Recurring Ganesha-Like Morphology in Cymatic Responses to Oṃ Gaṃ Gaṇapataye Namaḥ

A Phonetic, Acoustic, and Morphological Analysis

Working Research Manuscript · Version 3

Sattyananda

September 2026

Exploratory observational study based on one continuous cymatic recording session. This version is structured for internal research use and is not yet a journal-submission manuscript.

Abstract

This study examines a recurring figure-like cymatic morphology observed during three successive repetitions of the Sanskrit mantra Oṃ Gaṃ Gaṇapataye Namaḥ within one continuous recording session. A related bilateral form appeared at nearly the same relative point in each repetition. Acoustic alignment placed the selected visual peaks at approximately 1.000 s, 0.992 s, and 0.984 s within the three cycles, a spread of approximately 16 ms. The local acoustic states were highly similar, with a median fundamental frequency near 180.6 Hz and pairwise cosine similarity of local mean magnitude spectra exceeding 0.99.

Manual phonetic segmentation placed the strongest visual expression within late Gaṃ, immediately before the onset of Gaṇapataye. Across the Gaṃ → Ga → ṇa → pa → te sequence, Gaṃ showed comparatively low spectral flux, while subsequent syllabic transitions introduced greater spectral change and progressive reorganization of the water pattern. The observed form persisted briefly into the opening Ga / ṇa region rather than disappearing at a sharp phonetic boundary.

Morphologically, the recurrent transient was characterized by a dominant upper central mass, broad paired lateral expansions, a central descending axis, a rounded lower region, and bilateral frontal organization. These features showed a notable large-scale correspondence with a simplified frontal Ganesha form. The study does not treat this correspondence as a literal pictorial rendering or as evidence that semantic or symbolic content directly determines fluid-wave morphology. Instead, it documents a repeatable within-session acoustic-cymatic event and identifies its iconographic resemblance as an interpretive correspondence requiring further controlled testing.

Figure Architecture and Evidence Classes

The paper uses visual material heavily because the central observation is morphological. To keep the visual argument rigorous, figures are divided into three evidence classes.

Class	Definition	Use
A	Directly derived from the recorded video/audio by extraction, plotting, or deterministic image processing.	Primary evidence
B	Source-grounded explanatory plates using exact recorded frames and/or the researcher-supplied Ganesha reference, with annotation or schematic comparison.	Interpretive support
C	Exploratory concept graphics created during ideation and not traceable pixel-for-pixel to the source recording.	Excluded from evidential argument

The main text contains the most informative Class A figures and the principal Class B comparison plates. Additional Class A/B figures are retained as supplementary visual material. Redundant intermediate helper images are not reproduced separately when their information is already contained in a composite plate.

1. Introduction

Cymatic pattern formation arises when vibration drives matter into organized spatial states. In liquids, periodic forcing can generate standing or parametrically excited surface-wave structures whose form depends on excitation frequency and amplitude, fluid properties, damping, vessel geometry, surface

tension, and boundary conditions [1–4]. In the present study, the cymatic field is therefore treated as the response of a coupled physical system rather than as a direct visual transcription of a single frequency.

A vocal mantra is also not a single-frequency stimulus. Chant consists of a time-varying sequence of fundamental frequency, harmonics, vowel resonances, nasalization, consonantal transients, amplitude changes, and coarticulatory transitions [5,6]. This makes acoustic-phonetic analysis especially relevant when interpreting rapidly changing cymatic forms.

The present investigation arose during cymatic recording of Oṃ Gaṃ Gaṇapataye Namaḥ. During repeated presentation of the passage, a distinctive bilateral figure-like morphology appeared in the Gaṃ / opening Gaṇapataye region. The form was unusual relative to the more radial, circular, and mandala-like organizations visible elsewhere in the same recording.

The researcher's initial observation was that this transient resembled the frontal form of Ganesha. Importantly, the resemblance did not depend on jewelry, facial detail, hands, ritual objects, or other decorative attributes. It was perceived at the level of large-scale organization: a dominant upper mass, broad paired lateral expansions, a central descending feature, a rounded lower field, and bilateral frontal organization.

The traditional context is also relevant. The Gaṇapati Atharvaśīrṣa explicitly describes the sonic construction of the Ganesha mantra through ga-kāra, a-kāra, anusvāra, bindu, and nāda, and gives Oṃ gaṃ gaṇapataye namaḥ [8,9]. The same text describes iconographic features including lambodara and śūrpakarṇaka [8,9]. These traditional associations are treated here as contextual correspondences, not as a proposed physical mechanism.

The study asks: (1) does the unusual morphology recur during successive repetitions of the same passage; (2) is recurrence temporally aligned; (3) are the corresponding acoustic states similar; (4) which phonetic region coincides with the strongest morphology; (5) how does the form evolve through the Gaṃ → Gaṇapataye transition; and (6) does the recorded large-scale morphology support a structured comparison with frontal Ganesha iconography?

2. Experimental Context and Methods

2.1 Recording session

The analyzed material derives from one continuous recording session. Across the three analyzed repetitions, the same bowl, water volume, transducer, camera position, lighting, playback chain, and recording level were maintained. The observations therefore constitute within-session recurrence, not independent replication across separate sessions.

The cymatic visualization apparatus was a CymaScope Pro Audio using the HF Visualizing Cuvette. The supplied equipment manual describes this cuvette as a low-mass thermoplastic component designed to respond to fast transients and small vertical excursions, and specifies a nominal water volume of 320 microlitres (0.32 mL) for the HF visualizing configuration. The mantra audio source was the Challakere Brothers. Original video acquisition was made with a Canon EOS 5D Mark IV and a 100 mm macro lens at 25.00 frames/s; the EOS Utility screenshot documents f/5.6 and ISO 8000. The edited video file used for frame-by-frame analysis was exported/encoded at 59.94 frames/s (60000/1001).

Confirmed acquisition metadata from the researcher and supplied documentation: CymaScope Pro Audio; HF Visualizing Cuvette; manufacturer-specified HF cuvette water volume 320 microlitres (0.32 mL); audio source:

Challakere Brothers; camera: Canon EOS 5D Mark IV; lens: Canon 100 mm macro; original acquisition frame rate: 25.00 fps; aperture: f/5.6; ISO: 8000. The analyzed edited file is 59.94 fps (60000/1001). Exact shutter speed, playback-level calibration, room temperature, and the exact release/upload identifier of the Challakere Brothers recording were not documented and are therefore not inferred.

Timecode conversion note: Premiere sequence values were interpreted on the 59.94 fps analysis timebase (e.g., 00:00:00:44 ≈ 0.734 s; 00:00:01:08 ≈ 1.134 s). The 25.00 fps value refers to original camera acquisition, not the timebase of the edited file analyzed here.

For external submission, the following acquisition metadata should be added from the laboratory record if available: vessel diameter and material, exact water volume or depth, transducer make/model, amplifier/interface chain, playback level or calibration method, recording source and vocalist, camera/lens, frame rate, and room/environmental conditions.

2.2 Mantra timing and phonetic annotation

The measured acoustic repetition period in the analyzed edited video was approximately 3.808 s. The first repetition was manually segmented from the audible articulation using researcher-supplied Premiere Pro sequence timecodes. The analyzed edited file runs at 59.94 frames/s (60000/1001), so the final timecode field was interpreted as sequence frames. The original camera acquisition, documented in EOS Utility, was 25.00 frames/s.

Segment	**Approx. onset (s)**
Oṃ	0.03
Gaṃ	0.73
Ga-	1.13
-ṇa-	1.30
-pa-	1.47
-te-	1.65
-ye	1.83
na-	2.27
-ma-	2.47
-ha	2.68
End of first cycle	3.72

2.3 Audio analysis

Audio was extracted from the video as mono PCM at 48 kHz. Analysis was performed in Python using librosa, NumPy, and Matplotlib. Measurements included median fundamental frequency estimated with pYIN (analysis range 80–400 Hz), RMS amplitude, spectral centroid, spectral bandwidth, spectral flatness, spectral flux, and cosine similarity between local mean magnitude spectra. Short-time Fourier analyses used Hann-windowed STFTs; 2048- and 4096-sample FFT windows and 128- or 256-sample hops were used according to the plotted or local analysis.

2.4 Visual frame extraction and deterministic processing

Exact frames were extracted from the recorded video using FFmpeg. Deterministic image processing was performed with OpenCV and included cropping to the bowl region, local contrast enhancement, edge extraction, horizontal mirror blending, and left-right difference visualization. These transformations reveal or emphasize recorded structure; they do not synthesize new cymatic content.

2.5 Morphological comparison framework

The Ganesha comparison was restricted to global form. Five primary descriptors were used: dominant upper central mass, paired lateral expansions, central descending axis, rounded lower region, and bilateral frontal organization. Detailed iconographic features were excluded from the primary comparison to reduce over-interpretation.

2.6 Interpretive hierarchy

Three levels of claim were maintained. Level 1 consists of measured or source-derived observations: timing, spectra, plots, exact frames, and deterministic image transformations. Level 2 consists of morphological description of the recorded form. Level 3 consists of the cultural/iconographic interpretation that the form is Ganesha-like. The analysis does not infer symbolic causation from Level 3.

3. Results

3.1 Whole-recording visual context

The selected recording alternates among radial, concentric, turbulent, and figure-like organizations. The Ganesha-like state is therefore not the only form produced by the system; it is a transient within a broader sequence of cymatic states.

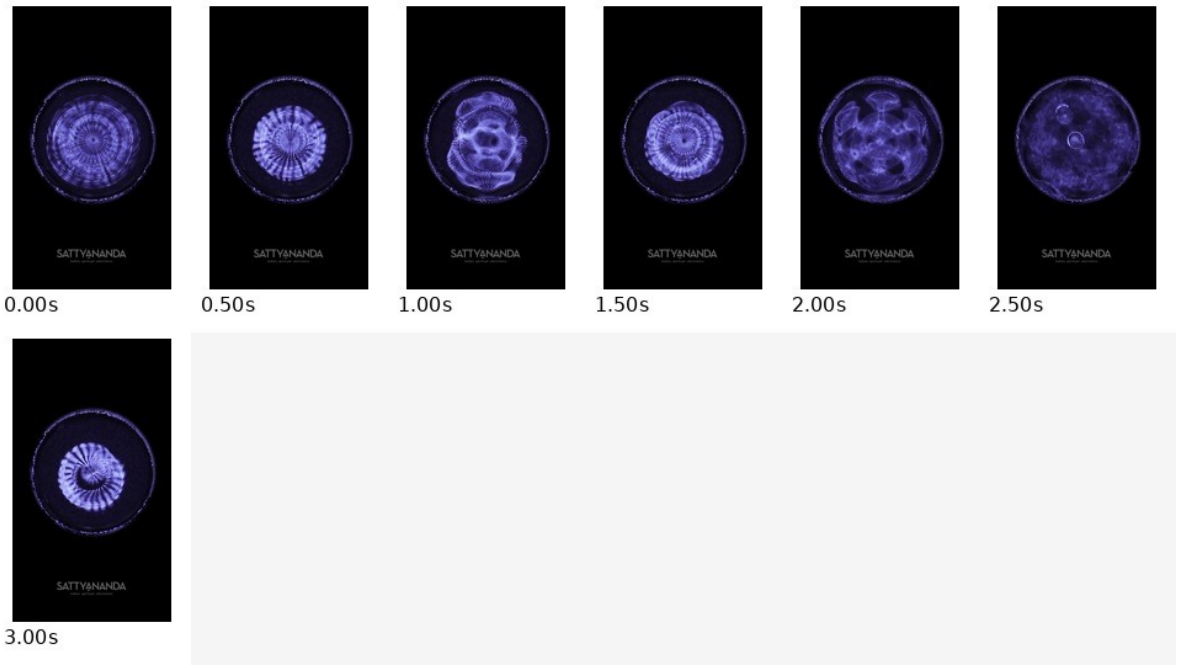


Figure 1 (Class A). Whole-recording contact sheet sampled at 0.5 s intervals from the analyzed video. This overview places the selected figure-like states within the wider sequence of radial, concentric, and transitional cymatic forms.

3.2 Temporal and acoustic recurrence

The selected figure-like peaks occurred at approximately 1.000 s, 0.992 s, and 0.984 s relative to the aligned cycle starts. Their approximately 16 ms spread is on the order of a single frame in the 59.94 fps analysis file. Around these selected peaks, the median estimated f_0 was approximately 180.6 Hz. Pairwise cosine similarities between local mean magnitude spectra were 0.99997 (repetitions 1–2), 0.99073 (1–3),

and 0.99126 (2–3). These values describe acoustic similarity in the analyzed recording; they do not by themselves establish a causal relation to the observed morphology.

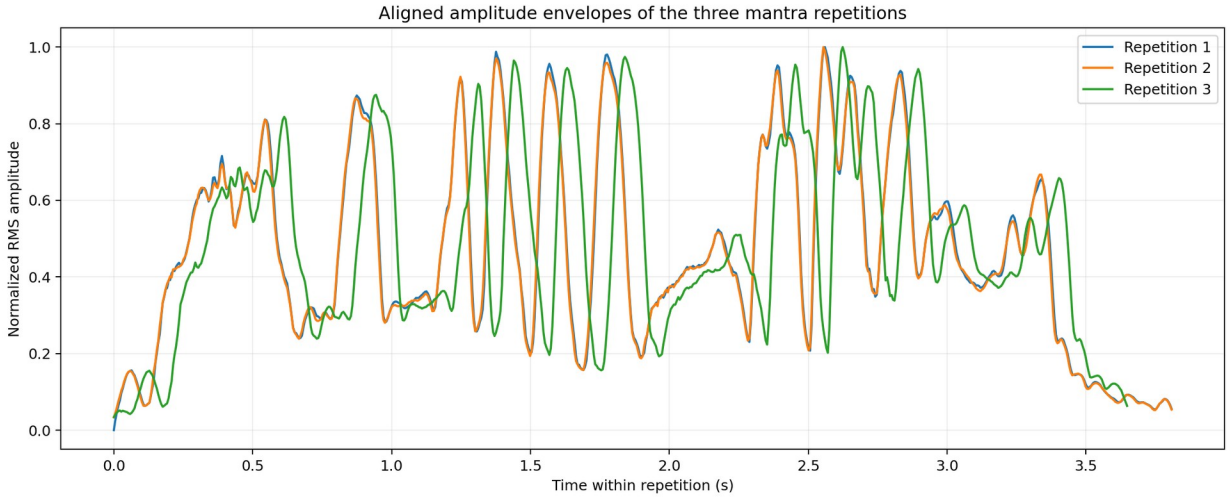


Figure 2 (Class A). Aligned RMS amplitude envelopes of the three mantra repetitions. The cycles show closely related temporal energy structure.

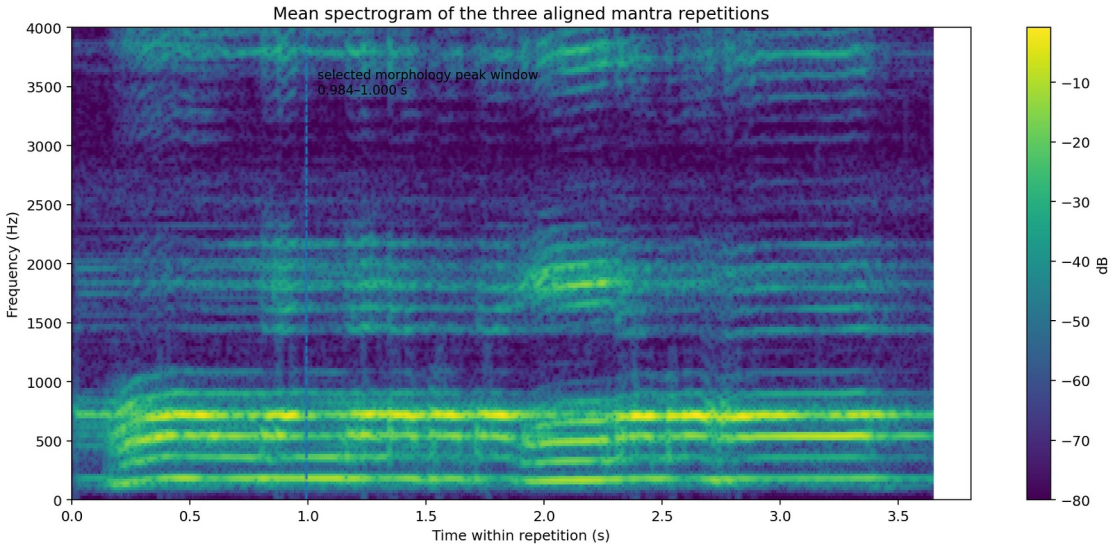


Figure 3 (Class A). Mean spectrogram of the aligned mantra repetitions. The selected Ganesha-like visual peaks fall at nearly the same relative time in the repeated acoustic sequence.

3.3 Phonetic localization

Manual segmentation placed Gaṃ from approximately 0.73 s to 1.13 s in the first cycle. The figure-like morphology begins to become recognizable during this interval, reaches its strongest expression near 1.00 s, and carries into the transition toward Gaṇapataye. The peak therefore falls within late Gaṃ rather than on the later pa or te segments.

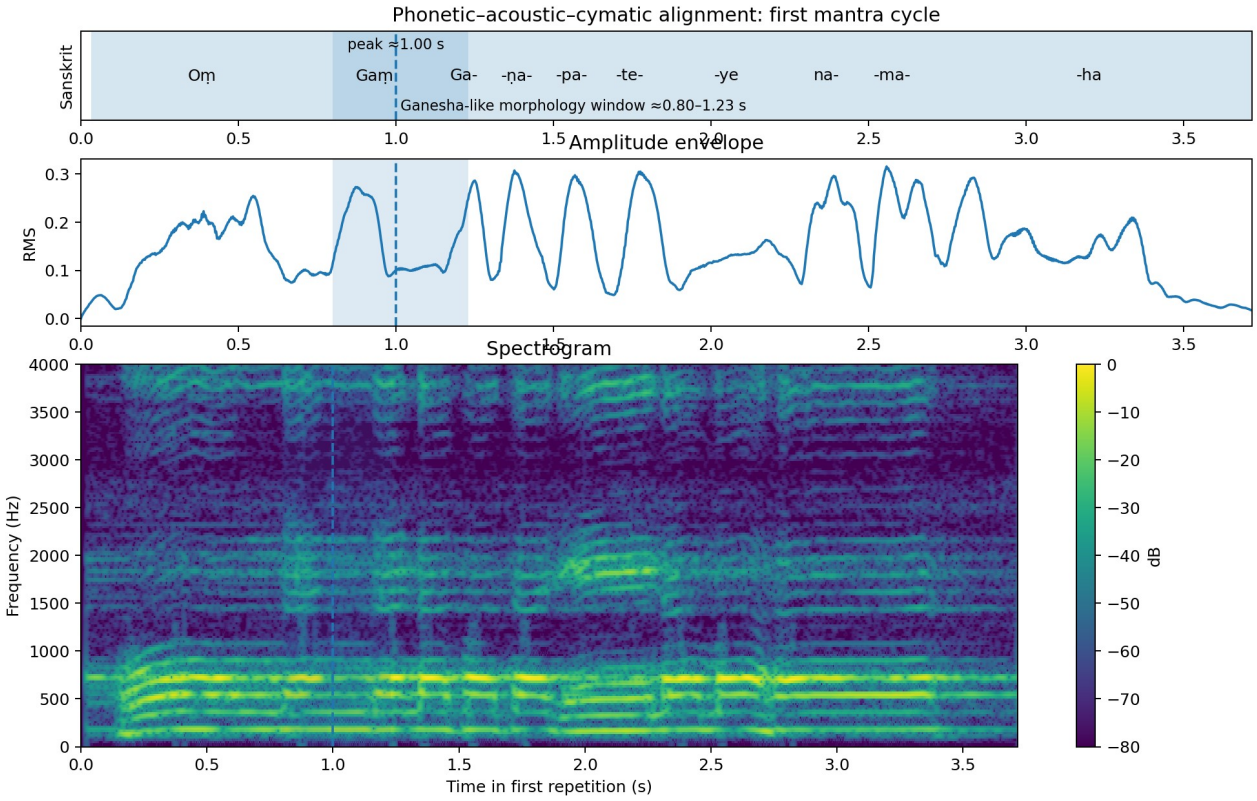
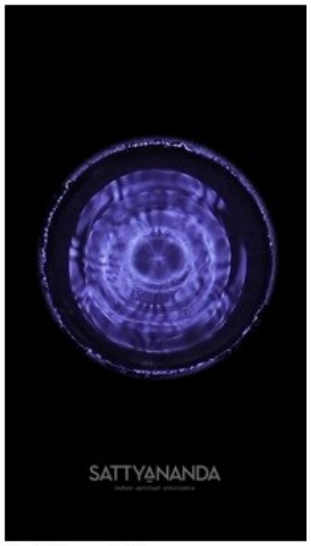


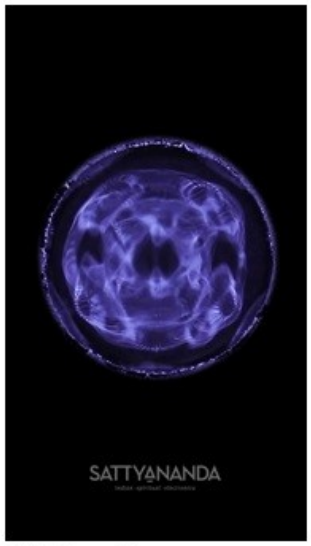
Figure 4 (Class A). Phonetic–acoustic timeline for the first mantra cycle. The selected visual peak near 1.00 s lies within the late Gaṃ interval.

3.4 Emergence, persistence, and reorganization

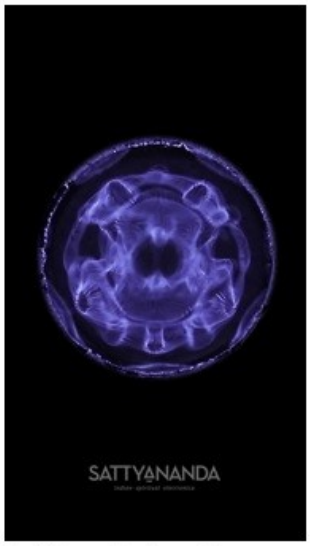
Dense frame inspection shows that the figure-like organization is not an instantaneous single frame. It develops across a short interval, is clearest in late Gaṃ, and persists briefly into the opening Ga / ṇa region before being reorganized by later syllabic transitions.



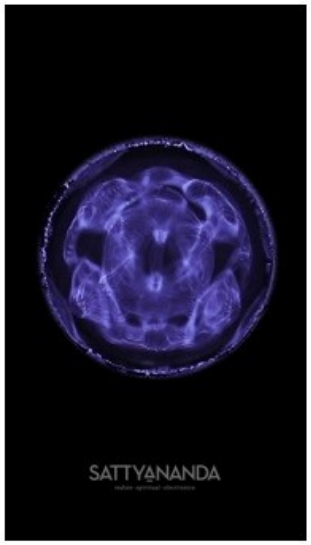
0.80s Gaṃ



0.95s Gaṃ

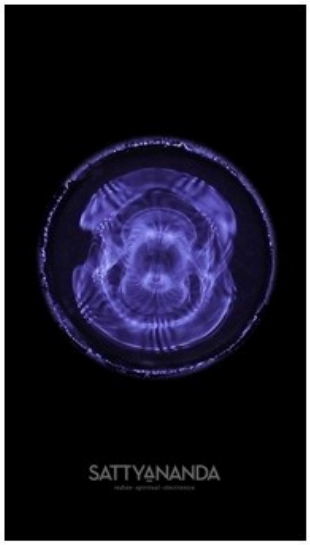


1.05s late Gaṃ

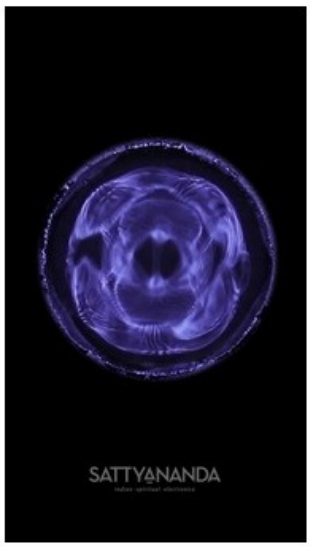


1.15s Ga-

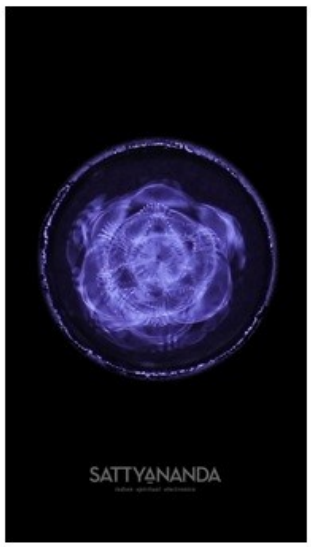
1.25s Ga-/ṇa



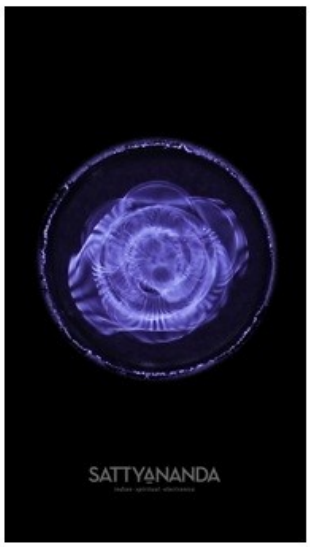
1.35s -ṇa-



1.45s -ṇa-/pa



1.55s -pa-



1.65s -te-

Figure 5 (Class A). Exact source frames sampled across the Gaṃ → Ga → ṇa → pa → te transition. The figure-like organization is strongest in late Gaṃ, remains partly visible into the opening of Gaṇapataye, and changes more substantially thereafter.

3.5 Acoustic transition through Gaṇapataye

Across the three repetitions, Gaṃ showed comparatively low spectral flux. Repetitions 1 and 2 showed the largest immediate increase in spectral flux at Ga-, while repetition 3 showed its largest increase at ṇa-. Thus, the detailed trajectory differs slightly across cycles, but the broader pattern is consistent: a relatively stable Gaṃ region is followed by increased spectral change during the opening of Gaṇapataye.

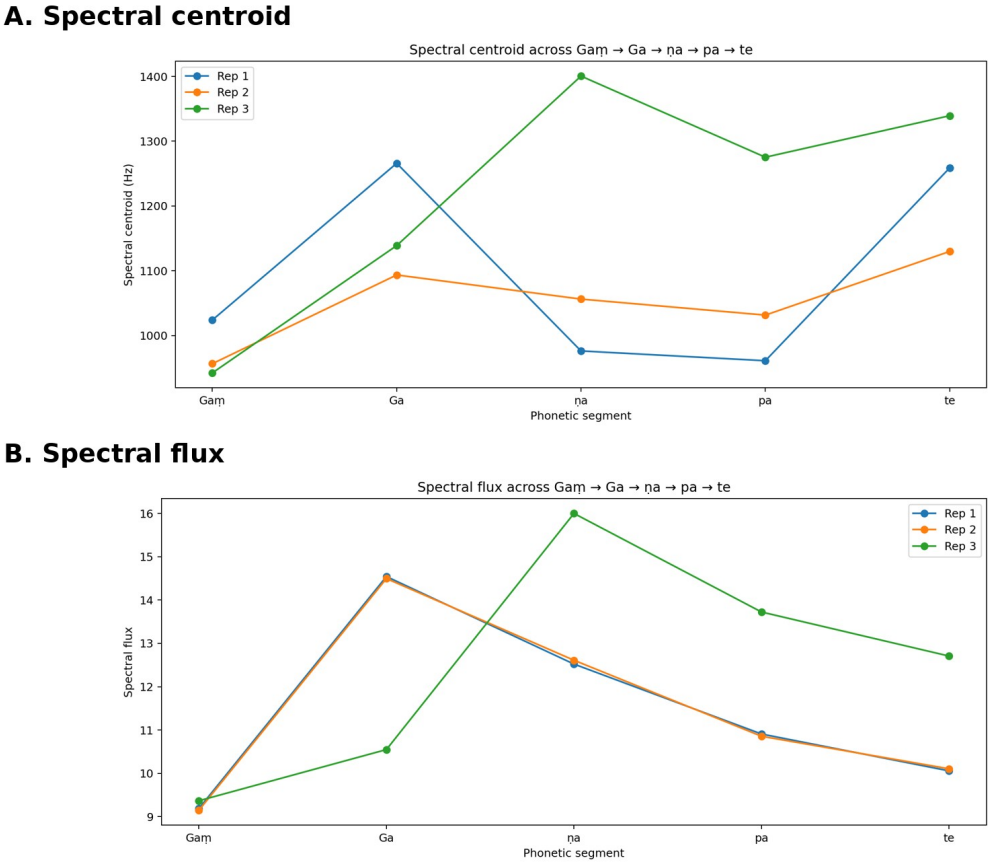


Figure 6 (Class A). Segment-level acoustic transition across Gaṃ → Ga → ṇa → pa → te. Top: spectral centroid. Bottom: spectral flux. Gaṃ is comparatively stable; subsequent segments introduce greater spectral change.

Rep	Segment	f_0 (Hz)	RMS	Centroid (Hz)	Flux
1	Gaṃ	180.63	0.147	1024	9.19
1	Ga	181.68	0.171	1266	14.54
1	ṇa	179.59	0.192	976	12.52
1	pa	179.59	0.175	961	10.91
1	te	180.63	0.178	1259	10.06
2	Gaṃ	180.63	0.148	957	9.15
2	Ga	181.68	0.171	1094	14.50
2	ṇa	179.59	0.192	1056	12.61
2	pa	179.59	0.175	1032	10.86
2	te	180.63	0.179	1130	10.11
3	Gaṃ	179.59	0.145	942	9.37
3	Ga	181.68	0.131	1139	10.55
3	ṇa	181.68	0.196	1401	16.00
3	pa	179.59	0.169	1275	13.72

3	te	180.63	0.145	1339	12.71

3.6 Source-derived structure of the three occurrences

Across the three selected occurrences, deterministic processing reveals related large-scale organization despite differences in fine wave structure. The recurring descriptors are an upper central mass, paired lateral expansions, a central vertical/descending structure, a lower rounded region, and substantial bilateral organization.

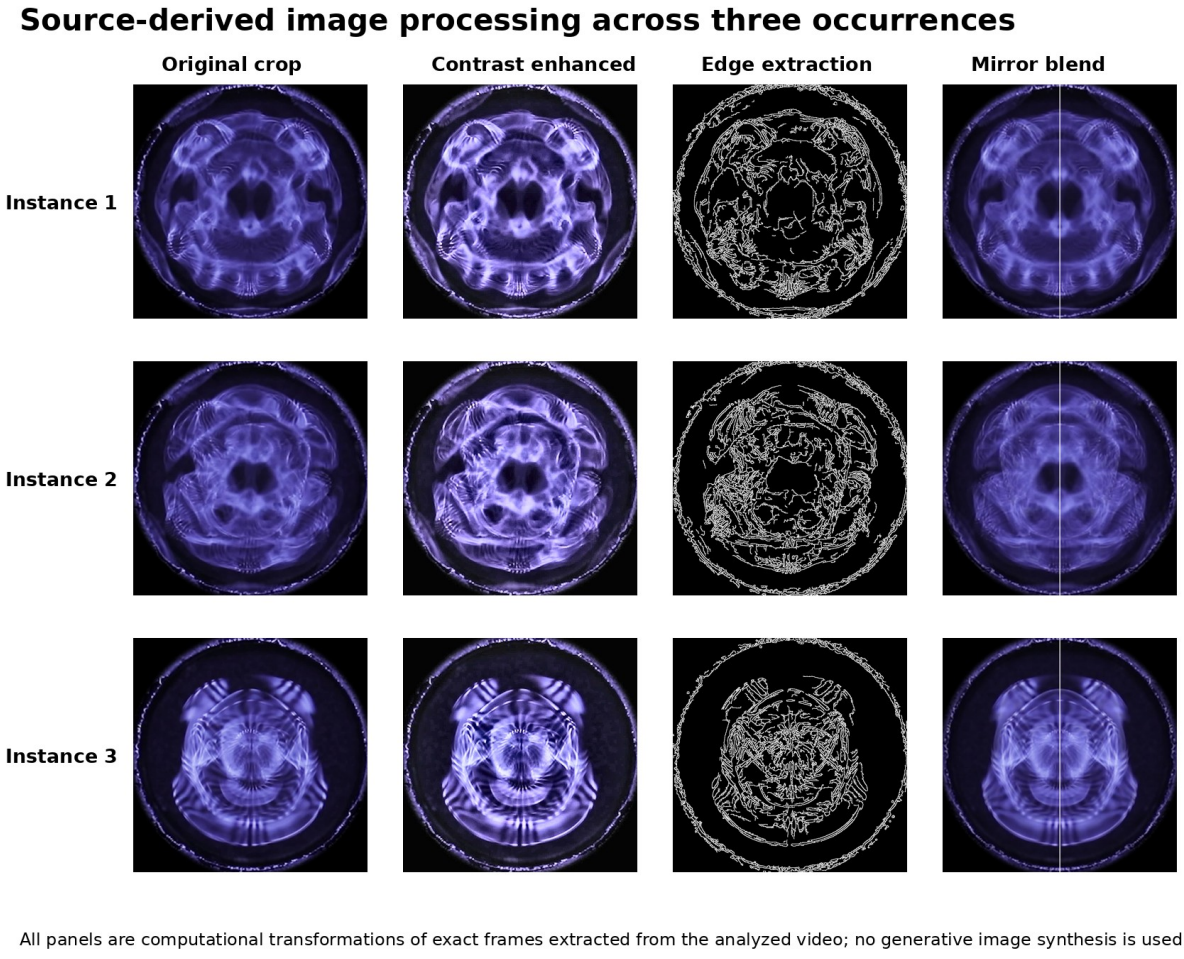


Figure 7 (Class A). Source-derived image processing across all three selected occurrences. Each row shows the exact extracted crop, contrast enhancement, edge extraction, and bilateral mirror blend.

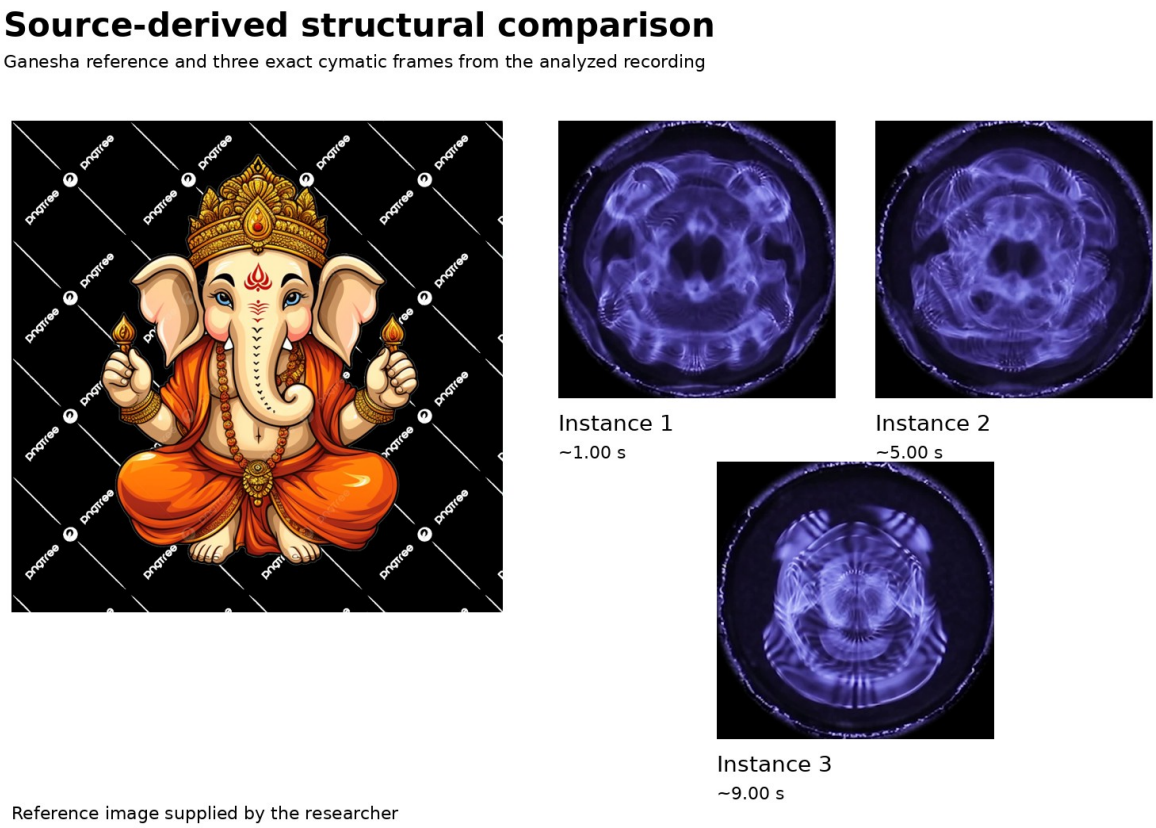


Figure 8 (Class A/B bridge). Researcher-supplied frontal Ganesha reference alongside three exact extracted cymatic frames. This is an unannotated visual comparison of large-scale form.

3.7 Detailed analysis of the strongest occurrence

The first selected occurrence is used as the principal detailed example because the relevant morphology is especially clear. The actual-frame plate combines exact frame-derived analytical views with explicit annotation of the large-scale features used in the comparison.

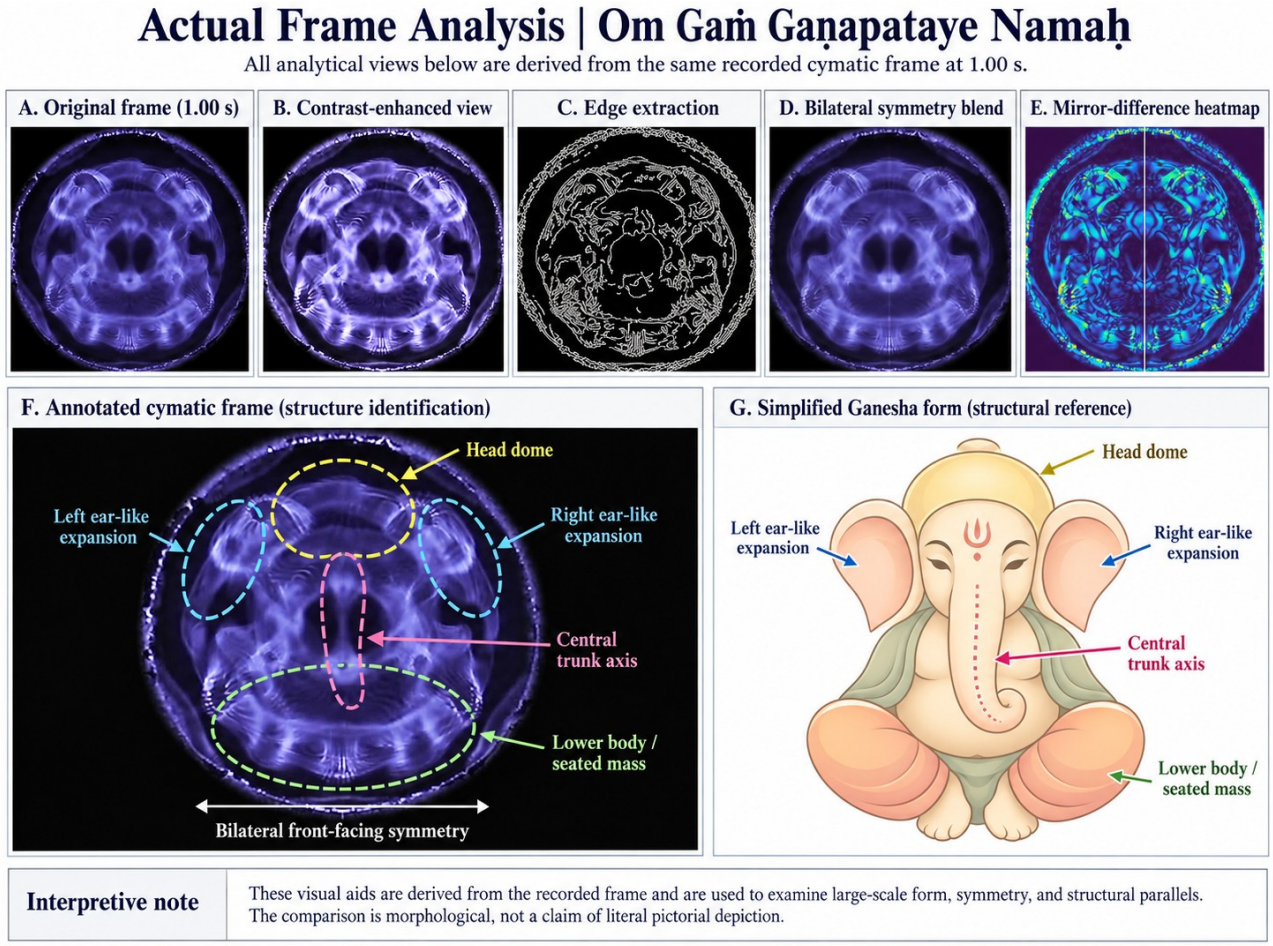


Figure 9 (Class B). Actual Frame Analysis for the principal occurrence (~1.00 s). The original frame, contrast-enhanced view, edge extraction, bilateral symmetry blend, and mirror-difference map are source-derived; the colored structural regions are explanatory annotations.

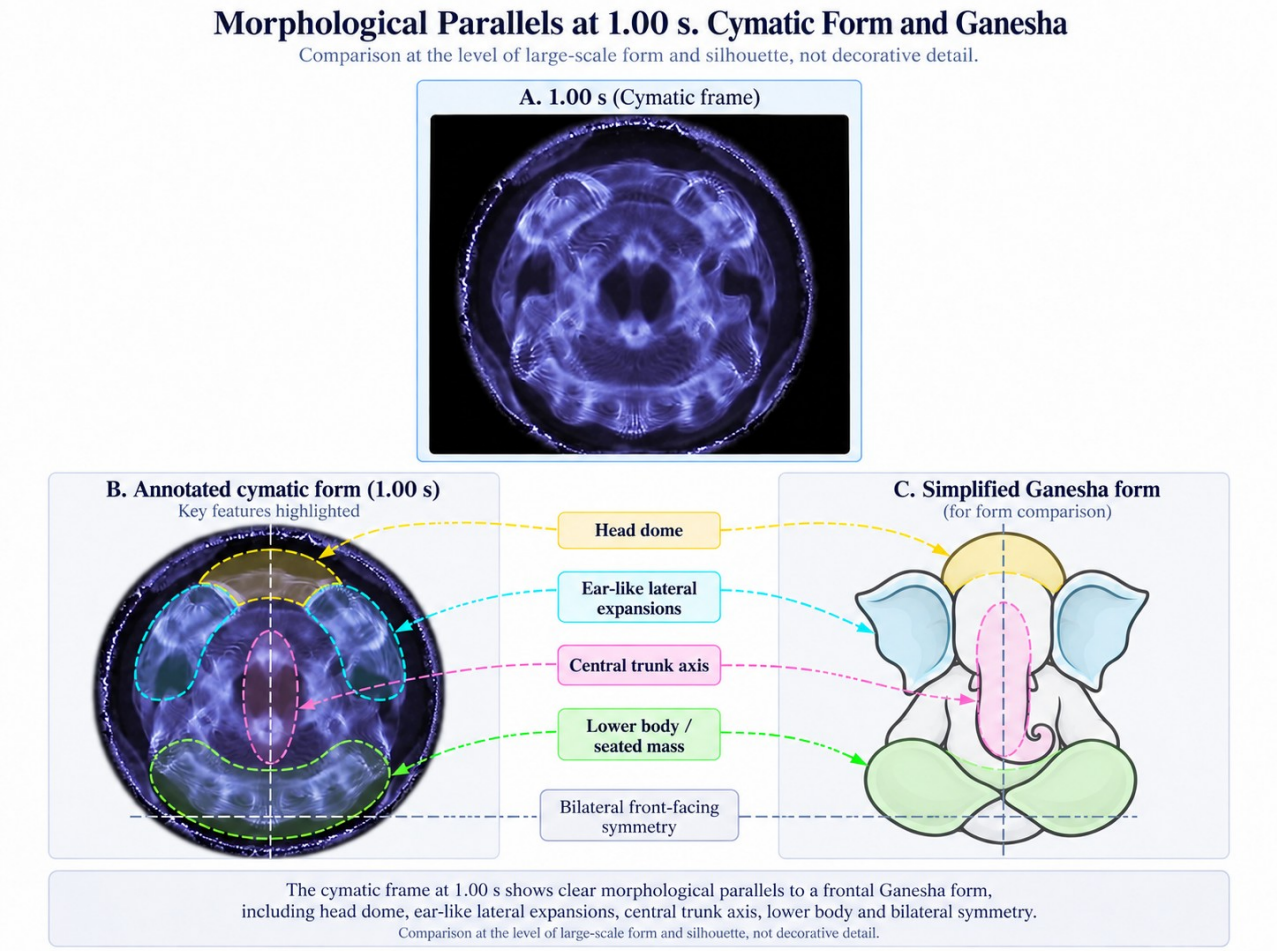


Figure 10 (Class B). Morphological comparison for the principal occurrence. The annotated cymatic structure is compared with a simplified frontal Ganesha form at the level of head/upper mass, paired lateral expansions, central descending axis, lower rounded mass, and bilateral organization.

Interpretive schematic: the simplified Ganesha drawing and colored overlays are explanatory devices, while the cymatic frame is the source observation. This plate is not used as pixel-level evidence of resemblance.

3.8 Summary of morphological correspondences

Reference feature	Observed cymatic counterpart	Assessment
Dominant head region	Large upper central mass	Strong
Large lateral ears	Paired lateral flares/lobes	Very strong
Central trunk	Descending central axis	Strong
Rounded lower body	Compact lower mass	Moderate–strong
Frontal symmetry	Bilateral organization	Very strong
Arms / ritual attributes	No stable clear equivalent	Excluded
Tusks / ornament	No stable clear equivalent	Excluded

4. Discussion

4.1 What the experiment establishes

The strongest supportable finding is not that the water literally depicted Ganesha. It is that a related figure-like morphology recurred at nearly the same relative point in a repeated mantra passage under closely similar acoustic conditions. That recurrent state can then be described morphologically and compared, separately, with the traditional frontal form of Ganesha.

4.2 Gaṃ-associated acoustic state

Gaṃ occupies a comparatively stable acoustic region in the analyzed sequence. This is compatible with a physical interpretation in which a relatively steady excitation may favor temporary reinforcement of a particular family of modes in the coupled transducer–vessel–water system. The stronger spectral changes introduced during Ga / ṇa / pa / te are then associated with progressive perturbation and reorganization of the recorded field. The present experiment does not isolate these acoustic variables sufficiently to establish this mechanism causally.

4.3 Morphological persistence rather than instantaneous encoding

The form persists briefly beyond the late-Gaṃ peak. This behavior is compatible with the inertia and stored energy expected in a driven fluid, where an established wave state need not disappear at the instant a phonetic boundary is crossed. Descriptively, the recorded sequence can be summarized as formation → persistence → perturbation → reorganization; this is not intended as proof of a unique underlying fluid-dynamic mechanism.

4.4 Traditional correspondence

The localization of the peak to late Gaṃ is noteworthy because the Gaṇapati Atharvaśīrṣa explicitly presents Gaṃ as the central mantra-form of Ganapati [8,9]. The same source contains descriptors such as lambodara and śūrpakarṇaka [8,9]. These textual associations deepen the interpretive context but do not establish a causal bridge from Sanskrit symbolism to fluid mechanics.

4.5 Pareidolia and the status of the Ganesha comparison

Humans are predisposed to perceive familiar figures, especially face-like structures, in ambiguous patterns; face pareidolia engages rapid perceptual mechanisms related to ordinary face processing [10]. The Ganesha identification must therefore be treated as an interpretation of a recorded morphology, not as an objective label inherent in the pixels.

At the same time, invoking pareidolia does not erase the underlying geometry. The bilateral organization, paired lateral expansions, central axis, and lower mass are physically recorded features. The scientific question is whether those features recur systematically and whether blinded or automated comparison would identify a stronger-than-chance resemblance to the Ganesha template relative to alternatives.

4.6 Why the observation remains interesting

The convergence of three facts makes the observation research-worthy: (1) the morphology recurs within the session, (2) it is tightly localized to a repeated acoustic/phonetic region, and (3) its global organization resembles the iconographic form traditionally associated with that mantra. The present study documents that convergence without claiming that it has yet been causally explained.

5. Limitations

• The three occurrences come from one continuous session and therefore do not constitute independent replication.

• Exact vessel dimensions, water depth/volume, transducer specifications, sound-pressure calibration, and source-recording metadata should be added before external submission.

• One voice/recording source and one apparatus configuration were analyzed.

• Phonetic boundaries were manually annotated and have finite temporal precision.

• The iconographic comparison is partly perceptual and culturally informed; no blinded observer test has yet been performed.

• No acoustically matched non-mantric control and no alternative iconographic templates were tested.

• The present study uses descriptive morphology and source-derived image processing; it does not yet implement preregistered quantitative template matching.

6. Future Work

The priority next experiment is independent replication across separate recording sessions with the same apparatus and documented acquisition parameters. Subsequent controls should vary speaker, pitch, level, and articulation; compare Gaṃ with acoustically similar non-mantric syllables; and include unrelated mantra passages.

A stronger visual test should predefine quantitative descriptors such as bilateral symmetry, central-axis strength, lateral-lobe position, upper-to-lower mass ratio, contour topology, and spatial mass distribution. Ganesha-mantra frames could then be compared with random frames and multiple alternative iconographic templates.

A blinded observer experiment would provide a complementary perceptual test. Observers could classify anonymized cymatic frames without knowing the mantra, allowing the probability of spontaneous Ganesha identification to be compared with chance and with control stimuli.

Claim audit: throughout this manuscript, 'observed' and 'measured' refer to source-derived properties of this recording; 'Ganesha-like' refers to a morphological/iconographic interpretation; and proposed fluid-dynamic explanations are treated as hypotheses, not demonstrated mechanisms.

7. Conclusion

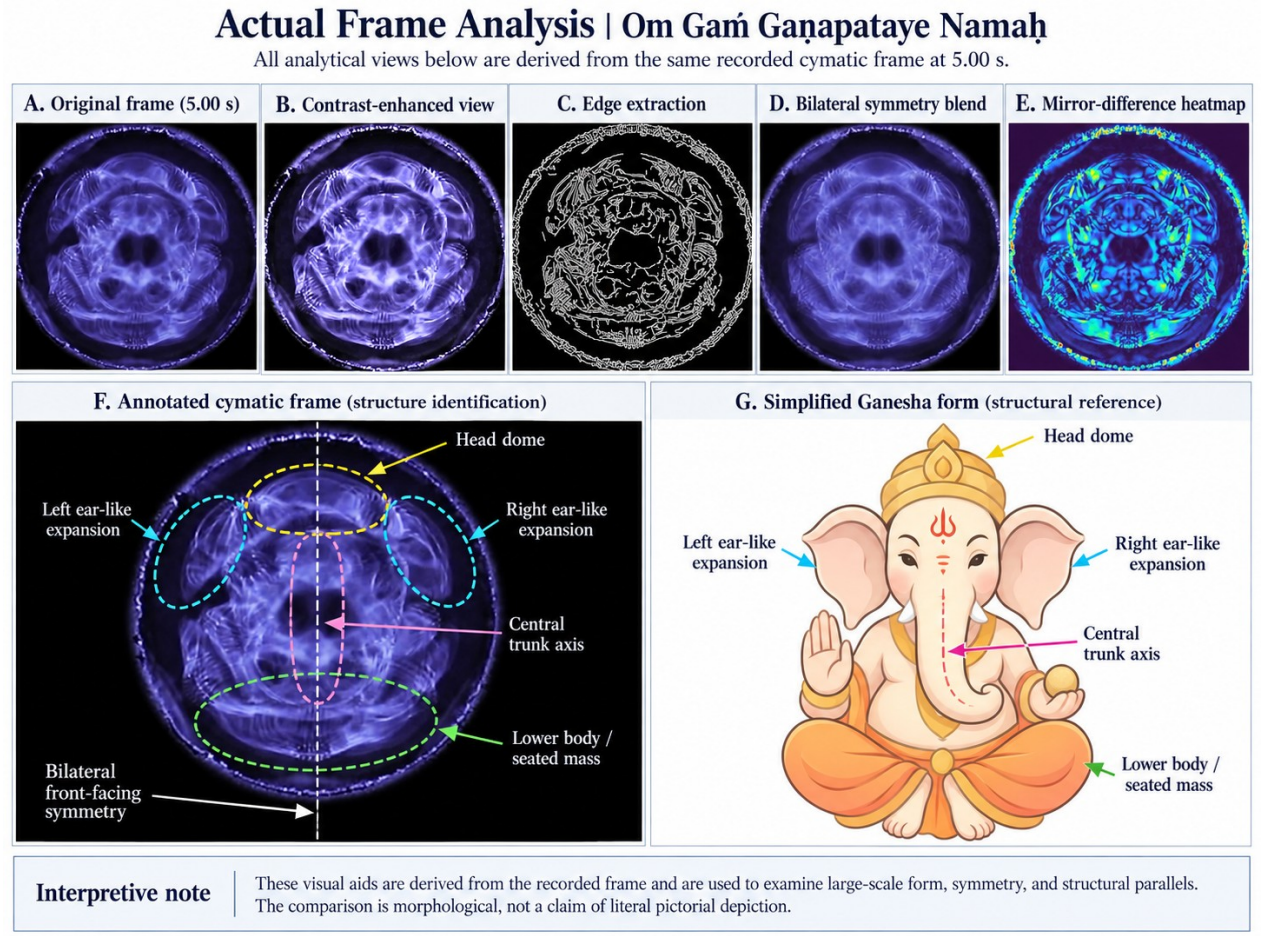
Within one continuous experimental session, a related bilateral figure-like cymatic morphology was observed during three successive repetitions of Oṃ Gaṃ Gaṇapataye Namaḥ at nearly the same relative position in the mantra cycle. The selected peaks occurred under closely similar acoustic conditions and, using the corrected 59.94 fps Premiere sequence timebase, localized to the latter portion of Gaṃ, immediately before the opening of Gaṇapataye.

The transition analysis suggests that the morphology is established during a comparatively stable harmonic region, persists briefly into the opening of Gaṇapataye, and is progressively reorganized as the acoustic spectrum changes. At the level of global form, the recurrent state shows a notable correspondence with frontal Ganesha iconography: a dominant upper mass, paired lateral expansions, a central descending axis, a rounded lower region, and bilateral frontal organization.

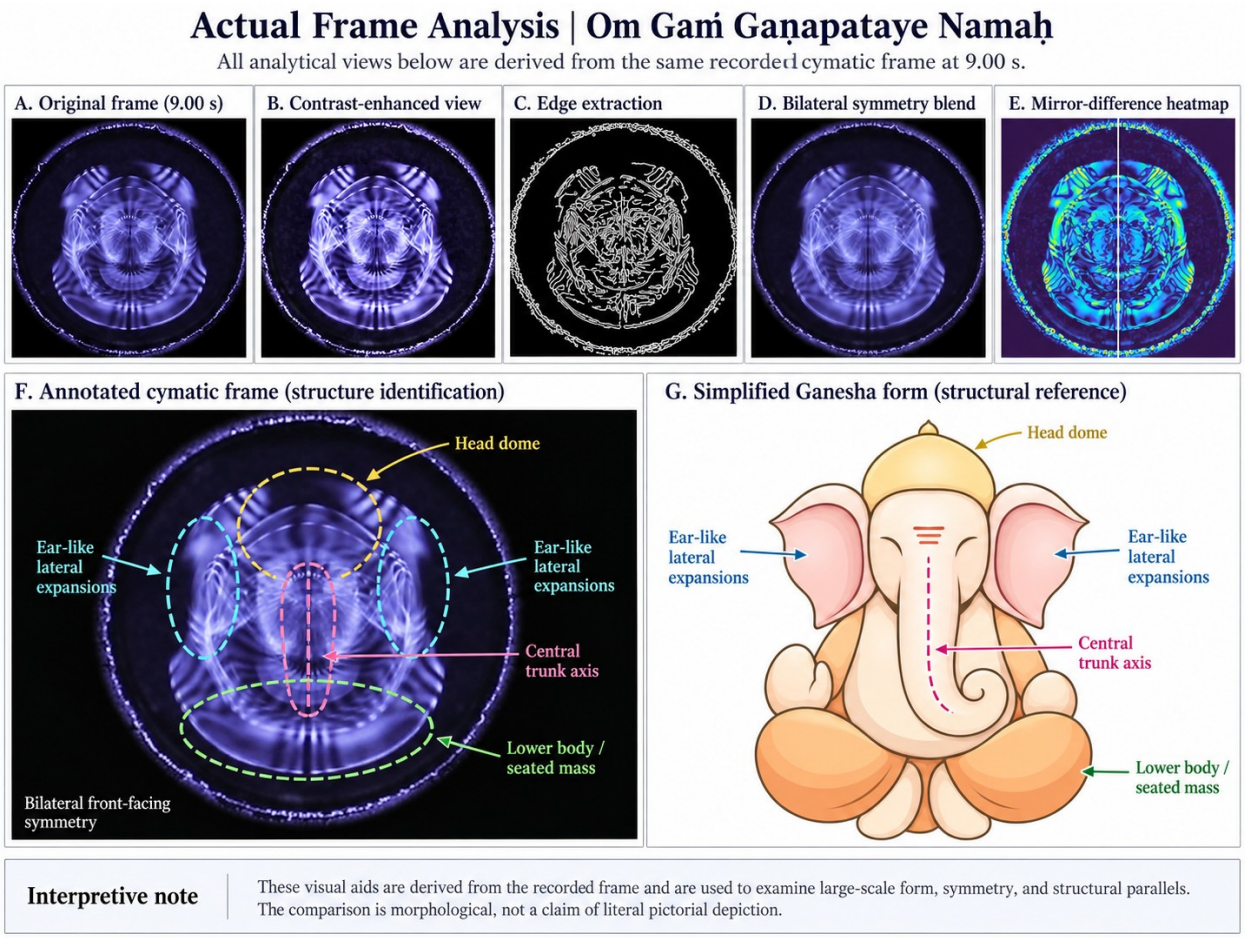
The study does not establish that symbolic meaning directly shapes the water or that Gaṃ universally produces a Ganesha-like form. Its present conclusion is narrower: within this single session, the same acoustic-phonetic region repeatedly coincided with a related cymatic morphology whose large-scale structure was judged to bear a notable Ganesha-like iconographic resemblance. The cause and specificity of that resemblance remain unresolved and require independent replication, controls, and blinded or quantitative morphological testing.

Supplementary Visual Material

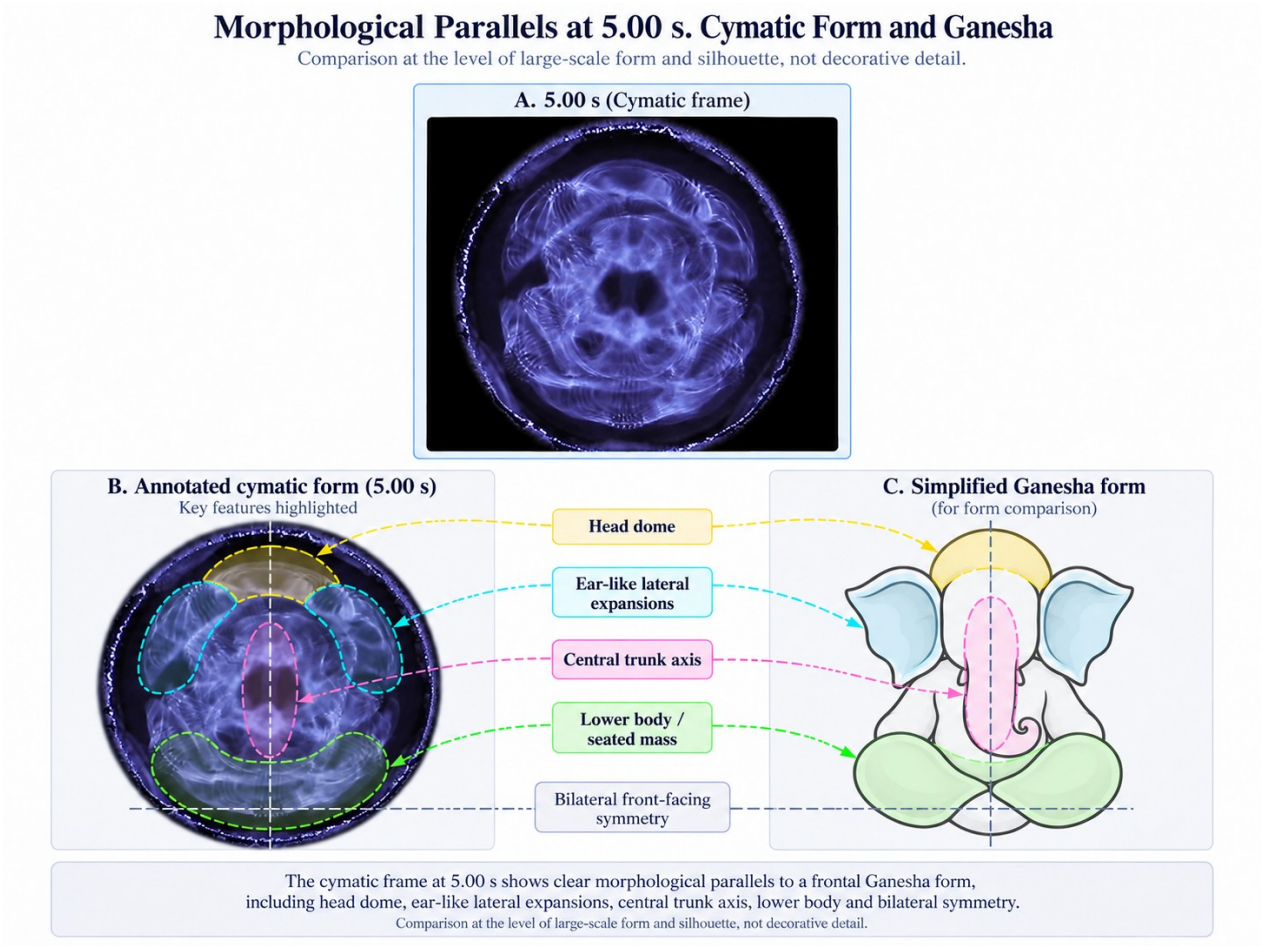
The following supplementary plates retain the repeated-instance visual evidence without overloading the main Results narrative.



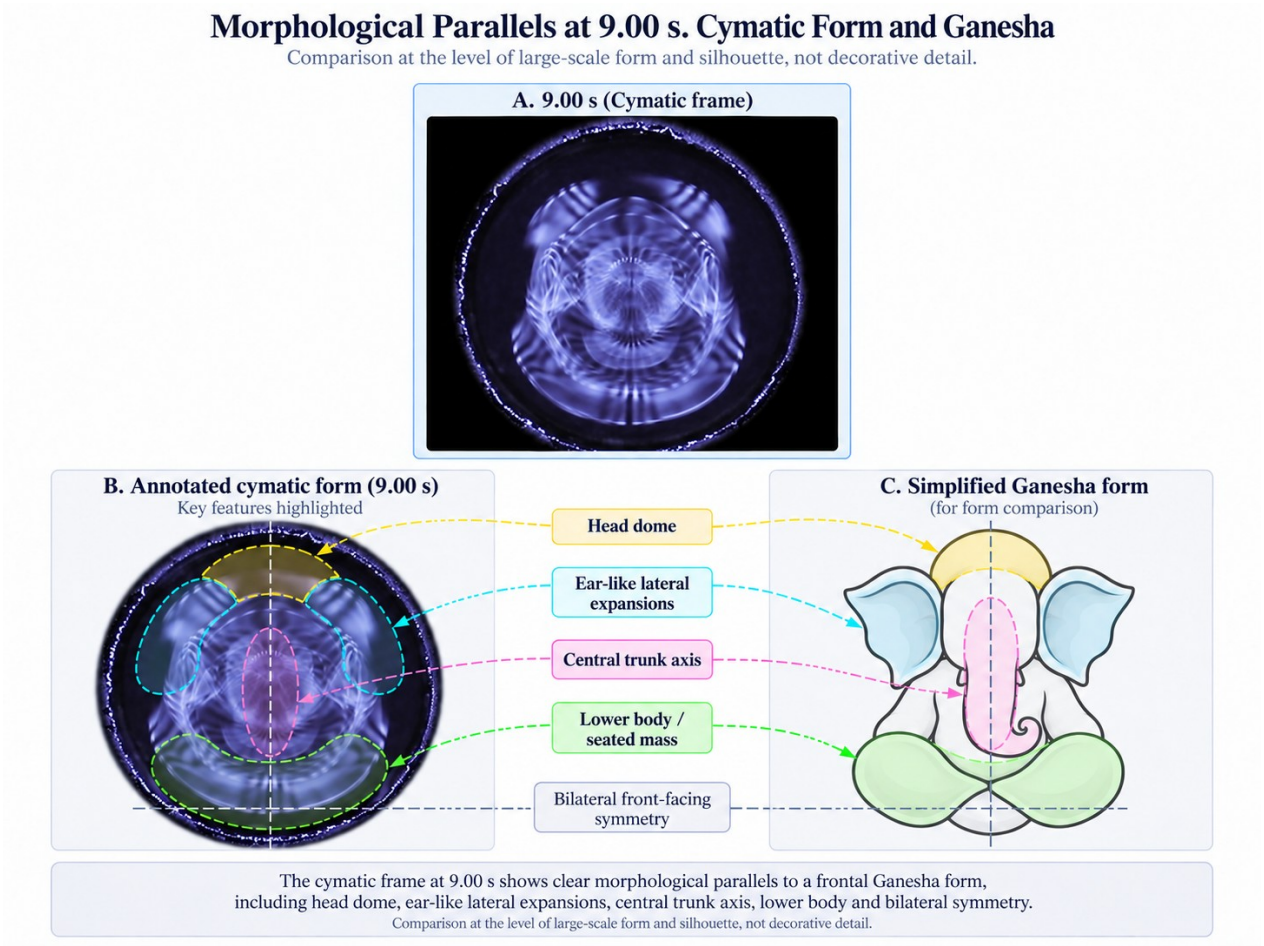
Supplementary Figure S1 (Class B). Actual Frame Analysis for Instance 2 (~5.00 s).



Supplementary Figure S2 (Class B). Actual Frame Analysis for Instance 3 (~9.00 s).



Supplementary Figure S3 (Class B). Morphological comparison for Instance 2 (~5.00 s).



Supplementary Figure S4 (Class B). Morphological comparison for Instance 3 (~9.00 s).

Research Integrity and Visual Provenance Note

All numerical acoustic results and all Class A figures in this manuscript were derived from the supplied recording. Class B figures are source-grounded explanatory graphics: they contain exact recorded frames and/or the researcher-supplied Ganesha reference but may include labels, arrows, simplified outlines, or schematic comparison elements. Class C concept graphics developed during early ideation are intentionally excluded from the evidential chain.

The previously generated dark infographic concept board and any other non-source-derived visualizations are not used as evidence in this manuscript. They remain design references only.

Reference-verification note: bibliographic details and DOIs for the fluid-mechanics, acoustic-phonetics, and pareidolia sources were checked against publisher or scholarly-index records. The Gaṇapati Atharvaśīrṣa is represented by both scholarly contextual sources and a primary-text witness because textual variants exist.

References

[1] Faraday, M. (1831). On a peculiar class of acoustical figures; and on certain forms assumed by groups of particles upon vibrating elastic surfaces. Philosophical Transactions of the Royal Society of London, 121, 299–340. https://doi.org/10.1098/rstl.1831.0018

[2] Benjamin, T. B., & Ursell, F. (1954). The stability of the plane free surface of a liquid in vertical periodic motion. Proceedings of the Royal Society of London. Series A, Mathematical and Physical Sciences, 225(1163), 505–515. https://doi.org/10.1098/rspa.1954.0218

[3] Kumar, K., & Tuckerman, L. S. (1994). Parametric instability of the interface between two fluids. Journal of Fluid Mechanics, 279, 49–68. https://doi.org/10.1017/S0022112094003812

[4] Perlin, M., & Schultz, W. W. (2000). Capillary effects on surface waves. Annual Review of Fluid Mechanics, 32, 241–274. https://doi.org/10.1146/annurev.fluid.32.1.241

[5] Stevens, K. N. (1998). Acoustic Phonetics. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/1072.001.0001

[6] Harrington, J. (2010). Acoustic phonetics. In W. J. Hardcastle, J. Laver, & F. E. Gibbon (Eds.), The Handbook of Phonetic Sciences (2nd ed., pp. 81–129). Wiley-Blackwell. https://doi.org/10.1002/9781444317251.ch3

[7] Bühnemann, G. (1984). Some remarks on the structure and application of Hindu Sanskrit stotras. Wiener Zeitschrift für die Kunde Südasiens, 28, 73–104. Used here as scholarly context for the Gaṇapati Atharvaśīrṣa textual tradition.

[8] Grimes, J. A. (1995). Ganapati: Song of the Self. State University of New York Press. https://doi.org/10.1515/9781438405018

[9] Gaṇapati Atharvaśīrṣa. Sanskrit text passage consulted for gakāraḥ pūrvarūpam, akāro madhyamarūpam, anusvāraścāntyarūpam, binduruttararūpam, nādaḥ sandhānam, and oṃ gaṃ gaṇapataye namaḥ; parallel online textual witnesses consulted via SanskritDocuments and Meenalaya.

[10] Wardle, S. G., Taubert, J., Teichmann, L., & Baker, C. I. (2020). Rapid and dynamic processing of face pareidolia in the human brain. Nature Communications, 11, 4518. https://doi.org/10.1038/s41467-020-18325-8