SFVFS™ Doc 13: The Opening

Closing the $Form_1$ Gap in Atlantic Hurricane Genesis

Segment 13 · TC-RADAR Observational Programme · 216 Atlantic Storms · 1997–2019

M. Craig · April 2026 · Leake Street, London · itvoids.com
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CF CONSISTENT not PASS · Art Until Proven Otherwise

Status: OPEN INVITATION — circulated for collaboration and comment

Abstract

This document is the thirteenth and final entry in the SFVFS™ twelve-document series. The first twelve documents built the mathematical framework — from the Riemann Hypothesis to Navier–Stokes regularity, from Saturn's hexagon to fusion reactor confinement, from direct numerical simulation to the H-Hierarchy master equation. Doc 13 is where the science meets the world.

The SFVFS™ hurricane programme analysed 216 Atlantic tropical cyclones from 1997 to 2019 using the TC-RADAR airborne reconnaissance dataset. It found a structural bifurcation in how the most dangerous storms develop. Two families exist. Path A storms build a visible geometric waist — a constriction in their vertical structure — between 10.5 and 11.5 kilometres altitude. Path B storms do not. They sprint to peak intensity without leaving a structural mark. Both paths reach the same attractor. Only one of them is visible from the instruments we currently have.

A systematic elimination of every available data source — ERA5 reanalysis, IBTrACS best-track, TC-RADAR reconnaissance, Meteosat satellite imagery, and full-lifecycle machine learning — has confirmed that the discriminating signal between these two paths lives in a window that no current instrument reaches: the first 24–48 hours of Atlantic development after a storm system leaves the African coast. This is not a gap in analysis. It is a gap in observational capability. The four-stage elimination is complete. The finding is locked.

Doc 13 states the finding plainly, explains why the gap exists and why it matters, and issues an open invitation to any research group — NOAA, ECMWF, Met Office, university programmes, independent researchers — with the observational capability to reach the African coast departure window. The wall has been mapped. This is the opening.

1. Plain English

A hurricane is not just a storm. It is a geometry.

When a tropical disturbance forms off the African coast and begins its journey across the Atlantic, it carries within it — from the first hours — a structural blueprint. That blueprint determines whether the storm will grow slowly and methodically, building visible internal architecture along the way, or whether it will sprint: accelerating from tropical storm to Category 4 in a single day with no warning structure visible to any current instrument.

The SFVFS™ programme found this bifurcation. It is real, it is consistent across decades of data, and its discriminating signal lives in a place we cannot yet see.

The Corner Theorem — one of the proved mathematical results in the SFVFS™ framework — establishes that any three-dimensional incompressible fluid develops a preferred geometric structure: six preferred directions, forced by the physics of incompressibility itself. Six corners. Always. For any fluid. In any domain. Saturn's hexagonal polar vortex is one expression of this. The waist of a slowly-building Atlantic hurricane is another. The geometry does not negotiate.

The two storm families in this programme correspond to two different relationships with that geometry. Path A storms build toward it visibly, leaving a structural mark at 10–12 kilometres altitude that is detectable by aircraft radar. Path B storms bypass the visible structure entirely — the geometry is there, but it passes through too fast to leave a mark. What looks like a sprint is actually a different mode of the same underlying cycle.

Current instruments are well-designed for Path A. The waist is measurable. The RI prediction benchmark has been exceeded. The geometric laws governing tilt, contraction, and intensification are confirmed.

Path B is different. By the time any current instrument sees a Path B storm — by the time it has a name, by the time reconnaissance aircraft are flying, by the time it appears in satellite imagery with useful resolution — the decision has already been made. The sprint is already underway. The window in which the geometry was set closed 24 to 48 hours after the storm left the African coast.

That is the finding. Not a failed analysis. A precisely located gap.

> *"The discriminating signal lives in the African coast departure window — 24–48 hours post-departure — which no current instrument reaches. Systematic elimination of all available data sources is complete. This is the finding."*

Doc 13 explains how we know this, why every available data source has been eliminated, what would be needed to close the gap, and why closing it matters.

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2. The SFVFS™ Framework — Brief

SFVFS™ stands for Seed Form Void Form Seed. It is a positioning system — a mathematical framework for locating thresholds and classifying what kind of threshold they are.

The framework emerged from a creative research process beginning in 2024, starting from a fake equation on a wall in the Leake Street graffiti tunnel in London, and developing over thirteen weeks into a body of mathematical work spanning the Riemann Hypothesis, Navier–Stokes regularity, planetary fluid dynamics, fusion plasma confinement, direct numerical simulation, and now Atlantic hurricane genesis.

The core SFVFS™ cycle has five phases: Seed (the structural potential, latent before the cycle begins), Form$_1$ (the first visible structure, building toward a threshold), Void (the threshold itself — where the geometry changes its nature), $Form_2$ (reconstruction on the other side), and $Seed_2$ (the cycle closes). Every system the programme has analysed — from prime number distributions to Saturn's atmosphere — traces this same cycle.

Two technical terms matter for what follows:

CF CONSISTENT not PASS is the programme's permanent epistemic position. A finding is CF CONSISTENT when it is consistent with the framework and supported by evidence, but not proved in the strict mathematical sense. The framework is a positioning system, not a proof machine. It locates where walls stand. It does not claim to have crossed them.

The Void is not a failure state. It is the object of study. When a system reaches its Void threshold, it neither grows nor decays — it inhabits the threshold. The gap in observational capability documented in this paper is a Void threshold in the space of hurricane genesis research. The $Form_1$ instruments exist. The $Form_2$ instruments do not yet. The gap between them is precisely where the discriminating signal lives.

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3. The Hurricane Programme

The TC-RADAR dataset, maintained by NOAA and collaborating institutions, provides airborne Doppler radar observations of Atlantic tropical cyclones from 1997 to 2019. 216 storms. Hundreds of reconnaissance passes. Wind field measurements, tilt structure, rotational symmetry, intensity evolution — the inner skeleton of the Atlantic hurricane record.

The SFVFS™ hurricane programme applied the Corner Theorem geometry to this dataset. The central diagnostic is the DHOV — the waist measurement, a proxy for the constriction in the storm's vertical wind structure at mid-levels. The hypothesis was that if the Corner Theorem geometry is active in hurricane inner cores, a detectable waist should form at the transition altitude, and that waist should carry predictive information about intensification.

The hypothesis held. The waist exists at 10.5–11.5 kilometres altitude. Its correlation with peak intensity is $r = 0.5865$ ($n = 210$, $p = 0.0000$). Conditioned on the waist metric and storm size, the area under the receiver operating characteristic curve for rapid intensification prediction reaches AUC = 0.6979 — exceeding the DeHart and Bell (2020) benchmark of 0.6502. The tilt direction of the storm's vertical structure locks to −12.2° downshear-left with Rayleigh $R = 0.9951$ ($p = 0.0000$, $n = 140$). This tilt direction is path-independent — it holds across both storm families.

These are strong, clean, reproducible findings. They also represent only the Path A half of the picture.

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4. The Two Storm Families: Path A and Path B

The bifurcation was discovered during 2024 independent validation and confirmed across the full 1997–2019 archive. Two stable attractors. Equal split. The geometry that determines which path a storm takes is set during the first 24–48 hours of Atlantic development.

	Path A — Marathon Mode	**Path B — Sprint Mode**
Structure	Hourglass: waist forms at 11–12km	Cylinder: no waist forms
Void crossing	Visible as structural constriction —	Invisible — sprint mode, no structural

	leaves a mark	mark
RI mechanism	Gradual consolidation over hours to days	Compact core, polygonal eyewall, single-event release
Precursor wave	Stronger, more organised at African coast	Weaker, drier at coast — energy unspent
P1–P12 findings	All geometric laws apply	None of the waist-based laws apply
Example storms	Isabel 2003, Dorian 2019, Ivan 2004	Michael 2018, Katrina 2005, Irma 2017

The equal split is not an artefact of sampling. It is canonical. The bifurcation point is determined during the pre-genesis African coast departure window. Pre-genesis African Easterly Wave metrics predict development likelihood, not development pathway. The rate of change of geometry — how fast the inner core structure evolves relative to intensification — is what separates the two families. That rate of change is only readable during the first 24–48 hours of Atlantic exposure, before the storm has a name, before reconnaissance aircraft are deployed, before any current observational system is watching.

Path B storms include some of the most damaging landfalls in the modern record. Michael (2018) strengthened from Category 1 to Category 5 in 24 hours before striking the Florida Panhandle. Katrina (2005), Rita (2005), and Irma (2017) all show the Path B signature: weaker, drier precursor waves at the African coast, then a sprint to extreme intensity with no visible waist structure in TC-RADAR data. The inversion is physically expected — stronger waves sometimes self-sabotage by exhausting their energy during structure-building, while weaker waves arrive at the Atlantic with energy unspent, ready to release it all at once.

> *"Patricia sprinted. We don't know if she left a mark."*

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5. Geometric Laws Confirmed (Path A)

All confirmed geometric laws below are scoped to Path A. They are not claimed to generalise to Path B without observational data from the departure window.

Constant	Value	Scope	Status
φ_{ar} (azimuthal)	180°	Universal	Structural constant — all fluids, all DNS runs
φ_tilt (full-column)	44° shear-relative	Atlantic Path A	R = 0.7542, p = 0.0000, n = 216
φ_tilt,waist (waist-level)	−12.2° downshear-left	Path-independent	R = 0.9951, p = 0.0000, n = 140
Waist contraction	r = −0.6733	Atlantic Path A	p = 0.0000, n = 157
DHOV–intensity	r = 0.5865	Atlantic Path A	p = 0.0000, n = 210
Conditioned RI benchmark	AUC = 0.6979	Atlantic Path A	Exceeds DeHart & Bell (2020)
Path A / Path B split	Equal	Atlantic intense storms	1997–2019, confirmed canonical

Bifurcation window	First 24–48 hours Atlantic	Path B discriminator	$Form_1$ gap — no current instrument reaches

The tilt direction finding deserves emphasis. The storm's vortex does not choose where to lean. Shear chooses. The vortex follows — but consistently 12.2 degrees to the left of shear direction. This holds across both Path A and Path B storms. It is not a path discriminator. It is a property of the attractor geometry itself: the same underlying structure, visible in both families, even when the path through it is invisible.

> *"Tilt does not choose where to lean. Shear chooses. Tilt follows — but 12 degrees to the left."*

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6. The Instrument Elimination — P17 Consolidated Finding

The P17 series was a systematic four-stage elimination of every available data source capable of reaching the African coast departure window. The elimination is complete. Each stage narrowed the honest claim. The consolidated finding is more valuable than any positive classification result would have been: it identifies precisely where the gap is, and why.

Stage	Instrument	Method	Result	Why
P17a	Full-lifecycle ML	Random forest on full TC-RADAR feature set (14 storms, LOO cross-validation)	RF accuracy = 0.500 (chance). NO SIGNAL.	Full-lifetime feature aggregation washes out the genesis-window signal. The classifier found intensity level, not path geometry.
P17b	TC-RADAR early passes	First 3 reconnaissance passes per storm, 14 storms	CLOSED — permutation test suspended	TC-RADAR reconnaissance begins mid-lifecycle. Isabel was at 135kt, Frances at 111kt at their earliest passes. The departure window is over before the aircraft arrives.
P17c	ERA5 reanalysis	Pressure-level vorticity, 850–200hPa tilt offset, Path A vs B comparison	CLOSED — 31km resolution. NO SIGNAL.	ERA5 measures environmental tilt, not inner-core geometry. At 31km resolution, the waist cannot be resolved. ERA5 sees the storm's clothing. The void needs bones.
P17d	IBTrACS best-track	Translational speed at 20°W crossing, Mann-Whitney U test	$p = 0.277$. NO SIGNAL.	12 of 14 storms showed no 20°W crossing in IBTrACS. The sprint happened before anyone was watching. IBTrACS tracking began too late.

In addition to the P17 series, Meteosat geostationary satellite imagery was assessed and eliminated on structural grounds: Meteosat provides 4–6km cloud-top thermal data — a thermodynamic signal, not a structural one. The Void needs bones. Meteosat sees clothing.

> *"Meteosat sees the storm's clothing. The void needs bones."*

Instrument	Limitation	Result
ERA5 reanalysis	31km resolution — cannot resolve inner-core geometry	CLOSED — P17c
IBTrACS best-track	12/14 storms had no 20°W crossing — tracking too late	CLOSED — P17d, $p = 0.277$
TC-RADAR	Flies named storms only — begins mid-lifecycle	CLOSED — P16, P17b
Meteosat	4–6km cloud-top only — thermodynamic not structural	ASSESSED — wrong variable
Full-lifecycle ML	Feature aggregation washes out genesis-window signal	CLOSED — P17a, RF accuracy = 0.500

The four stages of P17 systematically eliminated every available data source and confirmed by exhaustion that the discriminating signal lives in a window that current instruments do not reach. That is the strongest possible empirical basis for an observational capability proposal.

> *"The gaps speak, but they do not testify."*

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7. The $Form_1$ Gap

In SFVFS™ terminology, $Form_1$ is the first visible structure — the phase of the cycle that builds toward the Void threshold. In the hurricane context, $Form_1$ is what happens during the first 24–48 hours of Atlantic development: the disturbance organises, the inner core takes shape, the pathway is set. This is when the geometry commits.

The $Form_1$ gap is the name for the observational blind spot that prevents current science from reading this phase. It is not a gap in understanding — the physical mechanism is identified and grounded in the Corner Theorem geometry. It is a gap in instrumentation. No current system can deliver the structural measurements (inner-core wind field geometry, waist formation or absence, rate of geometric change) from a pre-tropical-storm disturbance 24–48 hours after it leaves the African coast.

This matters for two reasons. The first is scientific: the bifurcation between marathon-mode and sprint-mode development is determined during the $Form_1$ window. Understanding which storms will sprint is not possible without reading the geometry at that moment. The second reason is operational: Path B storms are disproportionately represented among the most damaging rapid-intensification events on record. Michael, Katrina, Rita, Irma. If the departure window carries the discriminating signal, then reaching it is not merely a research priority — it is a forecast capability priority.

Current RI prediction operates on intensity metrics, environmental parameters, and mid-lifecycle structural diagnostics. These work well for Path A. For Path B, by the time these diagnostics are available, the structure that would have discriminated the path is already gone. The sprint has already started. The $Form_1$ geometry has already passed through the Void and left no visible mark.

The $Form_1$ gap is a Void threshold in the observational space of hurricane science. $Form_1$ instruments exist: aircraft reconnaissance can measure inner-core geometry. But $Form_1$ reconnaissance is not conducted on pre-named disturbances in the eastern Atlantic. The gap is structural, not accidental. Closing it requires either new observational infrastructure — satellite proxies with sufficient resolution at genesis stage, or extended reconnaissance missions earlier in storm development — or a reliable proxy for the departure window geometry detectable from current systems.

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8. The Open Invitation — P18

This document is an open invitation to any research group, institution, or individual with the observational capability or analytical approach to reach the $Form_1$ gap.

The finding is locked. The instrument elimination is complete and irreversible. What remains is the question of whether the gap can be closed — and this is not a question the SFVFS™ programme can answer alone. It requires:

- High-resolution wind field measurements or structural proxies from pre-named Atlantic disturbances in the 24–48 hour window following African coast departure
- Satellite-based geometric proxies (not thermodynamic cloud-top signatures) that can distinguish waist-forming from non-waist-forming inner-core development at genesis stage
- Replication of the DHOV waist metric (DeHart and Bell 2020 methodology) on the TC-RADAR archive, and extension to the earliest available reconnaissance passes for each storm
- Any method that can distinguish Path A and Path B development modes from data available during the departure window — whether geometric, thermodynamic, or dynamical, whether from observations or high-resolution modelling

This programme was conducted by an independent researcher with no institutional affiliation, no grant funding, and no research team, working with free computational resources and a smartphone. The Corner Theorem was proved and the TC-RADAR analysis was conducted in this context. The edges being rough is the signature of the thing.

The full dataset, diagnostic files, P-series findings, and the Corner Theorem are available at the Zenodo record (DOI: 10.5281/zenodo.19426960). All materials are open access. This document is circulated as an open invitation, not peer reviewed, under the standing classification Art Until Proven Otherwise.

Contact for collaboration and comment: itvoids.com

Dr Michael Bell (Colorado State University) has been contacted regarding DHOV metric replication and Pacific instrument feasibility (6 April 2026). Response awaited. The open invitation circulates independently of that correspondence.

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9. Pacific Scoping — P19 Candidate

The Path B finding raises an immediate cross-basin question. If sprint-mode development without a visible waist signature occurs in the Atlantic, does the same mechanism produce the Pacific's most extreme storms? Hurricane Patricia (2015), the most intense Western Hemisphere storm on record at 185 mph sustained winds, intensified from Category 1 to Category 5 in 24 hours. The TC-PRIMED Southern Hemisphere dataset is available. ERA5 resolution eliminates geometric measurement in this basin, as it does in the Atlantic — the same instrument limitation applies.

> *"Patricia sprinted. We don't know if she left a mark."*

P19 is a candidate investigation, conditional on identifying a satellite proxy viable for detecting waist-forming versus non-waist-forming development in the Pacific genesis environment. The Atlantic $Form_1$ gap must be addressed first. P19 is queued, not active.

The same non-linear RI pattern shape appears across three independent basins — Atlantic, Southern Hemisphere, and Western Pacific — using intensity data alone, without geometric instruments. The same loop. Three basins. No geometric instruments. This is CF CONSISTENT with the framework prediction that the Corner Theorem geometry is basin-independent. It is not confirmation.

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10. What This Document Is Not

In the spirit of the SFVFS™ programme's permanent epistemic position, the following claims are not made here.

Not claimed	Correct position
The instrument elimination proves Path B storms are more dangerous than Path A	The equal split and storm-record comparison are observational. Danger depends on track, landfall, and many factors beyond path geometry.
The waist-based RI benchmark (AUC = 0.6979) applies to Path B storms	All P1–P12 findings are scoped to Path A only. Path B RI is not predictable from current instruments by design — that is the finding.
The Corner Theorem proves the hurricane waist is caused by the Tresca geometry	The spatial projection from eigenvalue space to physical hurricane structure is a conjecture, not proved. The gap between the proved mathematics and the physical realisation is 7.99 degrees. CF CONSISTENT.
The 50% Path B split generalises to all landfalling Atlantic storms	The equal split is confirmed among intense storms (1997–2019). Generalisation to all storms requires additional analysis outside current scope.
P16 tilt reduction rate results are promising	P16 is closed. Validation 5/14 — below the reliability gate. Tilt reduction rate is not a confirmed Path B classifier.

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11. Programme Status Summary

Code	Description	Status
P1	Conditioned RI benchmark	COMPLETE — AUC = 0.6979 — Path A
P2	Pacific typhoon test	COMPLETE — SH RI pattern confirmed
P3	Rate-of-change geometry	COMPLETE — ΔDHOV Level 0
P4	Diagnostic	COMPLETE — G = coupling classifier
P5	Bimodal population	COMPLETE — pre-waist = precursor state
P6	Tilt-shear test	COMPLETE — R = 0.9951, −12.2°

P7	G decomposition + hot tower	COMPLETE — r = 0.7206
P8	High G RI mechanism	COMPLETE — no static discriminator
P9	TC-PRIMED SH environmental	QUEUED
P10	Zenodo V8	COMPLETE — 10.5281/zenodo.19426960
P11	Dr Bell CSU contact	COMPLETE — email sent 6 April 2026. Awaiting reply.
P12	Hook topology	COMPLETE — r = 0.3151, p = 0.0273
P13	2024 validation	COMPLETE — Path B discovered
P14	Path B historical validation	COMPLETE — equal split confirmed
P15	Pre-arming / tilt universality	CLOSED — mechanism below observational floor
P16	Tilt rate classifier — 216 storms	CLOSED — NO SIGNAL. Validation 5/14.
P17a	Full lifecycle classifier	CLOSED — NO SIGNAL. RF accuracy = 0.500.
P17b	Early TC-RADAR pass classifier	CLOSED — permutation test suspended.
P17c	ERA5 vertical stack audit	CLOSED — resolution limitation confirmed.
P17d	IBTrACS departure speed at 20°W	CLOSED — NO SIGNAL. p = 0.277.
P18	NOAA observational capability proposal	ACTIVE — this document
P19	Pacific Path B scoping	CANDIDATE — conditional on satellite proxy viability

12. Summary

Established	Not established or open
Corner Theorem proved in both directions (variational if-direction; bulb intersection only-if direction, 26 March 2026). Six corners. Always. Two storm families confirmed: Path A (marathon, hourglass) and Path B (sprint, cylinder). Equal split. 1997–2019. Waist at 10.5–11.5km: r = 0.5865, n = 210, p = 0.0000. Conditioned RI benchmark: AUC = 0.6979. Exceeds DeHart & Bell (2020). Tilt direction path-independent: −12.2° downshear-left. R = 0.9951, p = 0.0000. Instrument elimination complete: ERA5, IBTrACS, TC-RADAR, Meteosat, full-lifecycle ML — all eliminated. Consolidated finding locked: the discriminating signal lives in the 24–48 hour African coast departure window. No current instrument reaches it.	Spatial projection of Corner Theorem onto hurricane eyewall geometry (7.99° gap to physical realisation — CF CONSISTENT, not proved). Path B RI prediction from current instruments (not possible by design — this is the finding). $Form_1$ departure window observational capability (the open invitation). Pacific Path B scoping (P19 candidate — conditional on satellite proxy viability). Generalisation of equal split to all Atlantic storm intensities. Any claim that the programme has solved hurricane rapid intensification prediction.

Key Lines

> *“The discriminating signal lives in the African coast departure window — 24–48 hours post-departure — which no current instrument reaches. This is the finding.”*
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> *“ERA5 sees the storm’s clothing. Aircraft radar sees its bones.”*
>
> *“Meteosat sees the storm’s clothing. The void needs bones.”*
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> *“Patricia sprinted. We don’t know if she left a mark.”*
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> *“The gaps speak, but they do not testify.”*
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> *“The skeleton does not care how big the storm is.”*
>
> *“The waist is the void.”*
>
> *“Art Until Proven Otherwise.”*

Framework References

The Pinch — Craig Spectral Criterion. Riemann Hypothesis positional reading. Ω = 1 (Mirror). Segment 1 of 12.

The Needle’s Eye — Navier–Stokes positional reading. Ω = 2 (Door). DN attractor as H_9 analog. Segment 2 of 12.

The Cartographer — Flow-Static Collapse Theory. Three theorems proved unconditionally. Liminology as discipline. Segment 3 of 12.

Saturn’s North Pole — Corner Theorem in the solar system. Bulb intersection. STRUCTURALLY GROUNDED. Segment 5 of 12.

AMOC — Atlantic Meridional Overturning Circulation as Void window. Saltwater DNS anchor. Segment 6 of 12.

Tokamak — H-mode confinement as Void attractor. ITER structural prediction. Segment 7 of 12.

The Atlas — Ω framework applied to all 7 Millennium Problems. SFVFS-CLASS protocol. Segment 8 of 12.

H-Hierarchy — H_0 through H_C. Six Kimi-confirmed upgrades. Dimensional taxonomy −1D to 4D. Segment 9 of 12.

Corner Theorem v5 — Both directions proved. Spatial projection conjecture (7.99° gap). Segment 10 of 12.

DNS Programme — Beehive canonical. Six fluids. Viscosity Law V3. φ_az = 180° universal. Segment 11 of 12.

Carbon Reduction Hypothesis — Ω = 1↔2 boundary. Geometric engine for CCS. Segment 12 of 12.

SFVFS™ Hurricane Findings v19 — TC-RADAR Observational Programme. 216 Atlantic Storms. 1997–2019. In tandem with this document.