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Project Gallery

Revealing slow monumentality: luminescence and soil narratives from Aguas Buenas, central Nicaragua

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New results from the 2025 excavations at Aguas Buenas (fourth–ninth centuries CE), central Nicaragua, combine soil-profile descriptions and luminescence profiling to reconstruct mound-building sequences and their temporal rhythms. Here, the authors explain how this helps to shed light on communal forms of monumentality in southern Central America.

Keywords: Southern Central America, pOSL, mound micromorphology, monumentality

Introduction and research aim

The mound site of Aguas Buenas in central Nicaragua represents a distinctive form of pre-Hispanic monumentality in southern Central America (Geurds 2025; Figure 1). The absence of vertical monuments and large-scale constructions typical of Mesoamerica and Andean landscapes has, for many decades, led scholars to view the region as marginal (Sheets 1992), while horizontal landscape modifications are commonly interpreted through models of hierarchical labour organisation (Frost & Quilter 2012). Aguas Buenas challenges these views. Spanning over 30ha, the site comprises at least 372 earthen and stone mounds arranged in a semi-circular pattern, demonstrating deliberate planning and collective effort (Auziņa 2018; Figure 2), yet the absence of evidence for political centralisation makes Aguas Buenas an intriguing case of monumentality. No other indicators suggest an elite authority capable of organising large-scale labour, nor have similarly scaled sites been found elsewhere in the Chontales Department of Nicaragua (Donner 2020), pointing instead to communal organisation in construction.

Despite previous investigations, the site's function remains uncertain. Excavations that took place between 2011 and 2013 yielded little artefactual material, no stratification and no clear signs of habitation, burial or agriculture (Geurds 2013). Previous radiocarbon dating was limited by the scarcity of suitable organic material and produced

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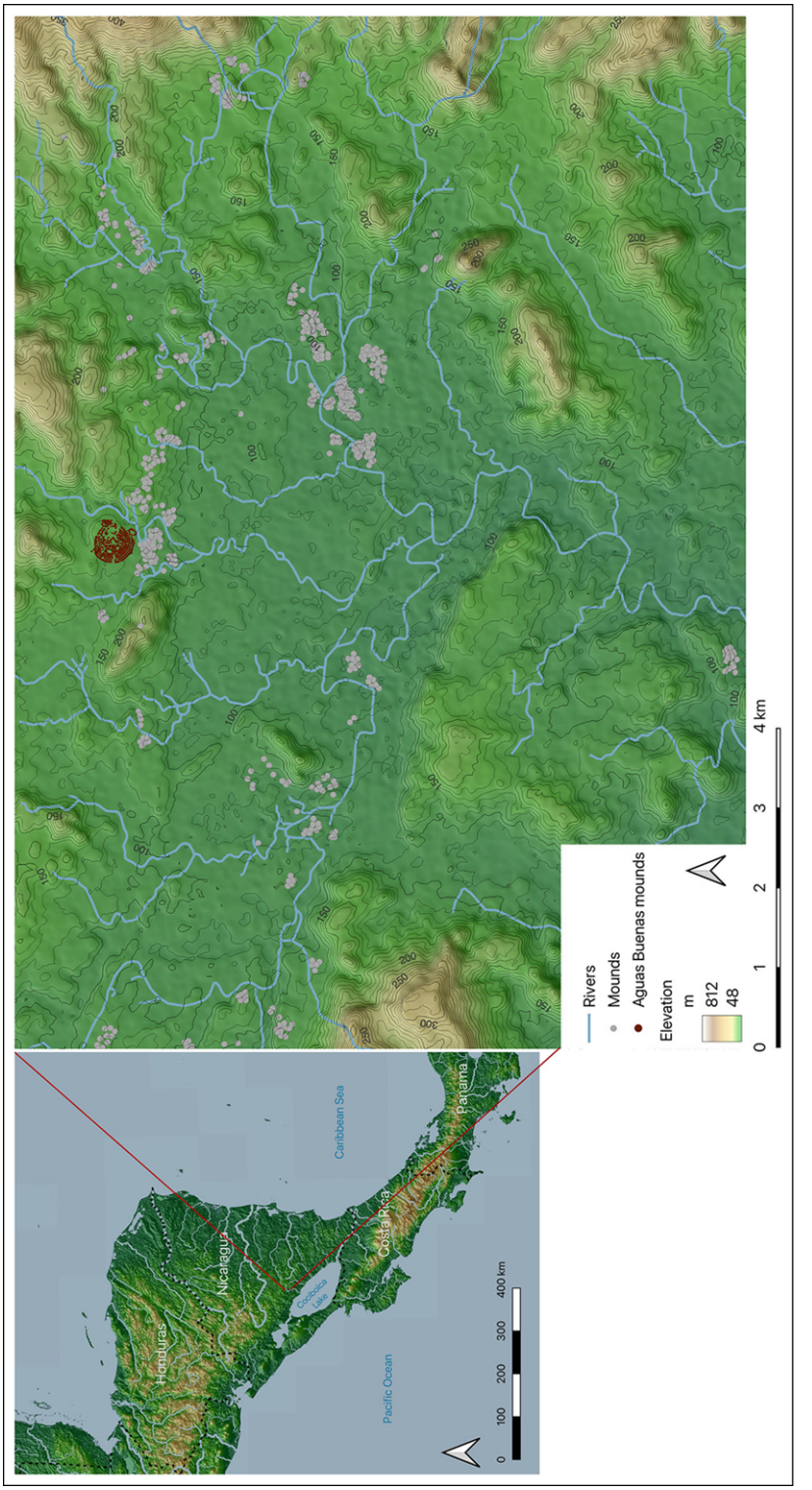


Figure 1. Locations of Aguas Buenas and other known mounded sites within the Mayales River sub-basin, Chontales department (figure by authors, site locations from Donner 2020).

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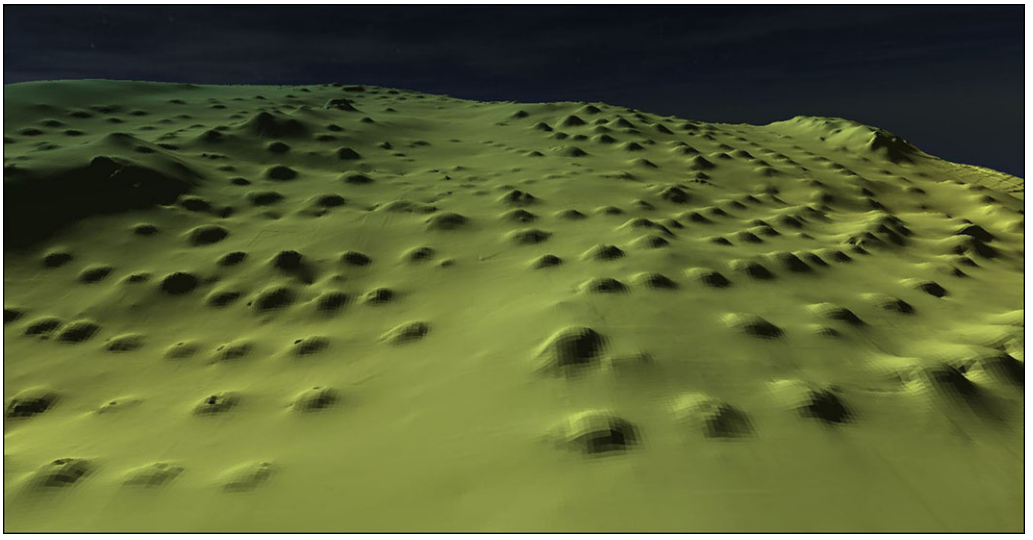


Figure 2. Digital elevation model of Aguas Buenas, viewed from the east, based on differential GPS and total station data. Mounds were mapped at 2m intervals and the inter-mound terrain at 10m intervals (figure by authors).

only two dates associated with site use, placing activity between 404 and 666 cal CE. While these dates suggest that off-mound activity may have preceded mound construction, comparative ceramic analysis indicates a broader occupation span of approximately 300–900 cal CE (Donner & Geurds 2018, 2020). However, the sequence and duration of mounds and site construction remain poorly understood. Even conservative estimates indicate that about 50 000m^3 of stone were moved, representing at least 426 person-years of labour (Auziņa 2018). Yet this immense investment in a precisely planned geometric layout remains invisible from the ground or nearby hills, obscured by vegetation (Figure 3). This study investigates whether the site was created as a single planned complex or developed incrementally over time; whether individual mounds represent single construction episodes or repeated rebuilding events; and whether deposits beneath the mounds provide evidence for construction practices and the importance of monument visibility.

Methods

During the 2025 field campaign, we excavated 20 mounds across Aguas Buenas, selected to represent various architectural groups identified in a previous spatial analysis (Auziņa 2018; Figure 4). Each mound was excavated through 1 × 1m test units placed on its summit. Stratigraphic sequences comprising between six and 14 horizons per mound were identified through field-based descriptions of sediment types, inclusions and soil properties, following the world reference base for soil resources (IUSS Working Group 2022). These are interpreted as reflecting episodes of construction, surface use or natural

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Figure 3. Visibility of mounds at Aguas Buenas at ground level. Three teams of archaeologists are excavating mounds that form a clear circular pattern when mapped from above but neither the mounds nor the pattern are visible on the ground (photograph by authors).

accumulation. Ceramic and lithic materials were documented from each stratigraphic unit, and soil samples were collected for lab-based analyses.

Stratigraphic horizons were sampled in the field for analysis with portable optically stimulated luminescence (pOSL) under red light, producing high-resolution luminescence sequences that guided the collection of full OSL samples for laboratory analysis (Sanderson & Murphy 2010). In this study, pOSL serves primarily as a relative chronological tool, with changes in luminescence intensity helping to distinguish separate depositional and construction episodes. Absolute chronologies will be established through ongoing laboratory OSL analyses.

Preliminary results

Preliminary results indicate that neither the site nor the sampled mounds were constructed in single events. Instead, monumentality at Aguas Buenas developed incrementally through successive episodes of construction, use and renewal. Soil morphology and pOSL sequences indicate that all excavated mounds were shaped by multiple construction episodes involving both human and natural processes. Across much of the site,

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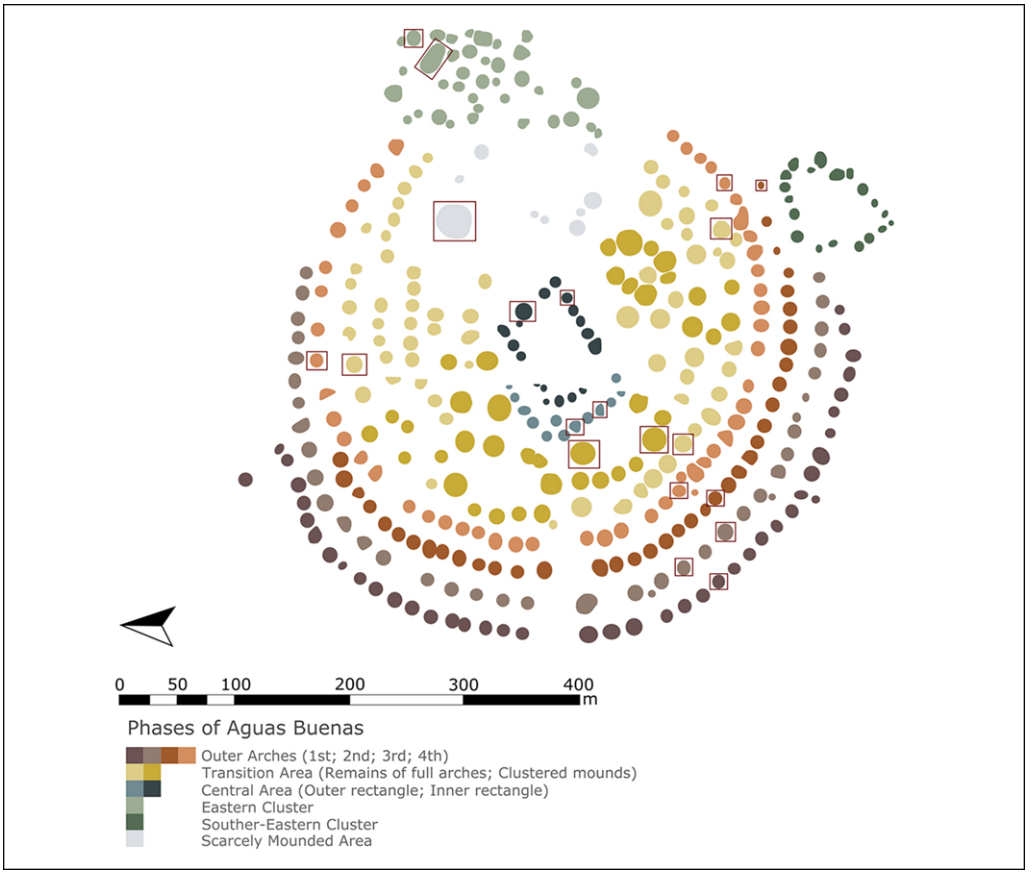


Figure 4. Suggested spatial phases of Aguas Buenas used to guide mound selection; circled mounds indicate excavation locations (figure by authors).

mound stratigraphy follows a recurring sequence of tephra-rich soils, ceramic deposits, pink rhyolite layers and white rhyolite capping (probably burnt) (Figure 5).

Although mound morphologies vary considerably across the site, broad spatial patterns emerge. Mounds within the outer arches, outer rectangle and transitional zone (see Figure 4) contain little evidence of sustained human activity. Nevertheless, four of the 15 excavated mounds from these sectors incorporate deposits of large ceramic vessels beneath mound construction, suggesting episodes of communal consumption or intentional deposition. In contrast, the inner rectangle yielded abundant ceramics, lithics, wattle and daub, and charcoal, indicating more sustained human presence, possibly related to the labour and activities associated with mound construction and maintenance.

At least 10 excavated mounds are characterised by repeated layers of white rhyolite capping renewed through successive construction episodes, suggesting that maintaining the visual appearance of the mounds remained important throughout their long-term use. These patterns reveal a form of slow monumentality in which monumental

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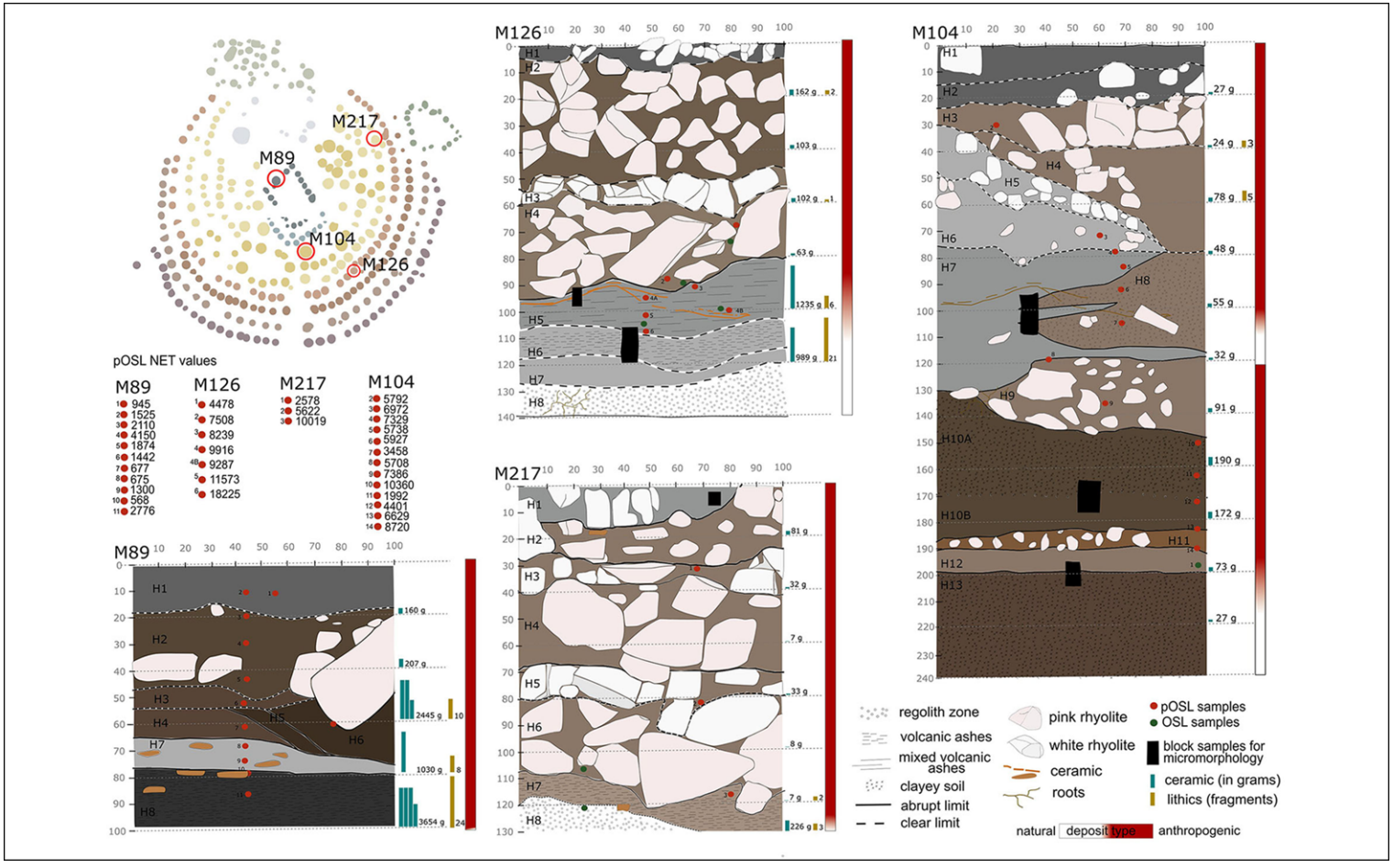


Figure 5. Representative stratigraphic sequences from four excavated mounds illustrating recurring construction patterns, soil horizons and pOSL measurements across different architectural sectors of Aguas Buenas (figure by authors).

significance was continually reproduced through long-term practices of construction, maintenance and renewal rather than through a single building episode.

Tephra layers occur beneath nine of the excavated mounds, suggesting that landscape-altering volcanic events may have preceded, and perhaps contributed to, the environmental and social context within which episodes of mound construction were initiated.

While pOSL profiles identify relative construction sequences, the timing and duration of individual building episodes will be established through standard laboratory OSL analyses. Micromorphological, ceramic and lithic analyses, together with the study of the tephra layers, will further clarify the human and environmental processes associated with mound building and use.

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Author Contributions: CRediT categories

Dita Auziņa: Conceptualization-Lead, Data curation-Lead, Formal analysis-Supporting, Investigation-Equal, Methodology-Equal, Project administration-Lead, Supervision-Equal, Visualization-Lead, Writing - original draft-Lead. **Ella Egberts:** Conceptualization-Equal, Data curation-Equal, Formal analysis-Lead, Investigation-Equal, Methodology-Equal, Supervision-Equal, Writing - review & editing-Supporting. **Axel Cerón González:** Formal analysis-Equal, Investigation-Equal, Methodology-Equal, Writing - review & editing-Supporting. **Marlyn Martínez:** Data curation-Equal, Formal analysis-Supporting, Project administration-Equal, Resources-Equal, Writing - review & editing-Equal. **Alexander Geurds:** Conceptualization-Equal, Funding acquisition-Lead, Supervision-Equal, Writing - review & editing-Equal.

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Resumen: Los nuevos resultados de las excavaciones de 2025 en Aguas Buenas (siglos IV–IX d. C.), en el centro de Nicaragua, combinan descripciones de perfiles de suelo y perfiles de luminiscencia para reconstruir las secuencias de construcción de montículos y sus ritmos temporales. Los autores explican cómo este enfoque contribuye a esclarecer las formas comunitarias de monumentalidad en el sur de Centroamérica.

Palabras clave: sur de Centroamérica, pOSL, micromorfología de montículos, monumentalidad.

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