420	40	janabarroide	Rick et al. 2010	
Beta224483	2620	50	janabarroide	Rick et al. 2010	
Beta224484	2620	40	janabarroide	Rick et al. 2010	
AA75393	2573	33	janabarroide	Rick et al. 2010	
AA75392	2522	34	janabarroide	Rick et al. 2010	
ETH20741	2395	55	janabarroide	Rick et al. 2010	
AA69449	2567	42	janabarroide	Rick et al. 2010	
AA69448	2506	43	janabarroide	Rick et al. 2010	
AA75384	2512	35	janabarroide	Rick et al. 2010	
AA75382	2481	35	janabarroide	Rick et al. 2010	
AA75390	2500	35	janabarroide	Rick et al. 2010	
AA75389	2573	34	janabarroide	Rick et al. 2010	
AA75388	2740	37	janabarroide	Rick et al. 2010	
HAR-1105	2380	70	Janabarriu	Lumbreras 1993	outlier
GX-1127	3077	100	Rocas/Janabarriu	Lumbreras 1993	outlier
SI-1212	2890	125	Rocas/Janabarriu	Lumbreras 1993	outlier
SI-1210	3025	80	Rocas/Janabarriu	Lumbreras 1993	outlier
SI-1211	3370	90	Rocas/Janabarriu	Lumbreras 1993	outlier
UCR-748	1635	100	Janabarriu	Burger 1998	outlier
UCR-747	1775	100	Janabarriu	Burger 1998	
ISGS-506	2520	100	Janabarriu	Burger 1998	
Beta-460303	2460	30	Janabarriu	Burger 2019	
Beta-415132	2530	30	Janabarriu	Burger 2019	
Beta-421359	2490	30	Janabarriu	Burger 2019	
Beta-421783	2490	30	Janabarriu	Burger 2019	
Beta-421360	2460	30	Janabarriu	Burger 2019	
Beta-421361	2470	30	Janabarriu	Burger 2019	
Beta-415133	2560	30	Janabarriu	Burger 2019	
Beta-460302	2650	30	Janabarriu	Burger 2019	considered an outlier by Burger
Palpa					
LuS50062	2587	38	Paracas Temprano (Ocucaje 3–4)	Unkel et al. 2012	Pernil Alto
ET125	2910	70	Paracas Temprano (Ocucaje 3–4)	Unkel et al. 2012	considered an outlier by Unkel et al.
ET176	2600	54	Paracas Temprano (Ocucaje 3–4)	Unkel et al. 2012	Mollake Chico
ET128	2495	45	Paracas Temprano (Ocucaje 3–4)	Unkel et al. 2012	Mollake Chico

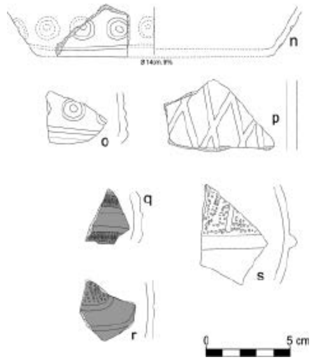
Cerro Blanco					
Tka-13942	2560	80	Cerro Blanco/Nepeña (sample associated with Event BR-1(B))	Shibata 2010: Table 1	
TKa-13911	2530	35	Cerro Blanco (sample associated with Event BR-1(A))	Shibata 2010: Table 1	
TKa-13941	2530	70	Nepeña (sample associated with end of Event BR-1)	Shibata 2010: Table 1	
TKa-13957	2500	70	Cerro Blanco/Nepeña (sample associated with Event BR-1(B))	Shibata 2010: Table 1	
TKa-13564	2680	40	Cerro Blanco (sample associated with Event BR-1(A))	Shibata 2010: Table 1	
Pacopampa					
Beta-244567	2680	40	Pacopampa II-A	Seki et al. 2010: Table 1	
Beta-228673	2460	40	Pacopampa II-B	Seki et al. 2010: Table 1	
Beta-245513	2670	40	Pacopampa II-A	Seki et al. 2010: Table 1	
Beta-227408	2590	40	Pacopampa II-A	Seki et al. 2010: Table 1	
Beta-212517	2490	40	Pacopampa II-B	Seki et al. 2010: Table 1	
Beta-244566	2420	40	Pacopampa II-B	Seki et al. 2010: Table 1	
Beta-227409	2520	40	Pacopampa II-A	Seki et al. 2010: Table 1	
Beta-211448	2600	40	Pacopampa II-A	Seki et al. 2010: Table 1	
Beta-211447	2620	40	Pacopampa II-A	Seki et al. 2010: Table 1	
Beta-212519	2520	40	Pacopampa II-A	Seki et al. 2010: Table 1	
Beta-211445	2480	40	Pacopampa II-A	Seki et al. 2010: Table 1	
Kuntur Wasi					
TK-913	2710	80	KW-2	Inokuchi 2010: Table 1	
TK-908	2560	60	KW-2	Inokuchi 2010: Table 1	
TKa-12730	2525	40	KW-2	Inokuchi 2010: Table 1	
TK-912	2520	60	KW-2	Inokuchi 2010: Table 1	
TK-909	2510	50	KW-2	Inokuchi 2010: Table 1	
TKa-12729	2505	40	KW-2	Inokuchi 2010: Table 1	
TK-910	2410	50	KW-2	Inokuchi 2010: Table 1	
TK-911	2330	60	KW-2	Inokuchi 2010: Table 1	
TKa-11797	2750	70	KW-2	Inokuchi 2010: Table 1	outlier
NUTA-2025	2960	170	KW-1	Inokuchi 2010: Table 1	outlier
TERRA-013001b38	2515	50	KW-1	Inokuchi 2010: Table 1	
TERRA-111400d26	2575	45	KW-1	Inokuchi 2010: Table 1	
TERRA-120100a09	2570	60	KW-1	Inokuchi 2010: Table 1	
TERRA-120100a10	2490	50	KW-1	Inokuchi 2010: Table 1	
TERRA-013001b19	2470	45	KW-1	Inokuchi 2010: Table 1	
TERRA-013001b18	2390	90	KW-1	Inokuchi 2010: Table 1	
TERRA-013001b20	2535	60	KW-2	Inokuchi 2010: Table 1	
TERRA-013001b28	2570	50	KW	Inokuchi 2010: Table 1	
NUTA-2105	2600	170	KW	Inokuchi 2010: Table 1	
NUTA-2334	2580	120	KW	Inokuchi 2010: Table 1	

Campanayuq Rumi					
AA87112	2517	44	Campanayuq II	Matsumoto and Cavero 2010: Tabla 1	
AA87116	2451	44	Campanayuq II	Matsumoto and Cavero 2010: Tabla 1	
AA87115	2473	44	Campanayuq II	Matsumoto and Cavero 2010: Tabla 1	
AA87114	2469	49	Campanayuq II	Matsumoto and Cavero 2010: Tabla 1	
AA87113	2451	54	Campanayuq II	Matsumoto and Cavero 2010: Tabla 1	
AA87111	2506	44	Campanayuq II	Matsumoto and Cavero 2010: Tabla 1	
Sajarapatac					
TKa-13677	2525	35	Sajara-patac 1	Matsumoto and Tsurumi 2011	
TKa-13676	2490	30	Sajara-patac 2	Matsumoto and Tsurumi 2011	
TKa-13675	2585	35	Sajara-patac 2	Matsumoto and Tsurumi 2011	
Pta-9658	2270	80	Sajara-patac 3	Matsumoto and Tsurumi 2011	terminal date for Sajara-Patac 3
Atalla					
UGAMS 33409	2540	25	Wilka	Young 2020	
AA110578	2482	21	Wilka	Young 2020	
UGAMS 33411	2460	25	Wilka	Young 2020	
UGAMS 40809	2540	20	Wilka	Young 2020	
UGAMS 33415	2540	25	Wilka	Young 2020	
AA110584	2625	21	Wilka	Young 2020	
Batán Grande					
SMU-2420	2410	70	Stratigraphic Position 3	Shimada et al. 1998	
SMU-1821	2550	30	Stratigraphic Position 3	Shimada et al. 1998	
SMU-2419	2560	60	Stratigraphic Position 3	Shimada et al. 1998	
SMU-1624	2580	60	Stratigraphic Position 3	Shimada et al. 1998	
Coyungo					
Erl-13236	2440	43	context T.1	Kaulicke et al. 2010	Chavin textile
Erl-13237	2576	63	context T.1	Kaulicke et al. 2010	Chavin textile
Erl-13238	2555	44	structure T.2	Kaulicke et al. 2010	
Erl-13239	2476	43	structure T.2	Kaulicke et al. 2010	
Erl-13240	2452	43	T.3	Kaulicke et al. 2010	
Erl-13241	2541	43	T.4	Kaulicke et al. 2010	

For each of these phases at each site I have used deliberately simple bounded phase models that include the dates from the relevant janabarroid phase, in sequence according to sub-phases where possible. More sophisticated models for each site might be constructed by including detailed prior information from site stratigraphy, architectural relationships, etc., but the development of each such model is a project unto itself and has not been undertaken here (with the exception of janabarroid ceramics from Chavín, which draw on a previously developed model [Contreras in press]). The models employed here, it should be stressed, are *not* of site chronologies generally, but rather are limited to the phases in which material (generally ceramic and/or iconographic) that the excavators have described as notably Chavín-related – that is, having stylistic affinities with janabarroid ceramics and associated iconography from Chavín de Huántar. In addition to

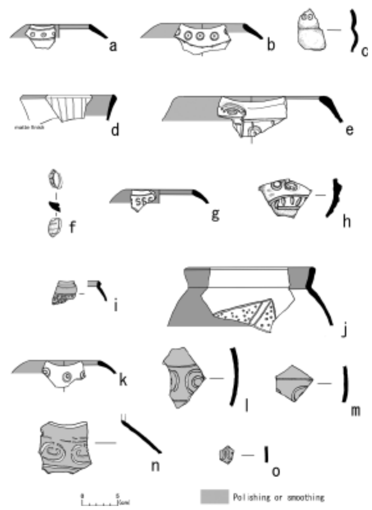
Kuntur Wasi
Inokuchi 2008: Fig. 2c
(KW-Gris Fino)

Kuntur Wasi
Inokuchi 2008: Fig. 3a (SG-Marrón Inciso [fase Kuntur Wasi])

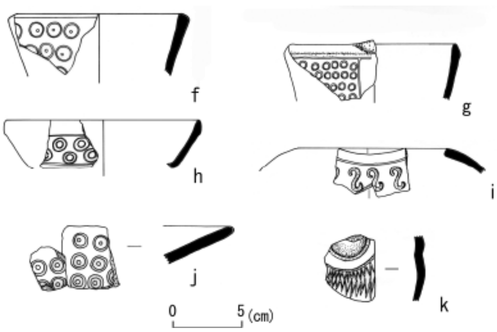


Cerro Balnco
Shibata 2010: Fig. 8 (Cerámica de la fase Nepeña[NP])

Chavín de Huántar
Rick et al. 2010: Fig. 15 (janabarroide)



Sajara-patac
Matsumoto and Tsurumi 2011: Fig. 35 (Phases 1-3)



Campanayoq Rumi
Matsumoto and Cavero 2010: Fig. 8 (Campanayoq II)

Mollake Chico
Isla Cuadrado and Reindel 2006: Fig. 19a and 19b (Ocupaje 3)

Figure 6-2 A selection of published janabarroid materials from the sites whose chronologies are analyzed here. (Inokuchi 2010: Fig.2 and Fig.3; Shibata 2010: Fig.8; Matsumoto and Tsurumi 2011: Figs. 33,35,36; Matsumoto and Cavero Palomino 2010: Fig.8; Rick et al. 2010: Fig.15; Isla and Reindel 2006: Fig.11 and Fig.19) including prior information such as stratigraphic relationships among the dates included, models could be made more precise through detailed attention to the relationship between dated events and target events (for instance, the likelihood that charcoal is of the same age as the context it is intended to date), as well as through the inclusion of dates from prior and subsequent phases, which could serve to further constrain the start and end dates of these phases. Any effects of including such additional data would be to further constrain the phase estimates. That is, the estimates here should be understood as spans of time *within which* the archaeological phase occurred; because they incorporate some uncertainty they are likely to be overestimates of the durations of those phases.

The nine sites include Chavín (Burger 2019; Contreras in press; Rick et al. 2010), the Palpa Valley (Unkel et al. 2012), Cerro Blanco (Shibata 2010, 2011), Pacopampa (Seki et al. 2010), Kuntur Wasi (Inokuchi 2010, 2014), Campanayuq Rumi (Matsumoto and Cavero Palomino 2010), Sajara-patac (Matsumoto and Tsurumi 2011), Atalla (Young 2020), Batán Grande (Shimada et al. 1998), and Coyungo (Kaulicke et al. 2010) (citations here are only to the most thorough syntheses of ^{14}C dates and are not intended to be comprehensive of investigations at those sites). I summarize the dates included from each site below, including brief descriptions of the relevant material from the selected phases (see Figure 6-2 for a selection of such material). All calibration and modeling were carried out in OxCal 4.4 (Bronk Ramsey 2009). Given the uncertainties surrounding the selection of the appropriate calibration curve for the region (Marsh et al. 2018), no specification of northern or southern hemisphere calibration curve has been made, adding additional uncertainty to the model[3)]. All dates are included in Table 6-1, and all OxCal code is included as supplementary material.

4.1 Chavín de Huántar

The bounded phase model includes thirty-five ^{14}C dates associated with janabarroid ceramics, as well as stratigraphic relationships among these dates (detailed in Contreras in press). janabarroid material at Chavín consists primarily of burnished blackware neckless jars, bowls, and cups, often stamped with circle, punctate circle, and "S" forms; see Rick et al. 2010: Fig. 15 for a selection of this material. This list of characteristics is not exclusive, and perhaps these are not even strictly necessary elements: the array of janabarroid material at Chavín encompasses significant variation (functional, social, and/or chronological; see [Rick 2014: 268–273]) and will likely be subdivided by future work (as for instance have the ceramics of the Kuntur Wasi phase at Kuntur Wasi, reflecting multiple axes of variability − see Inokuchi 2014). It is apparently associated with the site's apogee of construction in the Black and White Stage (Kembel 2008; Kembel and Haas 2015; Rick et al. 2010). While this material may not be exclusive to this stage of architectural florescence, it certainly substantially coincides with it.

4.2 Palpa

I here use an extract from the published Bayesian model of the entire valley chronology, encompassing 151 ^{14}C dates and 17 sites (Unkel et al. 2012). I focus specifically on the Early Paracas phase, associated with Ocucaje 3/4 ceramics and excavated materials from the sites of Pernil Alto and Mollake Chico, for which Unkel and colleagues report five dates from two sites, one of which (ET125) they reject as an outlier and one of which (LuS50065) is from a Middle Paracas funerary context. Isla and Reindel (2006: 171) characterize the Ocucaje 3 ceramics excavated from funerary contexts at Mollake Chico as displaying, "formas y rasgos decorativos que fueron introducidos por la influencia Chavín en los valles de la costa sur." See Isla and Reindel 2006: Fig. 19a and 19b for a selection of this material.

4.3 Cerro Blanco

The bounded phase model includes five ^{14}C dates associated with the CB/NP Event and the immediately subsequent Nepeña phase. Materials associated with the Nepeña phase are described as those in which, "Algunos tipos decorativos son característicos de esta fase, incluyendo el Episodio CB/NP, como *rocker stamping* (Figure 6-8, q), la pintura de grafito en área (Figure 6-7, s-u; Figure 6-8, q-r), los diseños de círculos concéntricos o de círculo e impreso de punto pintados con pigmentos rojos (Ikehara and Shibata 2008: Fig. 15, E), y las líneas incisas acanaladas anchas en combinación con punteados alargados (Figure 6-7, r), las que tienen su mayor presencia en esta fase." (Shibata 2010: 300) For a selection of material see Shibata 2010: Fig. 7 and Fig. 8.

4.4 Pacopampa

The bounded phase model includes eleven ^{14}C dates associated with the Pacopampa II phase, grouped into the sequential Pacopampa II-A and II-B sub-phases. During the Pacopampa II phase, "es muy popular la cerámica gris pulida y la decoración basada en diseños circulares estampados." (Seki et al. 2010: 83) For a selection of this material see (Rosas la Noire and Shady Solís 1970: Lámina 11 and 12).

4.5 Kuntur Wasi

The bounded phase model includes twenty ^{14}C dates associated with the Kuntur Wasi phase, most of which can be assigned to the sequential KW-1 and KW-2 sub-phases. The Kuntur Wasi phase is described as having "características [que] no se observan en la mayoría de la cerámica precedente" (Inokuchi 2010: 221), and includes, "el tipo *KW Negro Fino* [que] destaca por una gran gama de técnicas como incisiones anchas, punteado, *rocker-stamping,* relieves, aplicaciones y modelados," and "dos tipos de vasijas grafitadas." (Inokuchi 1999: 165) For a selection of this material, see Inokuchi 2010: Fig. 2c and Fig. 3a.

4.6 Campanayuq Rumi

The bounded phase model includes six ^{14}C dates associated with the Campanayuq II phase. The excavators write that, "Las características de la cerámica de la fase Campanayuq II indican un vínculo estrecho con la fase Janabarriu de Chavín de Huántar (Burger 1984), la fase Cerrillos del sitio de Cerrillos, en el valle medio de Ica (Wallace 1962), Mollake Chico, en Palpa (Isla and Reindel 2006), las fases Ocucaje 3 y 4 (Menzel et al. 1964) y el tipo Kichka-pata, de Ayacucho (Lumbreras 1974; Ochatoma 1992)."

(Matsumoto and Cavero Palomino 2010: 343). For a selection of this material, see Matsumoto and Cavero Palomino 2010: Fig. 8.

4.7 Sajara-patac

The bounded phase model includes four ^{14}C dates associated with the Sajara-patac 1–3 phases, modeled in sequence. The most recent date (Pta-9658), associated with the transition from the Sajara-patac 3 to Sajara-Patac 4 phases, is used as a *terminus ante quem*. Thie Sajara-patac 1-3 phases are defined as “an Early Horizon component corresponding to the Kotosh-Chavín Period” (Matsumoto and Tsurumi 2011: 78). For a selection of this material, see Matsumoto and Tsurumi 2011: Fig. 35 and 36.

4.8 Atalla

The bounded phase model includes six ^{14}C dates associated with the Willka phase. This phase is notable for the, “rising popularity of the Chavín International style, which came to make up approximately 20% of decorated ceramics” (Young 2020: 593). For details on this material, see (Young 2020: Ch.9).

4.9 Batán Grande

The bounded phase model includes four ^{14}C dates associated with a selection of the kilns exposed in the Poma Canal by the 1982–1983 El Niño (Shimada et al. 1994, 1998). These dates − from kilns in Stratigraphic Position 3 − are associated with reduced-fire ceramics with burnished surfaces and incised geometric designs “típicos de la cerámica estilo Chólope [Cupisnique]”. For a selection of this material, see (Shimada et al. 1994: Fig. 14).

4.10 Coyungo

The bounded phase model includes six ^{14}C dates from excavations of four previously looted tombs, which recovered textile fragments from a well-known textile with Chavín iconography in the Dumbarton Oaks Collection (Kaulicke et al. 2010: Fig.11-13) as well as ceramics identified as Ocucaje 3 that include janabarroid motifs (“La técnica de decoración de círculos estampados o inciso con o sin punto central está presente en todos los contextos también” [Kaulicke et al. 2010: 304]).

5. Results and Discussion

Results are summarized in Figure 6-3. Two results stand out:

(1) the ^{14}C data argue for a period that is relatively short in duration (at the 68% confidence level, all spans except Cerro Blanco and Sajara-Patac are < 200 years)[4)], and
(2) there is a strong probability that the phases are contemporaneous.[5)]
The bounded phase models of these site chronologies suggest that we can be confident (given the limits of available data) that within the period of

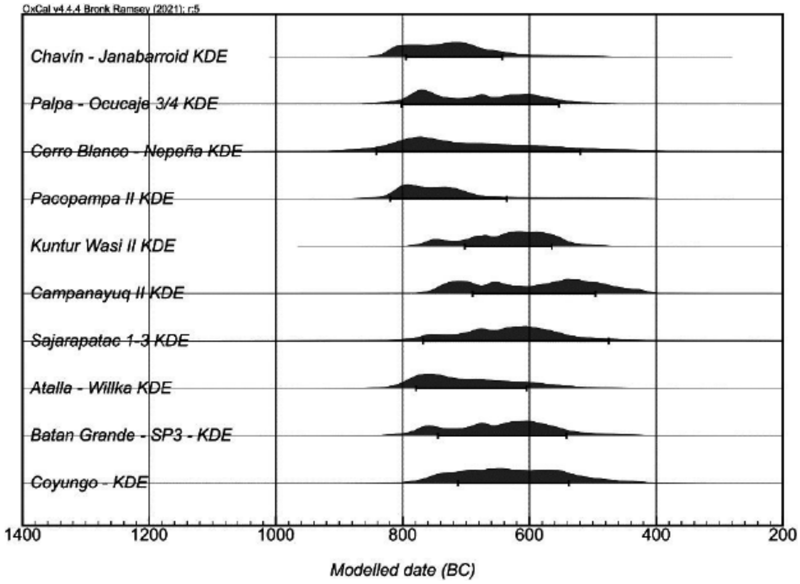


Figure 6-3 The modeled phases from the nine selected sites. These kernel density estimates summarize the modeled dates from each phase (Bronk Ramsey 2017). Because the individual ^{14}C dates can be treated as a sample of all the dateable events that constitute a given phase, in aggregate they approximate the duration of that phase (with boundaries attempting to account for statistical scatter [Bronk Ramsey 2009: 342–345] resulting from the uncertainties of individual dates falling near phase beginnings and endings). As Figure 6-4 demonstrates, because the constituent dated events are not in fact a random sample, the introduction of additional prior information would likely further constrain these phase estimates. The addition of further ^{14}C dates of course has the potential to extend phase estimates earlier or later in time, but as the total number of dates from a given site increases, it becomes less likely that additional samples will fall outside of the established distribution.

approximately 850–550 BCE:

- the period in which janabarroid ceramics were in use at Chavín de Huántar began and ended,
- Ocucaje 3–4 ceramics were in use in the Palpa Valley,
- the Nepeña phase at Cerro Blanco began and ended,
- the Kuntur Wasi phase at Kuntur Wasi began and ended,
- the Pacopampa II phase at Pacopampa began and ended,
- the Willka phase at Atalla began and ended,
- production of Chólope ceramics in the kilns found in Stratigraphic Position 3 in the Poma Canal at Batán Grande began and ended,
- textiles and ceramics incorporated into the Ocucaje 3–4 tombs in Coyungo were produced,
- the Campanayoq II phase at Campanayoq Rumi began (and ended by ~500 BCE), and

• the Sajara-Patac 1–3 phases at Sajara-patac began (and ended by ~500 BCE).

The contemporaneity of these phases at various sites warrants investigation – whether we term it "horizon" or not. Moreover, while contemporaneity and brevity are not themselves sufficient for interpretation, they highlight three important parameters for discussion:

5.1 Precision

Without more precise dating of the constituent sites (and of others), proposals regarding the spatial structure of the appearance, spread, and disappearance of janabarroid features remain provisional. Given the limits of chronological precision relative to the span of time involved, questions regarding directionality of spread, earlier appearance or later persistence in some zones rather than others, the temporal priority of any particular site, etc. can only be addressed in a preliminary fashion.

Beginnings and endings are particularly difficult to pinpoint using ^{14}C data, as the probabilistic nature of ^{14}C estimates creates tails rather than thresholds, and excavated and dated contexts rarely include those that can definitively be described as first or last in a given archaeological phase. Dates from earlier and later phases and/or contexts that can constrain ^{14}C probability distributions will improve precision, and thus discriminate between, for example, phases that are 300 years long and phases that in fact lasted 200 years but can currently only be identified as *falling within* a 300 span. The long tails for all phases reflect both the scarcity of constraints and the reduced precision resulting from the Hallstatt Plateau (a "flat" portion of the radiocarbon calibration curve, within which a single radiocarbon age is attributable only to a relatively broad range of calendar ages [see Hamilton et al. 2015]) at approximately 700–400 BCE.

The exclusion of stratigraphic information from the model of the janabarroid phase at Chavín (Figure 6-4) demonstrates that sites with more dates and additional priors can produce spans that are shorter because they are better constrained and hence more precise. This reinforces the idea that the spans in Figure 6-3 and Table 6-2 are in part reflecting imprecision, and should be understood as time periods that encompass the phases in question but are not necessarily exactly congruent with them.

5.2 Contemporaneity vs Synchronicity

Whether the ceramics and iconography found at these sites diffused from a single center or had polythetic origins, they were present at most sites only a matter of decades or less after their initial appearance. Unfortunately, as noted above, chronological precision is not currently sufficient to distinguish broad contemporaneity from close synchronicity.

In recent years several major projects at "Early Horizon" sites have looked inward in their chronologies, attempting to refine the accuracy, precision, and subdivision of site chronologies (e.g., Inokuchi [2010] and [2014] for Kuntur Wasi, Seki and colleagues [2010] for Pacopampa, Rick and colleagues [2010] for Chavín). This retreat from regional chronology seems to largely represent a recognition of the difficulty, and importance, of developing detailed site chronologies, and when projects like these have attempted to grapple again with problems of regional and inter-regional relationships they

Table 6-2 Estimated length of each phase, in calendar years (OxCal 'Spans')

Site – Phase	Span (95% range)	Span (68% range)	Median
Chavín – janabarroid/B&W	303	125	188
Kuntur Wasi – Kuntur Wasi	323	160	101
Pacopampa – Pacopampa II	486	156	152
Campanayuq Rumi – Campanayuq II	298	145	89
Palpa – Ocucaje 3–4	488	167	99
Sajara-patac – Sajara-patac 1–3	1091	336	198
Cerro Blanco – BR-1/Nepeña*	980	447	345
Atalla -Willka	351	191	170
Batán Grande - SP3	384	161	101
Coyungo	320	167	113
Mean	502	206	156
Mean (excluding Sajara-Patac and Cerro Blanco)	369	159	127

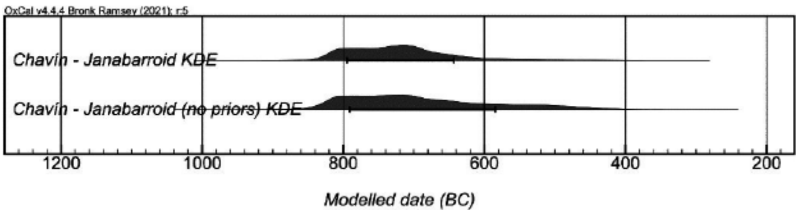


Figure 6-4 Impact of stratigraphic priors on the janabarroid dates from Chavín de Huántar. A simple bounded phase model produces similar accuracy to a model that includes stratigraphic constraints, but notably less precision (the medians are similar, but the range of the simple bounded phase model is broader, with a longer tail).

have struggled with the need for commensurate chronological vocabularies and precisions (e.g., Inokuchi 2014; Rick et al. 2010; Shibata 2004, 2010). Attempts at the explanation of process, or at defining the character of interregional relationships, have consistently come against the limits of chronological precision (cf. Kaulicke 2010a).

The results of these projects, the Bayesian analyses presented here show, can now re-open regional questions. Limiting the total span of time to < 300 years (see Figure 6-3 and Table 6-2) can inform the interpretation of the possible processes involved. Better constrained models – i.e., taking into account more detail for each site – are likely to result in yet shorter phases; those presented here may probably be considered as maximum estimates, lengthened both by the relatively sparse prior information considered and by the tendency of later dates to encroach into the Hallstatt Plateau, creating additional uncertainty.

Given demonstrable contemporaneity of these complexes of material culture and widely dispersed sites, we might now more strongly infer that similar but less rigorously dated material is *also* contemporary – for instance, Ocucaje 3–4 material elsewhere in the Paracas region and janabarroid material from Ancón (Carrion Cachot 1948; Rosas la Noire 2007; Scheele 1970).

5.3 Identification

Selecting sites for analysis on the basis of their apparent affiliation may overemphasize the ubiquity of sites with janabarroid features.

Improving ^{14}C chronologies will also make it possible to address a putative horizon phenomenon as a research problem of sociopolitical landscape: with the elaboration of increasingly precise absolute chronologies it will become possible to identify contemporary sites that *did not* participate in whatever phenomenon of interaction produced the shared features identified at the "horizon" sites. The continued use of an early horizon as a chronological tool in the Central Andes has had the unintended effect of making it difficult to identify contemporary but non-participating sites, and provides no ready vocabulary for describing them. According to Rowe's definition and usage, even contemporary sites without any affiliation with Chavín's interaction network would belong to the Early Horizon. In practice, subsequent usages of the concepts of Early and/or Chavín horizons, even as they developed elaborate conceptual apparatus for explaining the processes of interaction, generally ignored the possibility of *non*-interaction; contemporary but non-participatory sites have largely remained undiscussed. Although Burger's (1984) attention to interactions between the territories of Peru and Ecuador dealt explicitly with interactions between intra- and extra-Chavín-network sites, it envisioned adjacent spheres of interaction – i.e., those contemporary sites that fell outside of Chavín's network also definitionally occupied a distinct territory with an intervening frontier; more recently Burger (2008: 697–700, 2012: 139–140) has considered a more fragmented social landscape.

Salient questions remain: How widespread was this network during the first half of the first millennium BCE, and did any contemporary sites *not* participate? Is the distinction between participation and non-participation geographic (i.e., reflecting a distance-decay mechanism) or a function of other factors than distance? If sites did not participate, was this because the network was exclusionary, or because they rejected its goods and/or ideology? Furthermore, there is no *a priori* reason to suppose that participation was a binary proposition; likely we should be considering degrees of interaction (and how to measure them) rather than presence/absence of interaction. Tellenbach's (1999) attempt to develop a system for assessing similarity through ceramic and iconographic motifs provides a potential template for such approaches.

6. Conclusions

Kaulicke (2010a: 13) has argued that it is, "poco recomendable partir de la idea de megaestilos que cubran megaespacios (como el Horizonte Chavín)," and it is important to emphasize that this research does not *presume* the existence of an early horizon/mega-style, nor argue for the centrality of Chavín to such a phenomenon. Rather, taking a selection of component phases from various sites that have been suggested as somehow related to such a broad phenomenon, it asks whether the available ^{14}C evidence supports the suggestion that these are contemporary. In fact, simple Bayesian models of the evidence from several of these sites, developed independently of one another, suggest a high probability of contemporaneity, and make clear that increased chronological precision will be necessary in order to consider questions of synchronicity.

A chronology that suggests the possibility of heightened interaction over a relatively brief span of time resuscitates basic questions about horizon phenomena: e.g. Which sites were involved? What social/political/economic processes produced such patterning in material culture? However, these questions now should not be about binary determinations of membership in a "horizon", but rather should focus on the specificities of relationships between sites and their inhabitants – i.e. the processes and practices that created observable shared characteristics. A variety of possibilities have been proposed, ranging from the spread of a religious cult (e.g., Burger 1988, 1992; Keatinge 1981; Patterson 1971) to the emergence of class, regional economic interaction, and the state (e.g., Burger 1993; Lumbreras 1989; Tantaleán 2011), the interactions of emergent elites and multiple centers (Kembel and Rick 2004; Rick 2008), and a dispersal of maize agriculture and Quechua language with it (Beresford-Jones and Heggarty 2011; Heggarty et al. 2010). None of these proposals have been able to draw on the kinds of chronological information necessary to actually test their propositions.

Description of a discrete and brief janabarroid period that is based on the alignment of independent chronologies suggests that such testing is beginning to become possible. There is now a need to develop strategies for asking questions about what produces a horizon, and how we might recognize/differentiate processes – just what are the relationships implied, and the associated chronological relationships and patterns of material culture that should be expected?

If a startling contemporaneity and brevity of janabarroid materials is evident, so too is the diversity of this material, even while affiliation is apparent (both similarity and diversity are evident even in the small sample illustrated in Figure 6-2). Liberated from a reliance on that material to make binary in/out decisions about membership in a Chavín set, we can

(1) focus on the particularities of similarities (and differences) in material culture (i.e., assess degrees of interaction),
(2) consider if and how various exchange networks overlap, and
(3) examine the specificities of chronological relationships that, while they may be generally described as overlapping, also encompass distinct beginnings and endings as well as potential spatial patterning.

The possibility of addressing such questions results from building radiocarbon chronologies that can independently establish chronological relationships rather than looking to shared features in hopes of finding a marker of contemporaneity, a horizon on which to hang a regional chronology. Burger (1993: 46) noted as much almost three decades ago: "…the use of a horizon style as a temporal index seems increasingly redundant and outmoded. However, once freed from its function as a chronological tool, the horizon phenomenon can itself become the object of investigation." In spite of this observation, only in recent years are the required independent and adequately precise chronologies necessary for making the horizon phenomenon itself the object of investigation becoming available.

In a broader perspective, the delimitation of this relatively brief period within the 850–550 BCE span begs the question of how this period relates to the surrounding millennia of the Formative Period, spanning approximately 2000 BCE to 200 BCE. Are the processes internal to the constituent sites in this period as chronologically distinct as the period of heightened interaction itself? That is, what is the relationship of inter-site interaction to the emergence, institutionalization, and reification of sociopolitical inequality? What distinguishes this period from those before and after it at the site level, or the level of human experience and daily practice? Is this brief period of heightened interaction simply a manifestation of the broader currents of change in the Formative Period, or is it rather a qualitatively distinct moment in it? If a moment, what role did that moment play in the transformations of the Formative Period more generally?

Rice (1993) may have eulogized horizons as no longer necessary for chronological purposes and no longer adequate for descriptive purposes, but as Burger (1993) argued, if they can still be shown to constitute empirically demonstrable phenomena, their analysis and explanation remains not just possible, but vital. An early horizon (or something like one) poses questions, and archaeologists interested in the Central Andean Formative need to think hard about *how* it might be possible to generate explanations of the surprising contemporaneity and relatively short duration of similarity-with-diversity that seems evident at Chavín and its contemporaries. What information is necessary, how might ideas be falsified, and what research strategies can produce evidence that will yield such information and allow such testing? While ^{14}C chronology suggests that there is an early horizon to investigate, this should also refocus attention on non-chronological questions: how can we better characterize the interaction implied by a horizon-like phenomenon?

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Notes

1) Following the approach adopted by Rick and colleagues (2010), I use the term janabarroid to indicate "la presencia de cerámica formalmente estampada con diseños o iconos típicos chavín, como los asociados a la fase Janabarriu de Burger," (Rick et al. 2010: 113) – material which has consistently been linked with the proposed period of heightened interaction in the first millennium BCE. Although the characteristics of this heightened interaction have often been referenced, no generally-agreed rigorous definition currently exists. Ceramics are probably the most commonly employed marker (see Burger 1988: 133, 1992: 170), with lithic art, iconography more broadly, and architecture also in use.
2) Revised to "approx. 400–250 cal BC" (Burger 2008: 695), then to "700–300 cal. BC" (Burger 2012: 152) – neither estimate references any specific ^{14}C dates – and more recently to "700–400 cal BC" (Burger 2019: 384) on the basis of seven newly published ^{14}C dates.
3) As various authors (Marsh et al. 2018; Ogburn 2012; Rick et al. 2010; Unkel et al. 2012) have discussed, selection of the appropriate calibration curve for the Central Andes is complex, due to the proximity of the Intertropical Convergence Zone (ITCZ) and atmospheric mixing of air masses from northern and southern hemispheres. In this light, it is likely not only that some mixing model of northern and southern hemisphere air masses is appropriate, but also that the appropriate mixture or selection of calibration curve may vary regionally, particularly between coast and highlands (Ogburn 2012: 223–225; Marsh et al. 2018). Diachronic variation in the position of the ITCZ means that the most apt curve or mixing model will also vary depending on the time period under consideration, but detailed descriptions of this variability remain to be developed. Following the approach recommended by Marsh and colleagues (2018: 932–933), ^{14}C dates are calibrated here specifying a curve that may be IntCal20, SHCal20, or any mixture of the two.
4) These (see Table 6-2) have been calculated using the 'Span', query in OxCal, which returns the modeled interval between events in a sequence; see code in Appendix 1. Note that as the distributions are asymmetrical and often have at least one long tail, the 95% range is often misleadingly large.
5) It perhaps bears emphasizing that the selection of sites *preceded* any chronological analysis; in this respect they constitute a random sample of putatively Early Horizon sites. Unfortunately many of these other sites, which could serve to test the hypotheses of brevity and contemporaneity and extend the geographic extent (ultimately perhaps even allowing investigation of the possibility of spatio-temporal patterning), remain dated primarily only in relative terms.

Supplementary Information

1. OxCal code for bounded phase models of the relevant phases from each site.
2. OxCal code comparing models for Chavín janabarroid material with and without stratigraphic priors.

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