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Climate Change, Maritime Mobility and Cultural Contacts in the 4th and 3rd Millennium BC

Naqada Culture and Preliminary OSL Findings of a Step Pyramid on Tenerife

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Abstract

Climatic and geomorphological changes can accelerate mobility, resource crises and the reorganization of settlement areas. The presentation ‘Archaeology and Climate’ therefore combines the Holocene flooding of the Persian Gulf, the emergence of the Naqada culture in Egypt and maritime contacts as far as the Atlantic into a large-scale working hypothesis. The present contribution examines which parts of this hypothesis are already empirically connectable. Palaeogeographic reconstructions demonstrate a multiphase transgression in the Persian Gulf; archaeological finds also show highly developed seafaring in the Gulf already in the 6th and 5th millennia BC.

For a direct migration from the Gulf to Upper Egypt and onward to the Canary Islands, a continuous chain of finds had until now been lacking. This gap in the finds is increasingly being closed by the research work of the archaeologist Dr. Peter Tomkins on Crete, Sardinia and in southern Spain. At the same time, the diffusion theory receives a new chronological and cultural-historical context through the redating of the rock image of Laja Alta near Gibraltar (Morgado-Rodríguez et al. 2025; Tomkins P., report passim). As a new test case, preliminary surface-luminescence data from a step pyramid in the San Marcos complex on Tenerife are discussed. The OSL measurement gives a value of 4360 ± 330 BP. This first finding cannot yet be read as a construction age or as a cultural attribution. However, the OSL investigation opens a testable research question and provides further trans-disciplinary evidence for the spread of a Naqada migration via intermediate stations to Tenerife.

Keywords: Naqada culture; Palaeoclimate; Persian Gulf; maritime mobility; Optical Stimulated Luminescence (OSL); Tenerife; prehistoric navigation

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1. Research Question and Terms

The emergence of complex societies can be reduced neither to climate alone nor to a single migration movement. Environmental changes instead create spaces of pressure and possibility in which political organization, exchange, technical innovation and mobility interact. This non-deterministic reading forms the starting point of the presentation. Its guiding idea is that the flooding of earlier settlement areas on the Persian Gulf could have triggered population movements that had effects via Mesopotamia and the Levant as far as Egypt and the Mediterranean region.

The project title ‘Followers of Horus’ or Shemsu Hor is used here exclusively as a heuristic designation. It is not an archaeologically secured self-designation of the Naqada population and must not be equated with it. Likewise, ‘Pyramid of Santi’ in the following designates the local project name; neither function nor authorship is derived from the stepped form. This restraint transfers the diffusion idea into a testable hypothesis (Stevenson 2016).

2. Environmental Change and Maritime Reach

2.1 The Holocene Flooding of the Persian Gulf

Sea-level reconstructions show that the Gulf region, which was largely dry during the Last Glacial Maximum, was gradually flooded in the early and middle Holocene. According to Lambeck (1996), near-coastal areas were repeatedly displaced; the present coastal level was approximately reached around 6000 BP, followed by regionally differing high stands. Such processes could alter freshwater, hunting and grazing areas as well as settlement axes. They therefore provide a plausible context for resettlements, but prove neither a single ‘Great Flood’ nor the destination, identity or extent of migrating groups.

The model of a ‘Gulf Oasis’ discussed by Rose (2010) makes the area that is flooded today visible as a prehistoric living and refuge area. In parallel, boat remains, bitumen and maritime exchange relations in the 6th and 5th millennia BC demonstrate early nautical competence in the Gulf (Carter 2006). Seafaring is thus given as a historical mechanism. The specific conclusion that bearers of these traditions founded the Naqada culture and later migrated onward as far as the Atlantic, however, requires additional, location- and time-specific evidence.

2.2 Naqada: Chronology, Expansion and Contacts

Radiocarbon data and Bayesian models place Naqada I approximately in 3800/3750–3450 BC, Naqada II in 3450–3325 BC and Naqada III in 3325–3085 BC; the transition to the 1st Dynasty follows in the early 3rd millennium BC (Dee et al. 2013; Stevenson 2016). Archaeologically tangible are the spread of Old Sumerian achievements in the Nile Valley as well as contacts with the southern Levant and indirect relations with Western Asia. These contact zones make mobility probable, and for the first time form a possible migration trail from the Persian Gulf via Crete, the large Mediterranean islands as far as the Canary Islands.

In the presentation, ziggurat, mastaba and step pyramid, certain vessel motifs as well as stepped buildings are assembled as comparative forms. In addition, initial research on the astronomical alignment of the stepped structures shows further indications of a cultural transmission of specific intangible cultural elements from the eastern Mediterranean region. Such similarities are valuable for hypothesis generation. As evidence of diffusion, however, jointly occurring, sufficiently specific characteristics in securely dated find contexts would be required: production methods and clay recipes of ceramics, raw-material provenances, technological operational chains, rock-art analyses, inscriptions or biological mobility markers. The present article therefore undertakes for the first time the attempt, starting from functional convergences in architecture and their linkage with further trans-disciplinarily obtained findings, to develop a coherent model of a possible spread of the Naqada culture beyond its hitherto established geographical distribution area.

3. Santi Investigation Site and Sample Context

The structure documented in the slide set is located near San Marcos on Tenerife and consists of stepped dry-stone walls. Two positions are particularly highlighted: SPN3SL on a northern wall surface and SPR1SL in the area of a northern ramp that was placed in front of the older north wall. The graphic (Fig. 1) marking is helpful for spatial orientation; for an archaeometric evaluation, stone position, orientation, sampling depth, shading, weathering, possible relocation and assignment to construction or repair phases were additionally recorded.

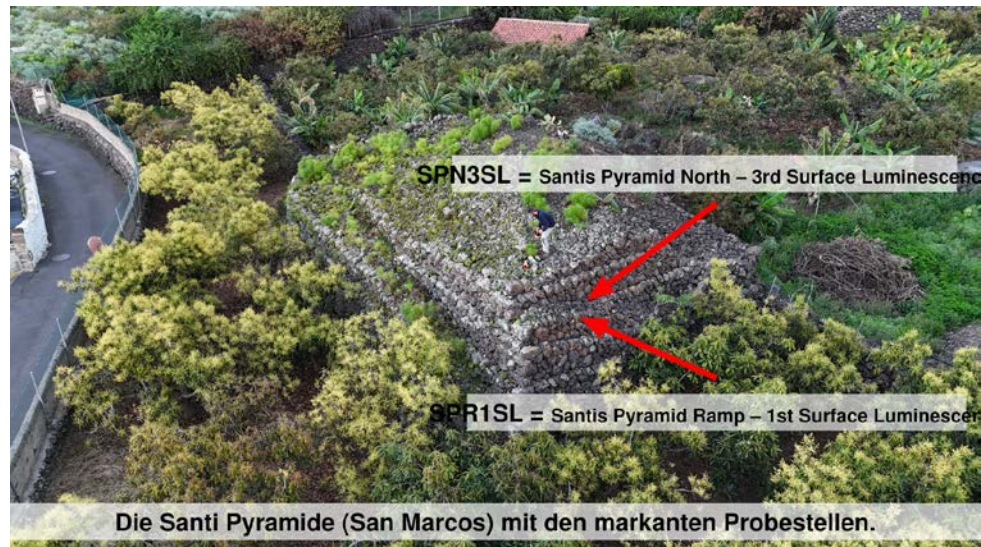


Fig. 1. Stepped dry-stone structure of Santi near San Marcos with the positions SPN3SL and SPR1SL marked in the slide set. A scale construction survey and a stratigraphic profile were not available. Source: Görlitz (2026), slide 54.

4. Preliminary OSL Findings and Dating Comparison

4.1 What OSL Dates

Surface luminescence makes use of the fact that daylight resets the luminescence signal in the outer regions of a rock. After subsequent shielding, the signal can build up again under natural radiation. Depending on sample geometry, depth profiles therefore allow statements about exposure or shielding events. Light permeability, mineralogy, dose rate, incomplete bleaching and model selection considerably influence the result (Liritzis 2011; Freiesleben et al. 2023). A surface age is therefore not automatically the construction date of an entire wall; it can also record stone working, relocation, repair or later covering.

4.2 The Transmitted Result

The presented project graphic groups several measurement series under the abbreviations SPE1SL, SPN2SL, SPN3SL, SPN4SL, SPN5SL, SPR1SL, SPT1SL and SPW1SL. Within a grey-shaded area, '4360 $\pm$ 330 BP' is given. Alongside this, both very young signals and clearly older individual values occur. These "outliers" are explained by the two nuclear physicists Polymeris & Sánchez through sampling at the outer areas of the north wall and northern ramp. I.e. all samples that were recovered from the deep inner area of both dry-stone walls show considerably older individual ages, which were summarized in the medians.

The exact analysis of the individual measurements yields values from 2,200 to 5,100 BP for the two samples SPN3SL and SPR1SL. The listing of the individual values per wall structure is, however, not the target orientation in this article. Here it is about the possible influence of climate change, diffusion factors and trans-Mediterranean migrations at the end of the Neolithic.

4.3 Three Currently Non-Congruent Time Indications

For further publication, a formal data comparison is mandatory. First, the raw graphic gives 4360 $\pm$ 330 BP. If BP is referred purely arithmetically and conventionally to 1950, this would correspond to a central value around 2410 BC and a range of approximately 2740–2080 BC; this is not a technical recalculation of the OSL result. Second, the slide translates the range 3500–4700 BP as 2300–2700 BC.

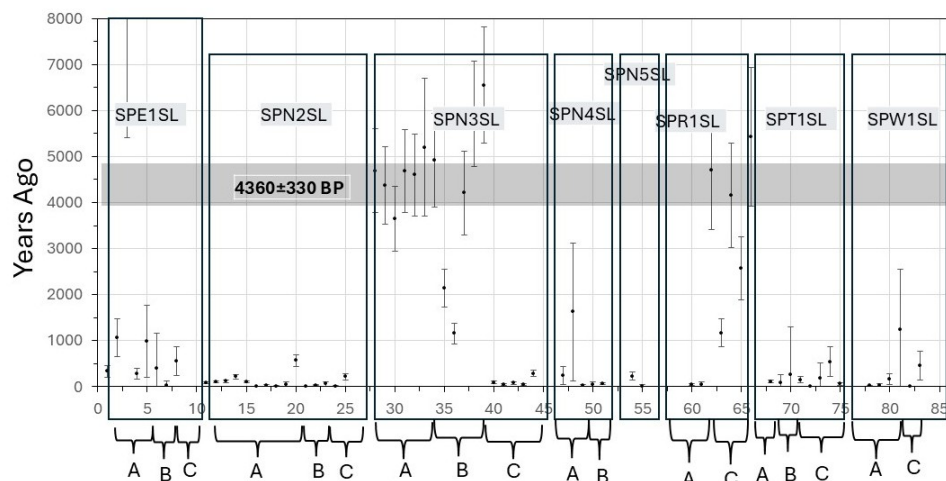


Fig. 2. Preliminary project graphic of the surface-luminescence measurements: 4360 ± 330 BP; y-axis 'Years Ago'. Reference year, raw data, dose rates and model parameters are not documented. Source: Görlitz (2026), slide 55.

5. Archaeological Significance

5.1 Conflict with the Established Canary Islands Chronology

The currently most robust chronological synthesis places the permanent indigenous settlement of the Canary Islands in the first centuries AD; for Tenerife, the Bayesian model gives approximately 155–385 AD (Santana et al. 2024). Genome-wide data at the same time trace the indigenous population predominantly to North African origin and record individuals from the 3rd century AD onward (Serrano et al. 2023). A robust construction event in the 3rd millennium BC would therefore lie more than two millennia before the currently accepted settlement phase. This does not make the finding logically impossible, but considerably increases the requirements for context, reproducibility and independent confirmation.



Fig. 3. The Canary Islands are home to large complexes with step pyramids. Our measurements demonstrate an alignment with stars, the Milky Way and landscape profiles. Using "Stellarium" we were able to calculate an age of 3000-2700 BC. Source: Görlitz & Rappenglück (2026), slide 48.

The separation of three statements is decisive: A stone surface can be old; the structure can have been built or rebuilt at a certain point in time; and its builders can have belonged to a certain cultural tradition. Each stage requires its own evidence. The current dataset touches the first statement, can address the second for the first time through the construction context (step pyramid as astro-alignment), but cannot yet answer the third without diagnostic material.

From this follow three levels of testing: The surface age requires a laboratory report and replication; the construction time additionally requires stratigraphy and independent datings; a Naqada connection finally requires diagnostic finds, provenance or biological mobility data.

5.2 A Testable Research Program

For a robust publication, the laboratory report should contain raw data, sample orientation and depth, mineral fraction, measurement protocols, doses, dose rates, depth profiles, model selection, reference year, uncertainties as well as exclusion rules. An independent replication on sealed contact surfaces is in progress. Sediment OSL, C_{14} data from primary construction horizons and micromorphology can separate surface age and construction. The team is working on it.

In addition, the ABORA team already dated three further stepped structures in the north, south and east of Tenerife by means of OSL in July 2026. The preparation of the samples as well as the readout of the light traces will take place in the next 8-9 months. Should these samples show a similarly high age, they would further support the working hypothesis. In addition, the OSL team, in cooperation with the Canarian archaeologist Prof. Carmen del Arco, plans the redating of petroglyphs that show ship images very similar to those of the Naqada culture. The corresponding methodology using the novel Surface-Exposure dating – an improved methodology of OSL in daylight – is already under testing. Two known rock-art stations as well as a Curt-Ruts station have already been physically sampled. The results will likewise be available in 8-9 months.

A successful validation of the Surface-Exposure method could subsequently be carried out on corresponding ship depictions, which could form a maritime and seafaring-historical bridge to the redated rock images of Laja Alta as well as to further presumed ship depictions of the Naqada culture.

Accompanying the project, the Naqada hypothesis requires a defined feature matrix: rare technical characteristics, ceramics in secured context with determinable origin, raw-material and isotope signatures as well as, where applicable, ancient DNA. Image motifs or rock signs should be blind-coded and tested against regional controls. The team will provide this in the coming months in cooperation with two British archaeologists. The indicated connection to Mesoamerica is an independent, farther-reaching hypothesis and does not belong in the evidentiary argument of this contribution.

6. Conclusion

The presentation connects three factually justified fields of research: Holocene environmental changes, early maritime mobility and the archaeometric dating of stone structures that are difficult to classify. The flooding of the Persian Gulf could shift settlement areas; early seafaring is archaeologically documented; the Naqada culture emerged in an era of intense regional networking. From this there does not yet follow a demonstrated migration of a ‘Followers of Horus’ as far as Tenerife. It does, however, provide further evidence for the Chalcolithic spread of this population group from Mesopotamia via the Nile Valley as far as the Levant and beyond, which has been undervalued for decades.

The scientifically strongest point of departure of the project is therefore not the immediate confirmation of a maximal route, but the transparent publication of the Santi dataset. If the surface age is confirmed by complete documentation, construction context and independent measurements, a chronological finding that must be taken seriously emerges. Only subsequently is it to be examined whether culturally diagnostic traces bear a connection to Naqada or other Mediterranean traditions. In this graduated form, the hypothesis is clear, risky in the good scientific sense and falsifiable.



Fig. 4. Is it really so difficult to imagine that the highly developed reed sailing vessels of the Naqada culture were capable of navigating via several intermediate stations as far as the Atlantic? The author's ABORA expeditions have documented that keelless reed sailing vessels can even tack slightly against the wind through the use of leeboards. Source: Görlitz (ABORA IV, 2019), slide 58.

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Data Availability and Conflicts of Interest

The basis is the slide set 'Archaeology and Climate', the trailer and the preliminary OSL graphic; the laboratory report and raw data were not available. Conflicts of interest and funding are to be added.

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