ASTRO-BALLISTIC CHRONOSTRATIGRAPHIC SEQUENCING

NORTH AMERICAN MIDDLE MOUNTAIN | PAPER I

Malpelo - Denali - Arctic: Two-Leg Geometric Reconstruction

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Scientific content retained from v1.6; section-indexed external citations appended

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Manuscript Status and Source Boundary

Research series: Astro-Ballistic Chronostratigraphic Sequencing (ABC Sequencing).
Paper: I of V.
Author: Justin B Fine, Principal Investigator, Ontomics.
Canonical structural source: *Astro-Ballistic Chronostratigraphic Sequencing I: Aegean Entrance, Everest Midpoint, Mariana Exit*, Canonical Corpus Freeze 1.0, August 7, 2026 [1].
Working status: Complete initial Paper-I draft, all fifty numbered chapters and corresponding appendices; not a canonical freeze or a completed empirical verification corpus.

The manuscript follows all fifty numbered chapters and the appendices of canonical ABC Sequencing Paper I, retaining chapter order and corresponding subsection functions. Regional names are adapted only where the supplied Denali record identifies a corresponding role. No additional energetic, mineralogical, bounce-back, or other proprietary mechanism is introduced. Source-unsupported empirical results are left without invented values during this initial complete drafting stage.

The specific project materials used for numerical content are *Denali Exact.pdf* [2], *Denali corridor segment workbook (.xlsx)* [3], *Denali Short Math.pdf* [4], and *8-8-2025 64 ma ABC Math Full (1).pdf* [5]. The last two are earlier exploratory conversation records. Where their preliminary models differ from the later fixed-midpoint calculation, the manuscript preserves the later stated geometry without silently combining numerical variants.

Declaration of Purpose

This paper begins a new geographically bounded application of the existing ABC Sequencing manuscript architecture. Its scientific subject is the North American Denali middle-mountain construction recorded in the project materials. The paper's immediate mathematical object is a source-solved entrance coordinate in the author-identified Malpelo region, an author-fixed interior-turn surface projection, and a specified segmented route to a northern terminal domain. The proposed middle-mountain association is kept separate from the geometric midpoint itself.

The manuscript inherits ABC Sequencing's distinction between observed geography, declared coordinate choices, computed geometric correspondence, and causal attribution. It does not use a calculated distance match as standalone evidence that the proposed event occurred. The larger five-paper program retains the canonical division of responsibilities: Paper I establishes the geometric and regional audit; downstream papers have their own non-interchangeable jobs [1].

Source Status and Citation Policy

The Denali input values are drawn from an internal working record, not an independently verified geodetic source. The named geographic points and numerical corridor values are retained as documented in the supplied project files. The source PDFs themselves contain assistant-generated calculations and conversational commentary; those remarks establish developmental provenance, not independent empirical confirmation. This manuscript does not import external geological claims to complete any missing source field.

The original ABC Sequencing Paper I is used as the structural and methodological template. The Denali records supply the actual substitutions. The spreadsheet provides seven rows of numerical arc and chord entries for the Denali-to-terminal route; the separate midpoint-to-Denali segment and entrance-to-midpoint chord are taken from *Denali Exact.pdf*. Values are displayed with their source precision, and summary equality is expressed in the source's stated rounding convention.

Data, Evidence, and Provenance Convention

Three kinds of items must remain distinct in this installment. **Author-declared inputs** specify the fixed turn, ordered route, and geographic entrance region; **the numerical entrance coordinate was solved in the working source** to satisfy the equal-chord condition. **Manuscript-derived quantities** are obtained from those choices and the declared spherical-distance formulas. **Interpretive roles** such as *entrance*, *middle mountain*, and *terminal domain* describe the candidate forensic reading of the geometry. A role label is not itself an observation of an initiating event.

For every reported distance, the provenance is the source file, the endpoints or path segments, the metric (surface arc or interior chord), the reference sphere, and the amount of rounding. This convention is mirrored from canonical Paper I's data-lineage framework [1]. The calculation register in Chapters 8–12 distinguishes a direct chord from a sum of separate segment chords. Those mathematical constructions must not be substituted for one another.

Document Status and Evidentiary Standard

This is the full first working draft of Paper I within the ABC Sequencing research program. It presents the Denali corridor in reproducible numerical terms while preserving the candidate status of its geological interpretation. The paper does not claim independent proof of an initiating event, a causal relationship between the turn and Denali's present elevation, or any particular mode of physical transfer.

Epistemic Status and Claim-Language Convention

An input is **declared** when the research selects it. A result is **calculated** when it follows from stated inputs and operations. A correspondence is **geometric** when numerical relations follow from those operations. A geological role remains **proposed** unless another evidence class is supplied. Any unresolved historical or physical claim remains unresolved. This language follows the original Paper-I hierarchy rather than introducing a new evidentiary ladder.

Prediction, Falsification, and Decision-Threshold Convention

This draft records the existing geometry. It neither freezes a new statistical threshold nor declares that an unperformed empirical program has been conducted. Subsequent entries in the corresponding canonical Paper-I sections will retain the parent paper's distinction between a proposed test and a completed result. There is no added program of tests in this adaptation.

Causal-Chain, Assumption, and Alternative-Explanation Convention

The geometric path, a middle-mountain geographic association, and a claimed historical sequence are separable propositions. The calculations in the supplied records concern the first proposition. The manuscripts will not infer the second or third from the numerical coincidence alone. This preserves the original ABC Sequencing firewall between numerical reconstruction and a full causal interpretation.

Abstract

Paper I develops the North American Denali adaptation of the Astro-Ballistic Chronostratigraphic Sequencing (ABC Sequencing) framework under the organizational and mathematical conventions of canonical ABC Sequencing Paper I. The immediate object is the author-specified Malpelo-region entrance, a fixed middle-turn surface projection at approximately $62.3843^\circ\text{N}, 146.8997^\circ\text{W}$, and a segmented northern route passing through Denali, Juneau, Unalaska, Adak, Amchitka, Attu, an under-Siberia/Chukchi waypoint, and a terminal location near $80.5^\circ\text{N}, 140^\circ\text{E}$. In the source's selected metric, the direct entrance-to-turn chord is 8,061.8708 km; the cumulative sum of the second-leg segment chords is also reported as 8,061.8708 km. Denali is located approximately 222.678 km along the second-leg route from the specified turn. The equal-leg statement is therefore a correspondence between one direct chord and a multi-segment chord sum, not an equality of two single straight chords. This Refinement Pass 15 source draft preserves the original manuscript's definitions, source conventions, coordinate mathematics, geometric audit, and separation of results from causal interpretation. Event chronology, physical transmission, and regional geological attribution remain bounded by the supplied record and are not completed by inference.

Keywords: ABC Sequencing; Denali; middle mountain; Malpelo; interior chord; segment chord; great-circle distance; Arctic terminal domain; coordinate audit; source provenance; North America.

Architecture of the Five-Paper Research Program

The new geographic subject does not alter the scientific roles of the five canonical papers. Paper I is the geometric and regional foundation; Paper II addresses only the mechanical questions inherited from Paper I; Paper III concerns event-sequence and spatial reconstruction; Paper IV conducts the matched causal comparison; and Paper V is the claims, equations, source, data, and falsification atlas [1]. Nothing in the present Denali documents is used to write the reserved papers prematurely.

1 The Replacement Thesis

1.1 Canonical Corpus Terminology

The research remains situated within *Astro-Ballistic Chronostratigraphic Sequencing* (ABC Sequencing), rather than a separately invented methodology. In the source corpus, an **entrance** is a proposed initiating geographic domain, an **interior transmission path** is a geometrically defined potential route, a **midpoint** is a mathematical location or station, a **midpoint response** is a proposed physical or geological interpretation, and a **terminal-response domain** is the candidate final regional expression. The terms are carried into the North American manuscript with the same separation of meaning.

In this application the fixed turn at $62.3843°\text{N}, 146.8997°\text{W}$ is called the **midpoint surface projection** because the source record identifies it as the prescribed turn. Denali is the **middle-mountain geographic feature**, not the identical coordinate of that turn. The distinction is a defining feature of the source construction, which places Denali 222.678 km into the second route leg [2].

1.2 Observed Plate Motion Is Retained

The original ABC corpus distinguishes the observation of plate motions from the proposed account of their causal organization. This distinction remains inherited and unchanged. The present paper adds no alternative measurements of plate displacement, speed, or direction. Its usable project inputs are geographic positions and geometric distances; no new plate-kinematic result is asserted here.

1.3 Causal Replacement Rather Than Kinematic Denial

The canonical paper gives the replacement thesis its separate burden [1]. This Denali installment neither enlarges nor resolves that burden. The equal-leg construction can be analyzed as a defined geometric object irrespective of whether the broader framework eventually qualifies as a causal replacement for an existing explanation. No additional model-comparison claim follows from the distance values alone.

1.4 Astro-Ballistic Forensics

The relevant forensic task is to preserve the inputs and sequence of transformations by which a proposed route was built. In the Denali record, the second-leg corridor is explicitly specified; its segment chords are calculated; the turn coordinate is fixed; and an entrance coordinate is then solved to make the first-leg direct chord equal the aggregate second-leg chord length [2,3]. This is the research object's mathematical provenance.

The word *forensic* therefore refers here to traceability: which points were chosen, how distances were measured, which quantity was matched, and what geographic names were associated with the points. It does not imply that the matched quantity independently identifies the historical cause.

1.5 Chronostratigraphic Sequencing

The project files identify the work as the *64 ma* branch in the source filename and exploratory discussion [4,5]. The supplied later *Denali Exact* calculation does not itself establish an independently dated event chronology. The source date label is consequently retained as a **program designation**, not promoted to a measured age from the geometric calculations. No additional chronological correlation is inserted here.

1.6 Sequencing as a Causal Constraint

The ordered sequence in the supplied geometry is entrance → fixed turn → Denali → Juneau → Unalaska → Adak → Amchitka → Attu → under-Siberia/Chukchi → northern terminal location [2,3]. The ordering is mathematically consequential: replacing the second leg with a different waypoint sequence changes the chord sum. The current result is conditional upon exactly the chosen ordered corridor.

2 The Flagship Candidate Event Reconstruction

2.1 Flagship Geometry and Flagship Event

The **flagship geometry** is the two-leg construction published in the later Denali working calculation [2]. Leg 1 connects the source-solved entrance coordinate to the fixed turn by one direct Earth-interior chord. Leg 2 connects the fixed turn to the northern endpoint through eight sequential chords. Their lengths are matched under the source's defined comparison. The **flagship event**, by contrast, is the proposed physical or historical interpretation that would explain the geographical roles. These remain different claims, as in the canonical Paper I.

The source procedure is directional. It did not start with three immutable geographic points and then find that two ordinary point-to-point distances happened to match. Instead, the second-leg route and turn were fixed, and the entrance was solved to achieve the desired aggregate length. The manuscript preserves this fact as an input-history description rather than obscuring it.

2.2 The Three Principal Geographic Anchors

The three leading **roles**, retaining the canonical entrance–midpoint–terminal hierarchy, are:

Principal role	Geographic designation in source	Coordinate or supplied definition
Entrance	Malpelo-region entrance	$0.448874^\circ\text{N}, 81.429273^\circ\text{W}$ (solved point)
Middle turn	Fixed midpoint surface projection, south/east of Denali	$62.3843^\circ\text{N}, 146.8997^\circ\text{W}$
Terminal domain	Northern trench location	$80.5^\circ\text{N}, 140^\circ\text{E}$

Denali is an additional named middle-mountain feature on Leg 2, represented in the working calculation at approximately $63.0695^\circ\text{N}, 151.0074^\circ\text{W}$ [2]. It is not substituted for the fixed turn. The route also includes the under-Siberia waypoint, identified as $73^\circ\text{N}, 170^\circ\text{E}$ in the source [2].

2.3 Specific Flagship Initiating-Event Age

The supplied source bundle uses a *64 Ma* designation. It does not supply, in the controlling exact-distance note or corridor worksheet, a separate geological age determination for each of the three geographic roles. As in canonical Paper I, a stated nominal age and an observed age must be different records. No new interval, dating method, or chronology is invented for this installment.

2.4 Current Flagship Data-Provenance Snapshot

The most recent specific corridor calculation in the supplied documents is *Denali Exact.pdf* [2]. Its numerical companion [3] contains seven route segments from Denali to the northern terminal. The midpoint-to-Denali link

is in [2], not in the workbook. The older *Denali Short Math.pdf* [4] contains a summary of preliminary Malpelo–Denali chord and surface-depth calculations that used a different endpoint construction. Those earlier numbers are not combined with the later equal-leg calculation.

Item	Present-source role	Status
Entrance coordinate	Solved from specified target chord and direction	Author-derived from selected constraints
Turn coordinate	Fixed before entrance solution	Author-declared input
Denali coordinate	Reference geographic point	Geographic input in working record
Seven Denali-to-terminal segment chords	Workbook numerical entries	Manuscript-derived in source worksheet
Midpoint-to-Denali segment	Separate source calculation	Manuscript-derived in source note
Two-leg equality	Equality imposed through entrance solution	Conditional geometric correspondence
Geological event attribution	Proposed interpretation	Not established by these arithmetic records

2.5 Entrance, Midpoint, and Exit Are Different Claims

2.5.1 Candidate Entrance

The working record identifies the Malpelo-region location as the preferred entrance. The exact coordinate was obtained by solving for the first-leg chord length after the midpoint and second-leg route had been fixed [2]. Accordingly, its numerical position is not an independently discovered impact point in this calculation.

2.5.2 Candidate Midpoint Response

The mathematical middle turn has a fixed surface projection. Denali lies a short, nonzero route distance away. The coordinate of the turn is therefore not interchangeable with Denali's summit coordinate. The *middle mountain* remains the geographically associated response feature proposed by the research, while the *midpoint* names the geometrically prescribed turn.

2.5.3 Candidate Exit

The terminal location is the northern trench coordinate at approximately $80.5°\mathrm{N}, 140°\mathrm{E}$ in [2]. The route is segmented through the named Aleutian and under-Siberia waypoints; no one direct midpoint-to-terminal chord is used as the second-leg length in the source equality.

2.6 Secondary Claim Slot Reserved

Canonical Paper I includes a separate secondary-claim subsection at this location. The Denali source does not assign a replacement secondary claim as part of the present principal entrance–turn–terminal geometry. Accordingly, this subsection is reserved without promoting an incidental geographic calculation into a substantive research subject.

3 Claim Hierarchy

The internal claim order is preserved from the original manuscript rather than redesigned. The record establishes first the **declared route and coordinate inputs**. From these follows the **numerical first-leg chord**, the

seven workbook chord values plus the midpoint-to-Denali segment, and their **cumulative comparison**. The source additionally reports **Denali's offset from the turn** . Only beyond those numerical quantities lies the proposed **interpretation of the entrance, middle mountain, and terminal geography**.

This hierarchy is material to the document's scientific reading. The numerical equality can be reproduced conditional on the exact route and entrance solution. It is not an independently sampled statistic, nor does it determine the geological origin of Denali. The source's chosen words about an *entrance wound* and a *middle mountain* are retained as designations of the candidate reconstruction, not silently relabeled as confirmed observations.

4 Scope of Paper I

Paper I receives the existing Denali mathematical construction and adapts the canonical Paper-I geometric organization. It addresses geographic anchors, the model's two distance definitions, coordinate conventions, the corridor sequence, source values, rounding, and the distinction between a turn coordinate and the nearby mountain feature.

4.1 Claims Reserved for Paper II

The Denali records contain separate exploratory energetic discussions. They are not drawn into the present public draft. In keeping with the canonical five-paper division, mechanical transmission and energetic eligibility are outside the material written here. No force, pressure, energy, speed, phase, resonance, or momentum calculation is used to explain the current geometric correspondence.

4.2 Claims Reserved for Paper III

No later global event sequence, crustal motion reconstruction, or geological history is derived from this local route. The geographic assignment and mathematical result are preserved as possible inputs to a later paper, not as conclusions that a global reconstruction already exists.

4.3 Reserved Directional and Material-Displacement Hypotheses

The supplied geographic route is not converted here into a directional geological transport calculation. No material-displacement, mineralization, geochemical, or other reserved IP mechanism is introduced.

4.4 Claims Reserved for Paper IV

No comparison with external geological theories or explanatory model families is performed in this opening adaptation. The canonical comparative role remains attached to Paper IV, not to the two-leg chord result.

5 Formal Definitions

5.1 Astro-Ballistic

The term retains its formal place as part of the parent framework's name and proposed forensic interpretation [1]. It is not inferred solely from a route distance calculation.

5.2 Chronostratigraphic

The term retains the canonical requirement that any proposed event account for its relationship to the geological time record. The current source bundle does not supply a newly verified chronological series.

5.3 Sequencing

A *sequence* is the specific ordered set of positions and path components used to construct the candidate route. Sequence order controls how the total second-leg distance is assembled.

5.4 Forensic Geophysics

The present use of forensic geophysics records the distinction between the calculated path and the proposed interpretation of regional structure, following canonical Paper I [1].

5.5 Entrance Structure

The *entrance* is the Malpelo-region selected point in the working construction; identification of a physical entrance structure is a separate proposed geological claim.

5.6 Interior Transmission Path

The *interior transmission path* is represented here by chord geometry. Leg 1 is one chord. Leg 2 is a specified sum of separate chords. The phrase does not, in this manuscript, imply a completed dynamical transmission model.

5.7 Midpoint Response

A *midpoint response* is a proposed regional expression associated with the geometric turn. In the Denali source the geographic feature and the turn are separated by approximately 222.678 km of the prescribed route.

5.8 Terminal-Response Domain

The *terminal-response domain* is the northern coordinate selected by the source record. The term is preferred for the geographic role unless a specified physical exit mechanism is being asserted; none is established here.

5.9 Plate-Motion Inheritance

The term retains its meaning within the wider ABC corpus. This manuscript does not derive any regional plate velocity or boundary displacement from the fixed Denali route.

6 Mathematical Program of Paper I

6.1 Coordinate Representation

For geodetic-like latitude ϕ and east-positive longitude λ represented on the stipulated sphere, the Cartesian unit-position vector follows canonical Paper I:

$$\mathbf{u}(\phi, \lambda) = \begin{pmatrix} \cos\phi \cos\lambda \\ \cos\phi \sin\lambda \\ \sin\phi \end{pmatrix}.$$

Longitudes west of Greenwich are represented by negative angles, so 81.429273°W is $-81.429273°$ and 146.8997°W is $-146.8997°$. Coordinate precision in the source is inherited, not augmented.

6.2 Central Angle

For points i and j, the spherical central angle is

$$\theta_{ij} = \arccos(\mathbf{u}_i \cdot \mathbf{u}_j), \qquad 0 \le \theta_{ij} \le \pi.$$

The same angle may be calculated through the haversine relation reported in the Denali working note:

$$a_{ij} = \sin^2\left(\frac{\phi_j - \phi_i}{2}\right) + \cos\phi_i \cos\phi_j \sin^2\left(\frac{\lambda_j - \lambda_i}{2}\right),$$
$$\theta_{ij} = 2\,\mathrm{atan2}\left(\sqrt{a_{ij}}, \sqrt{1 - a_{ij}}\right).$$

For the spherical reference radius $R = 6{,}371$ km employed in [2], the surface arc is $s_{ij} = R\theta_{ij}$.

6.3 Great-Circle Cross-Track Misfit

The original Paper-I heading is preserved. Its great-circle cross-track quantity is a surface-geometric misfit and must remain separate from the chord-distance comparison. The controlling Denali equal-leg construction does not report an entrance–turn–terminal cross-track audit, so no result is assigned here.

6.4 Interior Chord

The Euclidean chord between two points on the reference sphere is

$$c_{ij} = \left\|R\mathbf{u}_j - R\mathbf{u}_i\right\| = 2R\sin\left(\frac{\theta_{ij}}{2}\right).$$

This is the sole distance type used in the equal-leg metric. With entrance E and fixed turn M,

$$L_1 = c_{E,M}.$$

With ordered second-leg waypoints $W_0 = M, W_1 = \text{Denali}, \ldots, W_8 = T$,

$$L_2 = \sum_{k=0}^{7} c_{W_k, W_{k+1}}.$$

These definitions reproduce the metric used in *Denali Exact.pdf* [2]. Importantly, L_2 is not $c_{M,T}$ and is not $R\theta_{M,T}$.

6.5 Midpoint Direction

The source's stipulated turn M is fixed, while the entrance E is solved on a direction from that turn to achieve the target chord length. The working note records a bearing of approximately 111.820° toward the entrance reference direction [2]. Consequently the **position of the turn** and the **exact mathematical halfway location of an unrelated endpoint chord** are different objects. The original Paper-I terminology is retained without equating them.

6.6 Path-Symmetry Measure

With E the fitted entrance, M the fixed surface turn, and $W_0 = M, \dots, W_8 = T$ the prescribed second-leg stations, the compared lengths are

$$L_1 = c(E, M), \qquad L_2 = \sum_{k=0}^{7} c(W_k, W_{k+1}),$$

where $c(P, Q) = 2R \sin[\theta(P, Q)/2]$ and $R = 6{,}371$ km. The signed residual and the normalized absolute asymmetry are

$$\Delta L = L_1 - L_2, \qquad A_L = \frac{|\Delta L|}{(L_1 + L_2)/2}.$$

Denali Exact.pdf reports $L_1 \simeq L_2 \simeq 8{,}061.8708$ km. Using the full entrance coordinate carried in the same working source and recalculating the first second-leg chord from the recorded turn and Denali stations gives $L_1 = 8{,}061.870761355$ km and $L_2 = 8{,}061.870761355$ km to the shown digits. This residual belongs to the **source-fitted equality condition**; it is not an additional independently observed symmetry.

6.7 Coordinate-Uncertainty Model

The controlling *Denali Exact.pdf* note supplies coordinates to six decimal places at the entrance but only four at the fixed turn; its Denali reference is likewise rounded. These are **reported decimal precision levels**, not a covariance model or independently surveyed uncertainties. The corridor workbook reports downstream segments at greater internal numeric precision than the three-decimal chord list printed in the PDF. The working equality therefore uses the coordinate-derived first segment and the spreadsheet's seven following entries in the precision reproduction; the printed 222.678 km is retained as a rounded report. No positional error ellipse, sensitivity ensemble, or geological target-domain uncertainty is implied by the number of printed digits.

6.8 Deep-Time Reconstruction Is Branch-Conditional

6.8.1 Evidence-Origin Classes

The point locations and model path are author inputs; the distances are calculated from the chosen geometry; and regional causal roles are interpretations. These classes remain separate.

6.8.2 Reference-Frame and Lineage Branches

The calculations presented here concern the current geographic reference representation found in the project records. No time-dependent geographic transformation is present in the controlling Denali exact note or workbook.

6.8.3 Material-Lineage Graph

No independently sourced material-lineage graph is included in this installment. Its canonical place in the manuscript remains reserved without writing new provenance claims.

6.8.4 Chronology State and Delayed Expression

The source's *64 Ma* program label cannot itself establish the timing or lag of a present landscape feature. This section carries no additional chronology calculation.

6.8.5 Specific-Age Integrity Rule

The nominal age designation is retained as a designation only. A different historical age is not silently substituted.

6.8.6 Scoped Chronology and Lineage Falsification

No new age-based rejection condition is constructed from the geometric dataset. Any eventual chronology result must remain independent of the current length equality.

6.9 Statistical Null Test

The recorded equality is the result of solving the Malpelo-region entrance **after** fixing the turn and eight-segment target total. Accordingly, its near-zero length residual is a geometric construction under the source's selections, not an observed frequency under a null distribution. The supplied files do not contain sampled alternate entrances, rejected corridor configurations, a null-model statistic, or an empirical probability. The canonical statistical-test position is retained as **not executed**, with no fabricated score.

6.10 Discovery-Process and Causal-Leakage Control

The order of model development is documented: earlier simplified Malpelo-to-Denali path studies were followed by a different, segmented route and fixed-turn calculation [2,4]. The entrance was then adjusted to meet the selected second-leg sum [2]. Those dependencies must remain visible in any later interpretation.

7 Audit and Reproducibility Policy

7.1 Declared Inputs Versus Calculated Outputs

The fixed turn and ordered corridor define the calculation. The entrance coordinate is a solved result, not a prespecified independently surveyed event location. The leg totals are computed consequences of the adopted route and metric. Their equality is conditional on precisely those constraints.

7.2 Equation Audit

The direct-chord and segment-chord formulas use the same reference sphere, central-angle convention, and units. The comparison must sum the specified segments and cannot omit the midpoint-to-Denali segment merely because that entry is absent from the separate workbook. The workbook numbers contain more displayed digits than the rounded PDF segment list; the two presentations should be treated as different precision views of the same working calculation.

7.3 Claim Audit

An exact match by the selection procedure is a claim about the **constructed metric**. A claim that the mountain was caused by an actual interior turning event would require additional evidence not supplied by the equality. The original ABC Paper-I separation between calculated support and event interpretation is inherited intact.

7.4 No Hidden Rescue Conditions

No extra waypoints are appended here to improve a score, no entry coordinate is retroactively recast as independently predicted, and no additional physical energy term is inserted. These are not new exclusions; they express the input discipline of the canonical Paper-I audit applied to the provided data.

7.5 Version Control

The controlling numerical geometry for this installment is the later *Denali Exact.pdf* record [2], with seven Denali-to-terminal values from the supplied workbook [3]. Earlier calculations in [4,5] are retained as research history

External context: E13 | bibliography: Appendix EC

but do not determine the length equality set out here.

8 Earth Model and Numerical Conventions

8.1 Reference Sphere

The supplied numerical calculation uses $R = 6{,}371$ km as the spherical Earth radius [2]. All quoted arc and chord values below refer to that geometric model. This does not constitute a mechanical model of Earth's interior.

8.2 Angular Convention

Latitude is positive north and negative south. Longitude is positive east and negative west. Angular differences are converted to radians before evaluating trigonometric functions. A central angle between two points is unsigned over $[0, \pi]$.

8.3 Numerical Precision

Pass-1 precision reconciliation (same source geometry): Using $R = 6371\,\text{km}$, the fixed turn $(62.3843^\circ\text{N}, 146.8997^\circ\text{W})$ and the source Denali coordinate $(63.0695^\circ\text{N}, 151.0074^\circ\text{W})$, the first corridor chord recalculates to 222.677503129 km (displayed as 222.678 km in the source PDF). The seven workbook chord values sum to 7839.193258226 km; together these yield $L_2 = 8061.870761355\,\text{km}$. Independently, the precise Malpelo entrance and fixed turn yield $L_1 = 8061.870761355\,\text{km}$ within floating-point rounding. The corresponding second-leg surface arcs sum to 8085.044329017 km, reproducing the 8085.0443 km reported in *Denali Exact*. The previously noted 0.458 m difference arises **only** if the rounded first chord 222.678 is substituted for its unrounded value in a sum otherwise using full-precision workbook data. No coordinates, route segments or metric have been altered.

The published exact-distance note quotes $L_1 = L_2 = 8{,}061.8708$ km to four decimal places [2]. Its individual segments are rounded to three decimals. The workbook retains additional digits for seven segments [3]. The displayed values are a reproducibility trail, not a claim that the real geographic anchors or inferred historical structures are known to submeter accuracy.

8.4 Separation of Four Geometric Concepts

The reference document distinguishes surface arcs, interior chords, along-track stations, and off-track deviations. The North American version requires the same distinctions. A surface arc joins two points along a spherical great circle. A single chord joins them through Euclidean interior geometry. A segmented corridor length sums the individual direct chords of successive prescribed waypoints. A cross-track offset measures a third point's angular displacement from a selected great-circle course. No one of these numerical quantities can stand in for the others.

9 Declared Coordinates and Unit Vectors

9.1 Inherited Coordinate Set

The coordinates explicitly present in the controlling geometry note [2] are:

External context: E01 | bibliography: Appendix EC

Point	Latitude	Longitude	Role in current calculation
Malpelo-region entrance E	0.448874° N	81.429273° W	Solved entrance
Fixed turn M	62.3843° N	146.8997° W	Prescribed midpoint surface projection
Denali D	63.0695° N	151.0074° W	Middle-mountain geographic reference
Under-Siberia/Chukchi waypoint	73° N	170° E	Penultimate corridor waypoint
Northern terminal T	80.5° N	140° E	Final coordinate

The workbook names the other corridor waypoints but does not provide their latitude-longitude pairs in its cells. Those pairs are not reconstructed by guesswork in this subsection. The manuscript reproduces the existing workbook distances rather than claiming a fresh coordinate-based verification of every segment.

9.2 Coordinates in Radians

For any listed point, the radian representation is $(\phi, \lambda) = (\text{latitude} \times \pi/180, \text{longitude} \times \pi/180)$ after applying the sign convention. Thus the entrance longitude is negative and the northern terminal longitude positive in the evaluation. The conversion is a mathematical definition, not an additional geographic measurement.

9.3 Audited Unit Vectors

Applying the unit-vector map in section 6.1 to these stated coordinates determines the points on the source sphere. The unit vectors are therefore derived representations of the same declared inputs. The current manuscript does not add independently observed Cartesian coordinates or a new reference datum.

10 Present-Day Pairwise Surface Geometry

10.1 Malpelo Entrance to Fixed Turn

The source reports a **surface arc** of approximately 8,728.7236 km from the solved entrance to the fixed turn and a **direct chord** of approximately 8,061.8708 km for those endpoints [2]. The longer surface arc is not used in the equality test. Its role is to make the metric distinction explicit.

10.2 Fixed Turn to Denali

The controlling record reports a midpoint-to-Denali **segment chord** of approximately 222.678 km [2]. This is the first component of Leg 2. Denali is therefore located after, rather than at, the prescribed turn. The exact-distance calculation separately associates the geographic Denali point with the proposed middle-mountain feature.

10.3 Fixed Turn to Northern Terminal Domain

Leg 2 follows an ordered chain, not one direct turn-to-terminal arc or chord. The exact report gives the full corridor's **reference surface-arc sum** as approximately 8,085.0443 km and its **cumulative chord sum** as approximately 8,061.8708 km [2]. The seven Denali-to-terminal entries in the workbook are the principal segment-level numerical record [3].

10.4 Pairwise Distance Table

The direct and route-sum distances have different mathematical meanings; that distinction is preserved in the source-matched table below.

Distance object	Metric	Reported value (km)	Source
Entrance E to turn M	Direct spherical interior chord	8,061.8708	[2]
Entrance E to turn M	Great-circle surface arc	8,728.7236	[2]
Turn M to Denali D	Direct segment chord	222.678	[2]
Turn M through northern corridor to T	Sum of eight segment chords	8,061.8708	[2,3]
Turn M through northern corridor to T	Sum of corresponding surface arcs	8,085.0443	[2]

10.5 Distance Symmetry

The source-defined equality compares a **single chord** from the fitted Malpelo entrance to the fixed turn against the **sum of eight different chord segments** from the turn along the ordered northern corridor:

$$\underbrace{c(E,M)}_{\text{one chord}} \simeq \underbrace{\sum_{k=0}^{7} c(W_k, W_{k+1})}_{\text{eight successive chords}} \simeq 8{,}061.8708 \text{ km}.$$

The 222.678 km turn-to-Denali segment belongs to the sum on the right and does **not** place Denali at M. The entrance coordinate was solved only after the turn and northern sequence were prescribed. The mathematical equality is therefore a reported property of that construction, not an assertion that two direct endpoint-to-endpoint chords or two surface arcs are equal. Sources: *Denali Exact.pdf* and the seven-row Denali corridor workbook.

10.6 Path Excess Through the Specified Corridor

For the chosen **second-leg waypoint sequence**, the *Denali Exact* record prints 8,085.0443 km as the sum of the **eight surface arcs** and 8,061.8708 km as the sum of **eight interior segment chords**. Their difference, 23.1735 km at printed precision, describes those two different metrics on the same prescribed route. It is not the excess of a physically observed path over a shortest path and is not a comparison between two endpoint-to-endpoint chords. The first-leg equality uses only the latter summed-chord length. No alternate-route optimization is recorded in the controlling source.

11 Ellipsoidal Distance Check

The current source's equal-leg result uses a reference sphere, not a completed ellipsoidal recalculation. The corresponding chapter is preserved in its original place. No ellipsoidal result, correction, or geodetic precision improvement is inserted because the supplied controlling numerical sources do not report one. The spherical result remains exactly as defined in chapters 6, 8, and 10.

12 Audited Interior Chord Geometry

12.1 Chord Length

For any endpoints in the recorded route, the direct interior chord is $2R\sin(\theta/2)$. The source uses that definition repeatedly, once for Leg 1 and once for each successive Leg-2 pair. These direct segment chords are additive only as a **declared path-length sum**; the resultant total is not one Euclidean chord from start to finish.

The seven workbook chord records are preserved below without replacing their numerical precision with rounded source prose [3]. The turn-to-Denali segment is recorded separately in [2].

Ordered segment	Chord length (km)	Source
Turn → Denali	222.678	[2]
Denali → Juneau	1,041.56448672623	[3]
Juneau → Unalaska	2,019.16819733245	[3]
Unalaska → Adak	714.523963789273	[3]
Adak → Amchitka	192.565166865369	[3]
Amchitka → Attu	538.553341857014	[3]
Attu → Chukchi waypoint	2,228.58884451716	[3]
Chukchi waypoint → terminal	1,104.22925713830	[3]

The table contains an expected **source-rounding detail**: summing the seven high-precision spreadsheet values plus the three-decimal 222.678 first segment gives approximately 8,061.8713 km, while the controlling note gives 8,061.8708 km for the overall total. This approximately half-meter difference in displayed totals follows from the fact that the first segment is available in the PDF only at three decimals; the unrounded first-segment value is not listed in the spreadsheet. The manuscript does not manufacture that hidden digit or silently edit either source total.

12.2 Chord Midpoint Radius

The canonical section's geometric definition may be retained for any **individual** chord of central angle θ:

$$r_{\text{mid}} = R\cos\left(\frac{\theta}{2}\right).$$

This formula describes the distance from the sphere center to the midpoint of that individual chord. The multi-segment Leg-2 sum has no single chord midpoint radius obtained by applying this formula to its total length. No substitute depth or physical-turn depth is inferred from the corridor sum.

12.3 Physical Midpoint Vector

The midpoint of an **individual straight interior chord** joining surface-position vectors $\mathbf{r}_i = R\mathbf{u}_i$ and $\mathbf{r}_j = R\mathbf{u}_j$ is

$$\mathbf{r}_{ij,\text{half}} = \tfrac{1}{2}(\mathbf{r}_i + \mathbf{r}_j).$$

The fixed surface turn $M = (62.3843^\circ\text{N}, 146.8997^\circ\text{W})$ is instead an endpoint of the first chord and the starting waypoint of the second-leg chain. The source does not define it as the Euclidean midpoint of one Malpelo-to-terminal chord, and the eight-chord second leg cannot be assigned a unique single-chord midpoint vector by summing its lengths. This preserves the canonical geometric distinction without making a new depth or interior-turn calculation.

13 Denali Midpoint Audit

13.1 Normalized Midpoint Misfit

The applicable **two-leg length misfit** is A_L from section 6.6, evaluated using the actual source distance definitions. It is approximately zero at the overall displayed precision [2]. This does not imply that Denali itself lies halfway along one geodesic between the Malpelo entrance and the terminal location.

13.2 Great-Circle Plane

Leg 1 defines a unique entrance-to-turn great-circle plane in the spherical model. Leg 2 contains multiple prescribed segments and, as a result, is not asserted to occupy that same plane. The source's construction does not require global collinearity of the Malpelo entrance, fixed turn, Denali summit, and northern terminal coordinate. No unsupported collinearity test is declared successful.

13.3 Along-Track Position

The source reports Denali approximately 222.678 km along the first segment after the fixed turn [2]. By definition it is near the turn in the author-chosen route, but it is not the turn. The present Paper-I construction does not assign another middle-mountain position to the Leg-1 course.

13.4 The Geometric Result Must Be Partitioned

The supplied fixed-turn construction contains three separately reportable geometric results. First, the solved Malpelo-region entrance E makes the single chord $c(E, M)$ equal to the summed eight-chord northern corridor $\sum_{k=0}^{7} c(W_k, W_{k+1})$ to the reported precision. Second, the Denali station D is **not** the turn M: the source reports $c(M, D) = 222.678\,\text{km}$. Third, the reference surface-arc sum over that same ordered second-leg corridor is 8,085.0443 km, which is distinct from its 8,061.8708 km chord sum. These are three geometric descriptions of the author's stipulated construction. None independently establishes a physical turning mechanism, geological age, or uplift cause [2,3].

14 Revised Primary Geometric Finding

The primary finding of this North American application is the **defined two-leg length equality** under the exact source construction:

$$\underbrace{c(\text{Malpelo}, M)}_{\text{Leg 1: one chord}} \simeq \underbrace{\sum_{k=0}^{7} c(W_k, W_{k+1})}_{\text{Leg 2: eight segment chords}} \simeq 8{,}061.8708 \text{ km}.$$

The Malpelo coordinate was solved to make that equality hold, with the turn held fixed and the second-leg waypoints preselected within the working calculation [2]. The second-leg corridor passes Denali approximately 222.678 km from the turn. Those statements reproduce the controlling working record without redefining its metric.

14.1 Causal Status of the Flagship Geometry

The result establishes a **constructed numerical correspondence** under the declared inputs and path metric. It does not by itself establish that a physical event entered near Malpelo, turned beneath the mapped surface

projection, produced Denali, or terminated in the northern domain. Such statements remain proposed scientific interpretations distinct from the chord arithmetic. This division follows the original Paper-I treatment of its flagship geometry [1].

15 Coordinate Sensitivity Framework

The canonical Paper-I coordinate sensitivity chapter follows the audited geometry. In the North American case the principal calculation is a fixed-turn, unequal-construction comparison: a single chord on Leg 1 against a cumulative set of eight segment chords on Leg 2. The named locations are geographic references to a declared path, and the numerical match is conditional on those choices. Coordinate sensitivity must therefore be distinguished from uncertainty in independently measured ground locations and from freedom allowed during construction of the match.

15.1 Why Point Coordinates Are Insufficient

A point coordinate is an exact input to a calculation but cannot, by itself, delimit a geological structure. The entrance described as Malpelo is an interpreted regional feature; the fixed-turn surface projection is a specified calculation point; Denali is a named mountain reference; and the northern terminal is an author-chosen coordinate. Those objects are not identical in spatial definition. Paper I retains the canonical distinction between point inputs and larger target domains. The supplied notes contain no complete domain polygons or quantified source-location uncertainties; none are silently supplied here.

15.2 Target Domains

The available source defines a latitude-longitude entrance, one fixed turn, a Denali summit reference, named corridor waypoints, an under-Siberia/Chukchi coordinate, and the selected northern terminal. The source does not define a unique spatial probability distribution around those positions. Consequently, the coordinates can reproduce the original calculation, but no claim is made that a regional centroid, map feature boundary, or subsurface location uncertainty has independently been established. The target-domain function of this subsection remains intact pending an author-approved geographic specification.

15.3 Regional Optimization

The entrance was solved along a fixed-radius locus with the midpoint held at approximately $62.3843^\circ\text{N}, 146.8997^\circ\text{W}$ and the route length held by the declared second leg. This is part of the result's provenance: it is not an independent random placement that fortuitously satisfied the equality. Changing the entrance while maintaining the Leg-1 chord length can leave the distance equality invariant; such rotation would change the geographic interpretation. The working source associates its solved entrance with the Malpelo-region feature, and this manuscript retains that association as a declared selection.

15.4 No Coordinate Fishing

The source's order of operations is documented rather than concealed. The author fixed the turn M, specified the eight-segment corridor, and then solved a Malpelo-region entrance E such that $c(E, M) = \sum c(W_k, W_{k+1})$. The source also notes that a different entrance bearing on the same constant-chord locus would preserve the equality. Accordingly the observed equality is **fit-conditional**, not an independently held-out geographic coincidence. Neither the number of bearings considered nor a statistical search penalty is provided by the project record; those fields remain unreported, not numerically filled by this paper.

16 Monte Carlo Reconstruction Design

The canonical chapter establishes how coordinate-uncertainty distributions would be propagated, not an assertion that every such simulation was completed. The North American working files include the fixed coordinates and

spreadsheet chord entries, but not a set of independently justified coordinate-error distributions or a completed random-sampling output. The chapter remains a methodological slot in the source structure; its status is **not executed in the supplied Denali record**.

16.1 Regional Sampling

The source geometry has a fitted entrance coordinate, an author-fixed turn, and a prescribed ordered set of waypoints. Repeating the deterministic calculation reproduces the selected construction. It is not a Monte Carlo ensemble. No region-dependent probability weights, alternative route-draw procedure, or uncertainty scales have been furnished. Therefore, sampling counts, seeds, and outcome frequencies are not asserted.

16.2 Required Reported Distributions

Under the canonical presentation convention, any eventual distribution would require a clear record of input variation and metric identity. The quantity actually reported in the present record is $\Delta L = L_1 - L_2$, where L_1 denotes one chord and L_2 the sum of the prescribed corridor chords. The value is approximately zero at the precision of the original overall totals. No distribution of ΔL, route variation, turn displacement, or Denali separation is reported by the supplied files.

16.3 Threshold Classes and Reporting Bands

The original paper separates mathematical admissibility, numerical convergence, exploratory criteria, and preregistered decision thresholds. This draft inherits that separation rather than selecting a new cutoff. The displayed equality is a deterministic numerical construction; it has no newly assigned probability level or confirmation threshold. The only registered precision statement is the explicit difference between rounded PDF totals and high-precision workbook segments.

17 Deep-Time Reconstruction Requirement

The original Paper I separates present geographic positions from their putative positions at an initiating event. The North American sources provide a present-coordinate construction and contain earlier exploratory chronology language, but they do not provide a complete material-path reconstruction from a dated initiating state to the selected current landmarks. No historical map reconstruction is inferred from the present-day geometry.

17.1 Present Coordinates Cannot Establish an Ancient Path

A modern Malpelo-to-turn chord and a present waypoint corridor are current-coordinate mathematical objects. They are not by themselves observations of an ancient pathway. The supplied 64 Ma working document identifies a chronological research context, but it does not supply a completed, independently dated correspondence tying all route materials to a unique initiating configuration. The program label and an empirically established event age must remain separate.

17.2 The Objects Being Reconstructed Must Be Defined

A selected surface point, a geographical region, an evolving crustal carrier, and a hypothetical inherited geometric structure represent different types of object. The supplied Denali record fixes current coordinates for the first type and proposes geological meanings for some of them; it does not track an identified crustal parcel through a time-indexed reconstruction. The section therefore preserves the canonical object-definition requirement without importing new geological assertions.

External context: E07 | bibliography: Appendix EC

17.3 Competing Reconstruction Tests

No competing full deep-time reconstructions of the Denali corridor appear in the controlling later geometry file. The earlier working conversations contain alternative route ideas, not a comparison ensemble under a common frozen method. They are recorded as developmental provenance and are not blended into one supposedly tested historical path. The actual presented result remains the fixed-turn, matched-distance calculation.

17.4 Deep-Time Decision Rule

The source structure requires that a proposed historical connection be judged separately from modern-coordinate arithmetic. For this first draft, the modern-coordinate result is available and the deep-time correspondence is unresolved. No positive or negative paleogeographic verdict is manufactured. The complete record of that distinction transfers with the paper's audit ledger.

18 Reproducibility Algorithm

The directly reproducible computation follows the operations stated in *Denali Exact.pdf*: select the prescribed fixed turn; preserve the waypoint order; calculate each successive spherical interior chord; sum those chords to form L_2; solve an entrance point whose direct chord to the fixed turn equals L_2; and evaluate the resulting difference ΔL. The algorithm's domain is precisely this geometrical construction, not a physical simulation.

For geographic endpoints $P_i = (\phi_i, \lambda_i)$ on the source sphere of radius $R = 6371\,\mathrm{km}$, the central angle and chord are

$$\theta_{ij} = 2\arcsin\sqrt{\sin^2\frac{\phi_j-\phi_i}{2} + \cos\phi_i\cos\phi_j\sin^2\frac{\lambda_j-\lambda_i}{2}}, \qquad c_{ij} = 2R\sin\frac{\theta_{ij}}{2}.$$

Define $W_0 = M$, $W_1 = D$, and subsequent W_k as the named ordered corridor locations, terminating at the northern coordinate. The controlling comparison is

$$L_1 = c(E, M), \qquad L_2 = \sum_{k=0}^{7} c(W_k, W_{k+1}), \qquad \Delta L = L_1 - L_2.$$

This definition records the critical difference between a single segment and a multi-segment total. It does not require that all chords share one Euclidean line.

18.1 Audited Numerical Summary

The later Denali note reports $L_1 \simeq 8061.8708\,\mathrm{km}$, $L_2 \simeq 8061.8708\,\mathrm{km}$, and $c(M, D) \simeq 222.678\,\mathrm{km}$. The seven workbook records provide the remaining segments at additional numerical precision. Adding those seven entries to the first-turn chord recomputed from the source coordinates at full precision gives $8061.870761355\,\mathrm{km}$, matching the calculated entrance-to-turn direct chord at the displayed precision. The earlier approximately $0.0005\,\mathrm{km}$ difference appears only when the first component is prematurely rounded to $222.678\,\mathrm{km}$. The fitted geometric equality is retained without implying observed submeter positional precision.

19 Paper-I Geometric Status After Audit

The flagship numerical result is the equality of the two differently constructed path lengths. The geographical route itself is the controlling interpretation: it begins in the named Malpelo entrance region, reaches the fixed

middle turn, passes Denali at a nonzero offset from the turn, continues through the prescribed northern corridor, and ends at the selected terminal coordinate. The geometrical position of Denali and the equality condition remain separate results.

19.1 Supported Finding: Bilateral Distance Symmetry

The construction satisfies $L_1 \simeq L_2$ under the stated metric, fixed turn, and selected waypoints. Because the entrance was solved to meet that condition, this is a reproducible **fitted geometric equality**, not an independently estimated chance alignment. This is the precise support the current source provides.

19.2 Supported Finding: Halfway Along-Track Station

For this version the turn is the author-fixed station separating the two declared legs. It is halfway by **accumulated stated chord distance**, not by a unique entrance-to-terminal single great circle. Denali lies approximately 222.678 km into Leg 2. Calling Denali the *middle mountain* therefore does not identify the summit as the mathematical turn station.

19.3 Unsuccessful Present-Day Claim: Chord Collinearity

The canonical source distinguishes a halfway-type finding from a separate straight-axis condition. The Denali record does not claim that Malpelo, the turn, Denali, and the terminal all lie on a single chord. Leg 2 bends by construction. Accordingly, no literal global chord-collinearity finding is carried over from the original Everest case, and no failure result is imputed to the distinct fixed-turn corridor geometry.

19.4 The New Burden of Proof

The source-backed Paper-I result is a numerical equality under a **fitted entrance**, **fixed turn**, **prescribed eight-segment route**, and $R = 6{,}371$ km sphere. The entrance was solved after the target second-leg sum was specified. Accordingly, the equality can be reproduced as geometry without being treated as an independent geological prediction. The existing Paper-I forensic, chronology, and observational sections retain their canonical roles but have no new North American determinations in the supplied Denali files. This boundary is carried, unchanged, to Paper II.

20 Chronostratigraphic Reconstruction of the Proposed Initiating Event

The source corpus proceeds from geometry to chronology. The supplied project contains an earlier working document titled *8-8-2025 64 ma ABC Math Full* and a later exact-distance note. The former establishes a developmental 64 Ma framing; the latter establishes geometry. This Paper-I draft does not infer that the program label alone establishes a dated initiating event or associated markers.

20.1 The Event Age Is a Model Parameter

The numeral **64 Ma** appears in the earlier project source title. In this adaptation it remains a **working chronological assignment**, not an independently dated measurement, unless a supporting marker and uncertainty are supplied. The geometry is not recomputed by altering the age. The nominal label is never used to erase the distinction between initiating time and subsequent structural expression.

20.2 Event Time, Observed Time, and Expression Time

The canonical analysis distinguishes the time of a proposed initiating event, the time of an observed dated marker, and the time when a modern feature acquired its recognizable geometry. The Denali file does not equate these measurements. The present-day coordinates, the named mountain, and the corridor distances are not chronology observations and provide no independent geochronological uncertainties.

20.3 Chronological Event Vector

The source method organizes candidate ages by role rather than as one undifferentiated date. No time-indexed event vector populated with independent dated Malpelo, Denali, and northern terminal observations accompanies the supplied exact calculation. Its corresponding entries therefore retain the status **unpopulated** in this working draft. The source's original geometric results remain unchanged by this absence.

20.4 Chronological Windows

The current records do not provide site-specific dated windows around the proposed entrance, middle-mountain response, and terminal. This document does not expand the nominal working age into an arbitrary broad interval to achieve compatibility. The chapter preserves the canonical distinction among assigned age, date uncertainty, and later geological expression without manufacturing ranges.

20.5 Required Chronological Classes

The original manuscript calls for independent time constraints for the initiating assignment, intermediate inheritance, and regional expressions. No such full set exists in the source notes for this precise path. The absence of an included chronology table is recorded as a data boundary, not as a failed chronological test.

20.6 The Original Extinction-Association Slot

The corresponding canonical subsection discusses an extinction association for the original, separately defined flagship event. That association is not automatically transferred to Denali. The earlier 64 Ma research file provides the developmental program label, but an external extinction chronology, impact attribution, or new causal association is **not introduced** here. This slot remains chronostratigraphic, not an invitation to invent an event narrative.

20.7 Chronological Failure Conditions

The original paper's conditional decision logic remains. A source-defined age assignment and each required dated link would be evaluated only when supporting evidence and criteria are present. An untested link is not entered as an observed success or an observed failure. Any numerical age and present-coordinate geometry retain separate statuses.

21 Material Identity Across Deep Time

The canonical Paper-I material-identity chapter prevents confusion between present landmarks and ancient carriers. In the current Denali application, the controlling geometry is stated in modern latitude and longitude, while the identity and history of the material associated with those locations are not traced in the exact-distance note. This distinction is kept without assigning mechanisms or new transport histories.

21.1 Modern Landmarks Are Not Ancient Material Coordinates

Denali, the solved Malpelo entrance coordinate, and the chosen terminal point are modern reference locations. None is a time-stamped ancient parcel track merely because its coordinate is used in a spherical chord equation. The completed numerical comparison is therefore **present-coordinate geometry**. The older title's age label is not a coordinate transformation.

21.2 Three Material Representations

21.2.1 Surface-Landmark Representation

This is the representation actually available: named places and source-recorded surface coordinates, including an author-fixed turn, prescribed corridor waypoints, and a subsequently fitted entrance; the first- and second-leg metrics are calculated using their stated conventions. It is suitable for the reported mathematical construction but cannot directly establish a deep-time material trajectory.

21.2.2 Crustal-Carrier Representation

A crustal-carrier reconstruction would require the identity and movement of specific material domains. The supplied Denali numerical record contains no complete carrier registry, transformation history, or adopted reference-frame ensemble. No values for such a representation are invented.

21.2.3 Inherited-Structure Representation

The proposed *middle mountain* role is interpretive. The notes locate Denali relative to the fixed turn, but the numerical distance does not date the emergence of an inherited subsurface structure. The distinction allows the geographical association to be stated without upgrading its physical history.

21.3 Reconstruction Operators

The source supplies spherical point-to-point operators for arcs and chords. It does not supply a time-dependent operator mapping all designated regional materials through 64 million years or any other fixed interval. No such operator is silently substituted for the spherical calculations.

21.4 Target-Specific Material Questions

21.4.1 Malpelo entrance domain

The source names the Malpelo plate or fractured-plate entrance region as the candidate entrance associated with the solved coordinate. Material identity, age, and regional structural linkage beyond this geographical association are not documented in the later distance calculation.

21.4.2 Denali middle-mountain domain

The source identifies Denali as the relevant mountain, while explicitly placing it about 222.678 km after the mathematical turn. The mountain association and the turn coordinate are not collapsed into one object. No mineralogical account or causal transfer process is stated.

21.4.3 Northern terminal domain

The selected terminal coordinate is $80.5°\mathrm{N}, 140°\mathrm{E}$. The route passes the supplied Chukchi waypoint before reaching it. The exact note's use of *trench* is retained as the original terminal label without claiming independent confirmation of an ancient terminal structure.

21.5 Material-Identity Decision Rule

This paper's available material representation is the fixed present-coordinate construction. The original corpus's more demanding material-history role remains unpopulated rather than being converted into an unsupported result. Consequently, historical transfer is neither accepted nor rejected in this draft.

22 Malpelo Entrance Forensics

The canonical Paper-I entrance chapter is mirrored at the role level: a proposed entry domain is distinguished from its present appearance, candidate directional alignment, physical evidence, null explanations, and the conditions for assigning the entrance role. The only controlling regional evidence supplied here is the author's reported correspondence of the solved coordinate with the Malpelo plate entrance wound, together with the exact geometry note. No unseen bathymetry, structural measurements, or independent marker data are claimed.

22.1 Entrance Hypothesis

The current source identifies a geographic entrance in the Malpelo region. Its numerical coordinate, approximately 0.448874° N, 81.429273° W, was **solved after** fixing the surface projection of the turn and the prescribed second-leg corridor. It is therefore a fitted geometric endpoint, not an independently located physical entrance. The name *entrance* remains the source's interpretive role; the fitted coordinate alone does not identify a geological wound or its origin. (*Denali Exact.pdf.*)

22.2 Entrance Versus Ordinary Circularity

The inherited canonical subsection separates morphology from causal attribution. No numerical test of regional shape circularity, and no bathymetric source map, is included in the Denali exact-distance file. This manuscript therefore makes no morphological success claim. The solved coordinate's place-name association is retained as source provenance only.

22.3 Radial Fault Metric

The canonical method reserves a directional structural metric. The Denali documents supplied for this pass report route chord lengths, not a measured fracture-orientation field surrounding the entrance. The metric is not populated with invented directions or statistics.

22.4 Path-Directional Metric

The one source-grounded directional object is the spherical course joining the solved entrance and fixed turn. That course is well-defined by the two points; a matching local geological lineament or its uncertainty is not independently recorded. The direction can be derived geometrically but is not presented as confirmed structural alignment.

22.5 Predicted Entrance Signature Classes

The inherited classification follows the original source hierarchy. Its subdivisions remain slots for evidence **already contemplated by the canonical paper**; they do not constitute new tests devised for this North American adaptation.

External context: E03, E06 | bibliography: Appendix EC

22.5.1 Morphological Predictions

No independent Malpelo morphology observations or residual calculations are included in the controlling exact-distance note. This class remains not evaluated.

22.5.2 Crustal and Lithospheric Predictions

No crustal thickness cross-section or seismological profile tied to the solved entrance appears in the supplied record. This class remains not evaluated.

22.5.3 Gravity and Magnetic Predictions

No measured anomaly dataset, baseline, or field comparison is supplied. This class remains not evaluated.

22.5.4 Mineralogical and Geochemical Predictions

Reserved under the Principal Investigator's nondisclosure instruction. The source hierarchy is preserved; no mineralogical or geochemical mechanism, predicted signature, or proprietary parameter is disclosed.

22.5.5 Chronological Predictions

No independently dated Malpelo physical marker accompanies the specified entrance coordinate. A chronological attribution cannot be inferred from the coordinate fit.

22.6 Entrance Null Model

The canonical subsection distinguishes an event-specific entrance assignment from other explanations of the same regional observations. Because no regional observation vector was supplied, this paper does not assert a comparative likelihood or completed null result. Its defined input remains the fitted entrance coordinate.

22.7 Malpelo Evidence Vector

The available entries are: author-nominated regional entrance, solved latitude and longitude, fixed-turn reference, computed Leg-1 chord, and the source file identifying those values. Morphological, structural, geophysical, and dated-marker fields remain unpopulated, not replaced by another project's data.

22.8 Decisive Entrance Tests

The source corpus reserves such tests as an element of regional scientific qualification. The present draft lists no newly devised measurement campaign or independent test result. The entrance remains a candidate geographical interpretation of the reproduced chord.

22.9 Malpelo Rejection Conditions

The numerical fit and the regional entrance claim are separable. A later result about the region would attach to the geological attribution, not erase the original deterministic calculation. No completed regional rejection test is supplied here.

23 Denali Middle-Mountain Forensics

The central object of this adaptation is the distinction between the fixed mathematical turn and Denali's geographically nearby position along the second leg. The exact source explicitly separates them and quantifies

the offset. This section mirrors the canonical mountain-response chapter without adding physical bounce-back dynamics, pressure mechanisms, or mineralogy.

23.1 The Midpoint Claim After the Geometry Audit

The source's central claim is that its chosen turn separates two equal **length totals**, even though one total is the single Malpelo-to-turn chord and the other is the sum of the prescribed successive chords. The computed relationship is not an assertion that Denali coincides with the turn, nor that the complete course is a straight line.

23.2 Middle Mountain Versus Geometric Midpoint

The manuscript inherits the *middle mountain* forensic role, but its fixed geometric turn $M = (62.3843^\circ\text{N}, 146.8997^\circ\text{W})$ is not the Denali surface reference $D = (63.0695^\circ\text{N}, 151.0074^\circ\text{W})$. Their coordinate-derived straight chord is 222.677503129 km under the stated spherical model and is printed as 222.678 km in *Denali Exact.pdf*. The calculation locates Denali on the first second-leg segment **after** M; it does not define a mechanically derived maximum-response site or prove a geological event.

23.3 Inherited-Node Hypothesis

The working conversation identifies the mountain with an inherited structural interpretation. The geometric file does not supply a dated physical demonstration of that origin. The word *inherited* is therefore an interpretation held separate from the documented coordinates and chord values. No proprietary explanation of the inheritance is introduced.

23.4 Deep-Time Geometric Test

No deep-time rotated coordinates for Denali, the turn, Malpelo, or the entire waypoint chain appear in the supplied exact-distance report. This chapter reports the present geometry as the available mathematical object and leaves the time-dependent alternative uncalculated.

23.5 Selection-Bias Control

The geographic mountain was identified by the author before this adaptation; however, the entrance coordinate was mathematically solved to match the selected second-leg total. The origin of the coordinate choices is recorded rather than being described as a blinded trial. No statistical probability or population-wide mountain ranking is invented.

23.6 Predicted Midpoint-Response Signatures

The subsections below retain the canonical evidence classes. They are not findings from the attached Denali worksheet, which contains only inter-waypoint angular, arc, and chord values.

23.6.1 Deep Structural Inheritance

Not measured or established by the current numerical sources. The middle-mountain designation remains an interpretive label.

External context: E04 | bibliography: Appendix EC

23.6.2 Pressure and Deformation Geometry

Mechanistic details are not disclosed. No pressure, deformation, or energetic response parameter is manufactured. Only the mountain/turn separation is retained.

23.6.3 Chronological Inheritance

No source-supplied independent temporal lineage from the proposed initiating event to modern Denali is available in the controlling exact-distance note.

23.6.4 Regional Rather Than Summit-Only Expression

The source chooses Denali as a geographic reference; it does not quantify a regional mountain-domain polygon or provide associated structural measurements. A regional inference is therefore not presented as demonstrated.

23.7 Midpoint Null Model

The numerical midpoint-by-length is a fitted geometric construction. A null model for the broader mountain-origin interpretation is not reported as evaluated in the supplied materials.

23.8 Denali Evidence Vector

Available: fixed-turn coordinate; Denali reference coordinate; turn-to-Denali chord; length-equality construction; specified route order. **Not supplied:** dated physical signatures, subsurface measurements, measured regional boundaries, or independently replicated causal evidence.

23.9 Decisive Midpoint Tests

No new investigative program is proposed in this draft. The canonical testing slot remains structurally present, with no falsely completed observations.

23.10 Denali Rejection Conditions

The source's geometry can remain arithmetically correct whether or not the Denali causal interpretation is eventually supported. A rejected causal role would have its own scope; it would not retroactively alter the reported chord lengths.

24 Northern Terminal-Domain Forensics

The original Paper-I exit chapter is adapted to the terminal domain specified in the Denali route. Its physical *exit* meaning is not assumed. The controlling waypoint terminates at $80.5°\text{N}, 140°\text{E}$ after the under-Siberia/Chukchi waypoint, and the terminal leg contributes 1104.22925713830 km as its recorded final segment chord.

24.1 Terminal Hypothesis

The source prescribes the final corridor station at approximately 80.5° N, 140° E, approached from its specified 73° N, 170° E waypoint. The last segment is recorded as a **1,104.229 km** chord. This fixes a terminal **coordinate in the constructed route**; it does not independently establish a terminal excavation, a dated regional structure, or an exit mechanism. Those physical interpretations have no supplied result in the Denali files. (*Denali Exact.pdf.*)

24.2 Terminal-Response Geometry Is Not Required to Match Entrance Geometry

The canonical paper does not demand geometric identity between an entrance and a terminal response. Here, the only symmetric measure is the **total length** of the two legs under their explicitly different constructions. The terminal region is neither a mirror image of the Malpelo entrance nor an independently verified geological match.

24.3 Terminal-Response Morphological Predictions

No source-provided bathymetric contour, excavation geometry, or historical terminal morphology is attached to the exact note. This preserved canonical slot remains unpopulated.

24.4 Bathymetric Exit Metrics

The waypoint note uses a trench label for the selected terminal location. Its spreadsheet columns contain segment central angles, surface arcs, and chords, not bathymetric survey measurements. Accordingly, no trench depth, relief index, or excavation metric is asserted.

24.5 Trench-Parallel Scouring Test

No mapped trench-parallel directional field or scouring result is supplied. This heading is inherited strictly from the original manuscript; it is not a claim of observed scouring in the northern terminal domain.

24.6 Magnetic and Gravity Predictions

No local magnetic or gravity field observations were included. No claim of agreement is made.

24.7 Deep Seismic Predictions

No deep seismic model associated with the selected terminal coordinate appears in the project records used here. This class remains open.

24.8 Terminal Chronology

The 64 Ma working label and the terminal coordinate belong to different input categories. Neither a dated terminal marker nor a dated pathway is supplied by the numerical source.

24.9 Terminal Null Model

The source-defined endpoint is part of the constructed route and is not independently ranked against alternative terminal domains. No completed likelihood comparison is reported.

24.10 Northern Terminal Evidence Vector

The evidence record includes terminal latitude, longitude, the penultimate waypoint, the final chord length, and the cumulative path totals. All structural, temporal, and geophysical claims remain separate from those entries.

24.11 Model-Likelihood Comparison

The canonical chapter reserves comparative scoring. The available Denali files do not contain the likelihood functions, independent regional observations, or comparison outputs needed to populate that field. This paper makes no such numerical assertion.

External context: E02, E05 | bibliography: Appendix EC

24.12 Decisive Terminal Tests

The methodological slot is retained with no independently executed study claimed.

24.13 Northern Terminal Rejection Conditions

A future rejection of the proposed terminal role would be a claim-specific outcome. It is not conflated with the mathematical definition of the final waypoint or the reproduced segment chord.

25 Regional Prediction and Falsification Matrix

This chapter preserves the original structure's cross-regional synthesis while keeping each scientific status attached to the actual source. The three role domains are Malpelo entrance, Denali middle mountain near the fixed turn, and the selected northern terminal. The common confirmed *calculation* is the specified Leg-1 versus Leg-2 length equality, not a completed demonstration of causal transmission.

25.1 Purpose

The matrix exists to prevent one favorable numerical relationship from being recounted as several independent observations. Source-defined coordinates and their derived arcs/chords occupy the geometry column; interpretation, chronology, structural measurements, and independent replication belong to separate columns.

Role	Source-grounded geometric statement	Additional source-backed claim status
Entrance	Solved Malpelo-region coordinate to fixed-turn direct chord	Regional causal attribution unresolved
Middle mountain	Denali approximately 222.678 km beyond the fixed turn on Leg 2	Physical role unresolved
Terminal	Specified northern coordinate after the Chukchi waypoint	Historical terminal effect unresolved
Linked geometry	One direct chord equals eight-chord corridor sum, to reported precision	Historical connected sequence unresolved

25.2 Cross-Regional Directional Consistency

The source establishes the order of waypoints and thus a geometrically well-defined broken-line route, but it does not present separately measured regional fracture or motion vectors at all three domains. Numerical route direction cannot be substituted for independent directional geology.

25.3 Cross-Regional Chronological Consistency

The exact-distance note reports no independently dated marker sequence. The program's older chronological label cannot alone populate regional chronological agreement.

25.4 Cross-Regional Depth Consistency

The geometry is defined on a reference sphere and through segment chord lengths; a depth-resolved interior physical route has not been source-established. No material-depth profile or travel history is inferred from the segmented total.

25.5 Connected-Sequence Likelihood

The source provides one correlated fitted geometric construction. It does not provide a calibrated likelihood for the causal connection among all proposed domains. Accordingly, no combined statistical score is entered.

25.6 Minimum Regional Success Standard

The canonical source treats regional and causal claims as separate stages. This manuscript preserves that accounting while avoiding any new threshold setting. The present source-grounded finding remains geometric.

25.7 Regional Failure Does Not Disappear Into the Global Theory

The numerical equality, Malpelo role, Denali role, northern terminal role, and proposed historical sequence remain distinguishable in the claim ledger. A determination about one will not be reclassified as a result about another without a stated dependency.

26 Regional Findings and Open Variables

This chapter marks the transition from the regional audit to the later canonical methodological and comparison sections. It records the supplied source results without inventing any further fieldwork, subsurface model, or causal chain.

26.1 Findings Preserved From the Source Framework

The controlling *Denali Exact* note fixes the turn, reports the chord-equality solution for the entrance, identifies Denali as an offset middle-mountain reference, and states the route order to the terminal. The spreadsheet preserves the seven post-Denali chord and arc values at higher precision. These are the source-supported findings placed into the canonical Paper-I structure.

26.2 Variables Not Yet Established

The project files for this draft do not establish independent location uncertainties, complete waypoint coordinate provenance, dated regional marker tables, material trajectories, measured physical-response signatures, or completed statistical comparisons. These fields remain open in the matching source categories and are not replaced with generalized textbook assertions.

26.3 Minimum Mechanical Constraints Retained in Paper I

The original corpus separates geometry from any later claim of physical passage. This draft preserves only that division: a mathematically specified path length does not assert an admissible process for traversing it, and an assigned middle-mountain role is not the result of a numerical stress calculation. The underlying mechanics are excluded from the public document by instruction.

27 Mechanism Classes and the Meaning of Passage Through Earth

The original Paper I locates its conceptual mechanism taxonomy here, after regional findings and before the later statistical sections. The North American mirror retains the same chapter position and semantic distinction between a **geometrically specified corridor** and a **physically demonstrated passage**. The Principal Investigator has excluded proprietary energetics and bounce-back mechanics from this release. Accordingly, the following slots are preserved only as controlled boundaries, not populated with invented theories.

27.1 The Literal Primary Claim

The controlling Denali geometry defines one direct chord and a sequence of eight chord segments. It does not separately report a tested physical means of traversing them. The term *underground path* is used in the working material as a geometric route description; its physical realization is not asserted by this draft.

27.2 Five Distinct Mechanism Classes

The following subclass labels reproduce the structural distinctions of canonical Paper I. They are **classification labels inherited from the template**, not mechanism proposals, calculations, or assertions for the Denali case.

27.2.1 Class I: Coherent-Body Penetration

Reserved: not developed or disclosed in this working manuscript.

27.2.2 Class II: Fragmented Penetration Column

Reserved: not developed or disclosed in this working manuscript.

27.2.3 Class III: Shock-Dominated Transmission

Reserved: not developed or disclosed in this working manuscript.

27.2.4 Class IV: Fracture and Phase-Front Transmission

Reserved: not developed or disclosed in this working manuscript.

27.2.5 Class V: Hybrid Transmission

Reserved: not developed or disclosed in this working manuscript.

27.3 Branch Declaration Rule

No mechanism branch is designated as selected or mechanically eligible in this public North American Paper-I draft. The only adopted numerical choices concern the distance definitions and the fixed geographic route.

27.4 Continuity of the Event Path

Sequential geographic waypoints produce a continuous **ordered list of mathematical segments**. Physical continuity and geological inheritance require evidence outside that geometric list. This draft claims only the former.

27.5 Conservation Requirements

The original source assigns conservation requirements to mechanism-specific calculations. None is performed or parameterized here. The absence of those proprietary details does not change the reproduced chord arithmetic.

28 Audited Event-Energy and Momentum Parameter Space

Disclosure boundary: This is the canonical location of event-energy and momentum material. The North American adaptation leaves those values and their derivations unpublished, as directed. This chapter does not imply that specific numerical parameters have been established by the supplied Denali files.

28.1 Inherited Energy Band

Reserved; no energy interval is reported.

28.2 Kinetic Parameterization

Reserved; no physical velocity or mass parameterization is reported.

28.3 Equivalent Radius

Reserved; no physical-body radius is deduced from geometric route lengths.

28.4 Momentum Range

Reserved; no event momentum values are introduced.

28.5 Specific Kinetic Energy

Reserved; no kinetic-energy values are introduced.

28.6 Earth-Binding-Energy Reference

Reserved; no energetic comparison is performed in this adaptation.

29 Entrance Geometry and Coupling

This chapter's placement in the original paper connects geometric orientation to eventual physical entry conditions. In the Denali record, the spherical entrance-to-turn course is a calculable geometric object. No proprietary entry coupling, dynamic-pressure model, or physical survival fraction is published here.

29.1 Incidence Angle Required by the Audited Chord

The geometry of an individual chord is determined by its central angle and the chosen reference sphere. This draft does not extrapolate those mathematical properties into a demonstrated astronomical arrival direction or a physical impact angle.

29.2 Entrance Energy Coupling

Reserved. No coupling efficiency or energy allocation is asserted.

29.3 Dynamic-Pressure Scale

Reserved. No physical pressure number is asserted.

29.4 Entrance State Vector

The source-grounded entrance state comprises its latitude and longitude as a geographical input. Any added physical state variables are outside this draft's disclosure scope.

29.5 Entrance Survival Fraction

Reserved. No survival fraction is inferred.

30 Interior Transmission Alternatives

The source's ordered path remains completely specified **as a sequence of chord-length objects**, which does not identify a unique material trajectory, propagation process, or travel time. The canonical subsections below remain in their original order but contain no added internal energetic mechanics.

30.1 Audited Straight-Path Length and Transit Time

Leg 1 has the reported chord length 8061.8708 km; Leg 2 has the reported cumulative eight-segment chord total 8061.8708 km. Neither number can supply a transit time without additional physical assumptions. No transit time is assigned.

30.2 Maximum Path Depth

A single spherical chord has a mathematically defined midpoint radius, already distinguished in Chapter 12. The eight-segment route has no unique physical maximum depth derivable solely from its accumulated length. No path-depth assertion is imported.

30.3 Encountered Column Density

Reserved. No density distribution or material-column integral appears in the controlling numerical files.

30.4 Deceleration Equation

Reserved. No deceleration equation is introduced for the North American case.

30.5 Shock-Transmission Branch

Reserved. No energetic transfer or bounce-back model is presented.

30.6 Path Concentration

Reserved. No focusing or concentration parameter is introduced.

30.7 Audit of the Inherited Dimensionless Numbers

The existing source values are geometric lengths and angles. No dimensionless dynamic numbers from another event reconstruction are transferred into this one.

31 Midpoint Compression and Structural Inheritance

The original manuscript's compression chapter appears here. The North American draft retains its location while drawing an explicit source boundary: the geometry identifies a prescribed turn and a nearby mountain reference, but the Denali files do not provide a public pressure-field calculation. The Principal Investigator's reserved bounce-back details are not developed.

31.1 Geometric Midpoint Is Not Automatically a Pressure Maximum

The fixed turn is a position defined through distance bookkeeping and a selected route. The note places Denali 222.678 km after that turn. Neither statement is a computed pressure maximum or a proof of mountain causation.

31.2 Stress Field

Reserved. No stress tensor, boundary condition, or numerical stress field is introduced.

31.3 Candidate Midpoint Mechanisms

The following categories retain the original hierarchy without being adopted as claims for Denali.

31.3.1 Maximum-Depth Compression

Reserved; no associated physical calculation is disclosed.

31.3.2 Shock Focusing

Reserved; no associated physical calculation is disclosed.

31.3.3 Displaced Mantle Volume

Reserved; no associated physical calculation is disclosed.

31.3.4 Phase-Transition Memory

Reserved; no associated physical calculation is disclosed.

31.3.5 Fracture-Node Inheritance

Reserved; no associated physical calculation is disclosed.

31.3.6 Pre-Stressed Orogenic Target

Reserved; no associated physical calculation is disclosed.

31.4 Inherited-State Variable

No inherited-state parameter is quantified in the source-grounded public geometry. The role of Denali remains a proposed interpretation linked to its documented position.

31.5 Minimum Midpoint Requirement

The document's disclosed minimum is positional: the turn coordinate, the two equal declared length totals, and Denali's nonzero offset are kept distinct. No additional necessary energetic condition is asserted.

32 Exit Excavation and Decompression

The canonical exit-process chapter has no source-backed physical counterpart in the supplied later Denali geometry files. The terminal is designated by coordinate and named as a trench in the original numerical note. The physical excavation and decompression subject matter is reserved, and none of its variables is populated with guesses.

32.1 Inherited Exit Fraction

Reserved; no fraction is reported.

32.2 Exit Energy Partition

Reserved; no energy partition is reported.

32.3 Exit-Affected Volume

Reserved; no affected volume is reported.

32.4 Excavation Work

Reserved; no excavation energy or work is reported.

32.5 Exit Momentum

Reserved; no momentum transfer is reported.

32.6 Terminal Decompression

Reserved; no decompression model is reported.

32.7 Exit-Structure Requirement

The available source identifies a terminal coordinate but does not establish a physical exit structure. The mathematical endpoint and any physical exit claim remain distinct.

33 Planetary-Survival and Missing-Signature Constraints

The original corpus locates its wider physical-survival checks here. Those mechanics are outside the approved public scope of this Denali adaptation. This chapter retains the scientific function and original subchapter order; it does not silently borrow parameters from the canonical 256 Ma case or produce any claim of a successful North American survival computation.

33.1 Survival Is More Restrictive Than Remaining Gravitationally Bound

This is the inherited conceptual distinction, not a completed Denali calculation. No energy scale, global response model, or survival threshold is disclosed.

33.2 Thermal Constraint

Reserved, no thermal scenario calculated.

33.3 Melt Constraint

Reserved, no melt scenario calculated.

33.4 Seismic Constraint

Reserved, no seismic response scenario calculated.

33.5 Atmospheric Constraint

Reserved, no atmospheric scenario calculated.

33.6 Ocean Constraint

Reserved, no ocean-response scenario calculated.

33.7 Ejecta Constraint

Reserved, no ejecta scenario calculated.

33.8 Rotation Constraint

Reserved, no rotational-response scenario calculated.

33.9 Global-Marker Constraint

No independently measured global marker is linked to the source-defined Denali route in the controlling numerical note. No global causal attribution is inserted.

33.10 Missing-Signature Likelihood

No observational completeness model or likelihood has been supplied. No non-detection is converted into a number.

33.11 Survival Window

No derived physical survival window is reported for this project. The geometry result does not require an assertion about such a window.

34 Mechanism-to-Observation Prediction Matrix

The inherited Paper-I matrix differentiates predictions by selected mechanism. Because this public draft does not select or disclose an energetic mechanism, it contains no mechanism-specific numerical prediction table. The geometry-to-evidence record remains available in Chapters 18–26; it is not repackaged as a causal mechanism demonstration.

34.1 Status of the Inherited Mechanical Claims

No mechanical claim from the original, separate event is imported as a verified result of the Denali calculation. The source data support a distance construction and designated geographic roles only.

34.2 Paper-I Mechanical Conclusion

No physical-mechanics conclusion is made in this version. That is a **scope restriction**, not the result of a reported simulation, and it does not change the numerical geometry.

34.3 Remaining Paper-I Analysis

The original architecture now transitions to statistical status, reproducibility, claims, conclusions, and paper-to-paper handoff. Those chapters are mirrored below with the North American figures and provenance held fixed.

35 Statistical Null Models and Selection Effects

The canonical Paper I follows its regional and mechanical portions with an explicit accounting for selection effects. For this North American version the central selection fact is unusually clear in the source: the turn and second-leg path were held fixed while the entrance coordinate was solved so that its direct chord length equaled the sum of second-leg segment chords. This mathematical construction is the reported result. No inference that an unoptimized three-site coincidence was observed is needed or made. The statistical headings below preserve the original corpus's classification and remain distinct from completed experiments.

35.1 Why Statistical Testing Is Required

The observed numerical equality is conditional on the optimization rule used to choose the entrance. Without a defined population of eligible entrance coordinates and paths, the occurrence frequency of such a fit cannot be estimated from the one constructed case. This does not nullify the geometry; it establishes the kind of inference the number supports. The original framework retains this separation between deterministic calculations and population-level significance.

35.2 Observed Geometric Statistics

The source-supported statistic is $\Delta L = c(E, M) - \sum_{k=0}^{7} c(W_k, W_{k+1})$, approximately zero at the working note's displayed precision, with first-leg and second-leg chord totals both approximately **8,061.8708 km**. The entrance E was solved to attain this target under a fixed M and prescribed corridor. Consequently the observed numerical match is a **calibration outcome**, not a reported chance frequency or prospective significance test. The present source gives no executed null distribution, empirical probability, or model-selection penalty. (*Denali Exact.pdf* and the corridor workbook.)

35.3 Separate and Composite Tests

Length equality, mountain proximity to the turn, and the interpretation of the two end domains are separate assertions. They must not be multiplied as if their source inputs were independent observations. No composite probability appears in the controlling project notes. This paper records each as a distinct claim rather than manufacturing a joint outcome.

35.4 Null Model N0: Uniform Global Points

The canonical test class is retained but not executed. No random global-point sample and no resulting distribution of the adapted path statistic are included in the supplied Denali files.

35.5 Null Model N1: Fixed Endpoints, Random Midpoint Targets

The later Denali construction fixes the middle turn, not arbitrary random replacements. The canonical heading is preserved, while no simulated alternative turns or trial counts are claimed.

35.6 Null Model N2: Random Entrance and Exit Classes

The source entry point is mathematically selected and the terminal is author-prescribed. No random candidate-domain catalog or corresponding probability model is provided. No empirical tail frequency is reported.

35.7 Null Model N3: Extreme-Structure Selection

Denali is a named mountain reference, but the source does not specify a catalog of all eligible mountains nor present a ranked trial of mountain systems. The manuscript makes no population-wide rarity statement.

35.8 Null Model N4: Coordinate-Flexibility Test

The original Paper-I subsection tests sensitivity to selection flexibility. In the source construction, the northern route and geometric turn set a target L_2, after which the entrance coordinate is solved to give $c(E, M) = L_2$. The *Denali Exact* follow-up explicitly acknowledges other points on the same-distance locus, so exact agreement alone cannot quantify rarity over all eligible entrance locations. The supplied materials contain no sampled coordinate ensemble or selection-domain measure for N4. This inherited test slot therefore remains **not executed**, while the fitted nature of the entrance is declared as part of the calculation provenance.

35.9 Null Model N5: Deep-Time Reconstruction Flexibility

The present calculation does not implement a deep-time rotation ensemble. The canonical test slot is retained, but no reconstructed past-fit distribution is reported.

35.10 Empirical Probability

No statistical p value, confidence interval, likelihood ratio, or Bayes factor is supplied for the North American geometry. A calculated difference of approximately zero is not itself a statistical significance result.

35.11 Multiple-Comparison Adjustment

The exact-distance note and earlier exploratory records document multiple developmental calculations. The supplied materials do not constitute a frozen, independently sampled comparison dataset with a known total number of candidate searches. No post-hoc multiplicity adjustment is fabricated. The distinction between candidate exploration and a later frozen result is kept in the provenance ledger.

35.12 Selection Ledger

Choice	Role	Source status
Fixed turn, approximately 62.3843° N, 146.8997° W	Prescribed middle station	Author-declared
Ordered northern corridor	Defines Leg-2 length	Author-declared
Malpelo-region entrance coordinate	Solved to meet Leg-2 length	Calculated/selected
Denali reference	Proposed middle mountain, offset after turn	Geographic role and source-defined segment
64 Ma framing	Earlier research label	Working program designation; dated test unresolved

36 Random Endpoint and Mountain-System Tests

The original next chapter translates candidate geometry into catalog-based comparisons. The North American source does not contain a catalog of alternative triple locations or endpoint/mountain selections; consequently these original test classes remain methodological and are not represented as completed North American findings.

36.1 Triplet Test

The candidate grouping is Malpelo entrance, fixed turn with Denali geographic association, and the selected northern terminal. The turn and the mountain are distinguishable, so this is not literally the same three-point straight-line construction as the original Aegean–Everest–Mariana example. The source defines no independent frequency for obtaining this prescribed route.

36.2 Bilateral-Distance Rank

The computed bilateral distance residual is approximately zero by construction. There is no ranked sample of nonfitted alternatives in the source materials, so no comparative distance rank is stated.

36.3 Along-Track Rank

Denali's position is quantified as the first 222.678 km of Leg 2 after the fixed turn. The route is segmented, so along-track distance means cumulative distance through its given waypoints, not distance along a single global great circle. No rank against alternative mountains is reported.

36.4 Joint Mid-Sequence Statistic

The fitted equality and Denali displacement describe two aspects of the same chosen path. The supplied record has no joint null distribution. This chapter does not treat the pair as independent verification.

36.5 Mountain-System Catalog Requirements

No catalog beyond the named Denali reference and an incidental Mt. Elbert comparison in the working conversation is supplied for this project. The Elbert curiosity calculation is not incorporated as an additional research target or statistical trial in this manuscript.

36.6 Trench and Exit Catalog Requirements

The controlling path ends at its source-specified northern terminal. No alternative terminal catalog or coverage criterion has been supplied.

36.7 Entrance Catalog Requirements

The Malpelo entrance is the solved geographic choice. No complete catalog of possible entrance features is supplied, and the solved point is not described as chosen blindly from such a catalog.

36.8 Positive Statistical Result

No positive significance result is recorded. The deterministic length match remains reported under its true source classification.

36.9 Negative Statistical Result

No completed negative statistical test is recorded either. Absence of a test is not presented as rejection.

37 Paleogeographic Reconstruction Ensemble

This inherited chapter distinguishes the original present-coordinate equations from event-time geographic inference. The source's earlier 64 Ma document establishes a working age context; the final exact-distance note does not contain a full chronological paleogeographic ensemble. This draft does not combine historical and current positions without source support.

37.1 Purpose

The original purpose is to check whether a present-coordinate candidate relation survives a time-dependent reconstruction. The North American result here is confined to the original geometry under the current reference sphere.

37.2 Reconstruction Model Index

No time-dependent geographic models, versions, plate frames, or material-carrier assignments are supplied in the controlling Denali file. No model index is invented.

37.3 Initiating-Age Sensitivity Ensemble

The working chronological label is 64 Ma, but no sensitivity distribution or independently observed uncertainty interval is supplied. No age scans are claimed to have been run.

37.4 Target Ensemble

The available fixed targets are those already entered in Chapters 9 and 12. No source-supported alternative target regions or selected priors are introduced.

37.5 Reconstructed Geometric Vector

At the supplied present-coordinate state, $(L_1, L_2, \Delta L, c(M, D))$ is defined and numerically recorded. A separate deep-time reconstructed vector is not in the files.

37.6 Reconstruction Improvement

No before-and-after reconstruction comparison is furnished, so no percentage improvement is stated.

37.7 Reconstruction Stability

The single source-reported matched configuration does not establish stability under a reconstructed ensemble. Such stability remains unassessed.

37.8 Reconstruction Complexity Penalty

The solved entrance contributes explicit fitting freedom. This is stated in the geometry provenance. A formal reconstruction model-complexity penalty was not calculated in the source records.

37.9 Required Reconstruction Outputs

The canonical output fields are retained as documentary placeholders for any future authorized completion of the existing framework, not as new requirements invented by this draft. The present version reports only the

supplied modern-coordinate values.

37.10 Reconstruction Falsifier

No executed paleogeographic reconstruction yields a positive or negative result in the files. The corresponding original chapter's decision category is preserved as unresolved.

38 Dataset and Observation Inventory

The core evidence for this draft is small, explicit, and numerically traceable. It consists of the controlling Denali exact-distance PDF, the seven-segment arc/chord spreadsheet, and two earlier developmental mathematical conversation records. Canonical Paper I supplies the structural language and category order. A supplied continental-design image is background only and is not used to extract numerical coordinates.

38.1 Dataset Classes

The original paper distinguishes primary observations, curated datasets, reference models, author-declared inputs, reconstructions, and manuscript-derived results. The current inputs are predominantly declared coordinates and historical working documents. The high-precision worksheet consists of calculated angular and distance values, not observations of deep interior structures.

38.2 Dataset Record

ID	Material	Use in this draft	Status
NA-I-S01	*Denali Exact.pdf*	Turn, solved entrance, route, total lengths, Denali offset	Controlling working calculation
NA-I-S02	*Denali corridor segment workbook (.xlsx)*	Seven pairwise route angles, surface arcs, chords	Numerical calculation register
NA-I-S03	*Denali Short Math.pdf*	Earlier exploratory calculation context	Developmental, not controlling
NA-I-S04	*8-8-2025 64 ma ABC Math Full (1).pdf*	Earlier program and chronology context	Developmental, not controlling
ABC-I-CF1	Original Paper I (August 7, 2026)	Hierarchy, methodology, formulas and presentation	Canonical structural template

38.3 Minimum Geometry Dataset

The geometry dataset contains an entrance coordinate, fixed-turn coordinate, Denali coordinate, under-Siberia waypoint, selected terminal coordinate, and segment calculation values. The exact waypoint coordinates for every intermediate named location are not listed in the spreadsheet cells and are not reconstructed by assumption. The path order is reproduced as given in the controlling note.

38.4 Minimum Chronology Dataset

A program label appears in the earlier 64 Ma document. The project sources used for this draft do not supply an independent dated-event marker dataset linking all regional roles. The chronological columns remain unfilled.

38.5 Minimum Regional-Geophysics Dataset

The source files for this first draft do not contain an instrument-recorded Malpelo/Denali/northern-terminal measurement compilation. No unsupplied regional geophysical fields are added.

38.6 Data Exclusion Rule

Earlier geometry proposals are not substituted into the final matched-turn configuration. Proprietary mineralogical, material-response, and energetic-mechanics details are excluded by the Principal Investigator's instruction. Neither category is silently presented as a completed analysis.

39 Paper-I Claim Ledger

The canonical claim ledger separates what follows from equations from what is geographically or physically inferred. The adapted ledger retains that separation in a compact source-grounded form. It deliberately contains no new hypothesis intended to rescue an unsupported regional interpretation.

39.1 Claim Classes

The original categories apply: geographic designation, declared input, numerical calculation, correspondence, historical inference, mechanism, prediction, and comparison qualification. Every claim below identifies its current category and source.

39.2 Current Claim Ledger

Claim ID	Claim	Status
NA-G01	The turn is fixed at the source-specified surface projection	Author-declared input
NA-G02	The entrance coordinate was solved within the researcher-identified Malpelo region	Region author-identified; numerical coordinate fitted to equal-chord criterion
NA-G03	$L_1 \simeq 8061.8708\,\mathrm{km}$ for the direct entrance-to-turn chord	Manuscript/source-derived geometry
NA-G04	$L_2 \simeq 8061.8708\,\mathrm{km}$ for the eight-chord corridor sum	Manuscript/source-derived geometry
NA-G05	Denali is $\sim 222.678\,\mathrm{km}$ after the turn	Source-derived geometric position
NA-H01	The corridor corresponds to a historical astro-ballistic event	Hypothesis, not established by these files
NA-H02	Denali is a causal midpoint response	Hypothesis, not established by these files
NA-H03	Northern terminal location is an actual event response	Hypothesis, not established by these files
NA-T01	The working 64 Ma label matches an initiating physical event	Historical-age assignment unresolved
NA-M01	A physically sufficient passage mechanism has been shown here	Not claimed; outside public scope

39.3 Claim Dependency Graph

The two path-length calculations depend on the defined sphere, coordinate choices, segment order, and metric selection. The computed equality follows from those mathematical inputs plus the entrance solved to satisfy the equal-chord criterion. The historical and regional hypotheses are **not** automatically validated by the equality. Conversely, an eventual change to a historical interpretation would not erase arithmetic under the original declared inputs.

39.4 Claim-Version Rule

The October 14 working draft is not designated a new canonical freeze. *Denali Exact.pdf* controls the numerical variant used in this draft; earlier conversation records remain developmental. If the geometric choices are later changed by the author, they must be versioned rather than silently overwritten in the same ledger.

40 Complete Paper-I Falsification Matrix

The original Paper I separates the scope of possible rejection conditions from the mere presence of missing evidence. The North American version follows that **same** mapping and does not introduce a new battery of tests. Because the supplied records mostly document a numerical construction, the current evidentiary verdict concerns that calculation only; the physical roles remain hypotheses.

40.1 Falsification Standard

Claim category	What the current source establishes	Current status
Declared geometry	Endpoints, fixed turn, specified corridor and lengths	Reproducible source calculation
Exact equality	Matched to published total precision by solved entrance	Constructed geometric equality
Mountain interpretation	Denali's positional relation to the turn	Role proposed; causal link unresolved
Entrance role	Malpelo association of a solved coordinate	Candidate interpretation
Terminal role	Coordinate and final chord	Candidate interpretation
Chronology	Developmental 64 Ma designation	Independently dated support not supplied
Physical mechanics	Not released in this draft	Outside scope; no verdict
Global replacement	Not decided in Paper I	Reserved for canonical later-paper function

The matrix does not invent a failure condition beyond those inherent in the original scientific categories. A reproducibility mismatch would affect the specific numerical claim; a dated material contradiction would affect a chronology or historical-lineage claim; a mechanism result would affect the associated physical claim. No one outcome is silently extended to all scientific questions.

40.2 Non-Detection and Missing-Data Rule

No measured absence of a signature is recorded in the supplied Denali numerical materials. A blank evidence field cannot be described as a field survey yielding a negative result.

40.3 Partial Failure Rules

A change in the fitted entrance coordinate would alter the defined geometry and require recalculating the direct first-leg chord. A negative result on the hypothesized Denali origin would pertain to the mountain-role claim, not invalidate the original source's calculation of its 222.678 km separation. These are dependencies already present in the canonical paper's logic.

40.4 No Asymmetric Falsification

No newly invented criterion is applied solely to this North American geometry. The claims remain classified consistently with the original corpus: computation, regional interpretation, physical mechanism, historical attribution, and global comparison are not interchangeable categories.

41 Independent Replication Protocol

The canonical paper includes a replication ladder that distinguishes arithmetic verification from regional and causal assessment. This adaptation preserves the ladder and populates only what the source files currently allow. In particular, the source workbook itself is a record of previous calculations and is not an independent reproduction by a second instrument or research group.

41.1 Purpose

The immediately reproducible question is whether the published coordinates and chord definitions yield the reported length comparison. The project documents additionally state a mountain offset and a specified route order. These are the bounded numerical inputs available for an independent analyst.

41.2 Replication Levels

41.2.1 Level R1: Numerical Geometry

The formulas, Earth radius, point definitions, source totals, and seven high-precision workbook segment records are available. The incomplete high-precision value of the turn-to-Denali first segment is explicitly identified as a display-precision limitation.

41.2.2 Level R2: Coordinate Sensitivity

No source-supported uncertainty regions or alternative-coordinate evaluation results are furnished. The original question remains available but unrun.

41.2.3 Level R3: Statistical Null Tests

No null distribution is supplied or claimed as executed.

41.2.4 Level R4: Deep-Time Reconstruction

No complete time-dependent material-frame result is supplied.

41.2.5 Level R5: Regional Forensics

No independent three-region measurement archive is supplied in this working set.

41.2.6 Level R6: Claim and Falsification Audit

The present claim ledger, source inventory, mathematical definitions, and explicit unresolved statuses make this level auditable as a document, without implying that every associated empirical question is complete.

41.3 Required Repository Structure

The public Paper-I release can be reproduced from its LaTeX and Markdown source, its exported PDF, and the identified controlling internal numerical source files. No new external dataset is represented as part of the repository. The original Paper-V companion remains the designated corpus-wide navigational role; this first draft does not pre-empt it.

41.4 Deterministic Reproduction

A source-faithful calculation takes the prescribed surface-turn coordinate, the eight ordered second-leg endpoint pairs, and a spherical reference radius of **6,371 km**. For each pair, compute the spherical central angle θ and chord $c = 2R\sin(\theta/2)$; add the eight second-leg chords and evaluate the direct Malpelo-to-turn chord by the same formula. The seven workbook segment values and the separate turn-to-Denali source entry must be distinguished. Reproduction of these numbers is **arithmetic replication**, not independent evidence for the source's proposed causal role. (*Denali Exact.pdf*; *Denali_Trench_underground_path___per_segment_arc____chord_lengths-1.xlsx*.)

41.5 Independent Recalculation Rule

A source-faithful independent recalculation distinguishes **input recovery**, **formula execution**, and **result comparison**. The working inputs are the fitted full-precision entrance $E = (0.44887422830847457^\circ, -81.42927293513645^\circ)$, fixed turn $M = (62.3843^\circ, -146.8997^\circ)$, named corridor order, and $R = 6{,}371$ km. For each specified pair, independently compute its spherical central angle and $2R\sin(\theta/2)$; use that result for $c(E, M)$ and for the recorded $M \to$ Denali first segment. Add the **seven remaining** workbook chord values, keeping those values at their supplied precision. Compare both totals before and after the rounded display convention used by *Denali Exact.pdf*.

The workbook is the source for seven post-Denali numerical pairs, not for an independent full eight-row observation series. Recovering the chord equality by these steps verifies the supplied numerical operation; it does not by itself locate an ancient physical trajectory.

41.6 Adversarial Replication

The calculation can be repeated from the source's declared sphere and coordinates; this checks implementation of its chosen metric, not the geographical choices themselves. The fixed turn and corridor preceded the entrance solution. Thus an adversarial reading must retain the fitted status of E when interpreting the equality $c(E, M) = \sum c(W_k, W_{k+1})$. Recomputing the printed numbers cannot by itself convert that fitted relation into an independent causal prediction. No further null simulation or observational evaluation is reported in the supplied North American records.

41.7 Minimum Successful Replication

The narrower achievement available is reproduction of the source-defined direct-versus-segmented chord arithmetic. That achievement does not require or imply confirmation of causal mountain formation or historical event interpretation.

41.8 Replication Outcomes

For this source bundle, the reproducible outcome is limited to the spherical direct-chord and segmented-chord arithmetic, including the distinction between the printed 222.678 km offset and the unrounded coordinate-derived first segment. The files do not contain an independent confirmation of an entrance event, a mechanically modeled midpoint response, or a terminal geophysical consequence. Those claims retain their original separately scoped positions and are not counted as numerical replication outcomes.

41.9 Paper-I Replication Challenge

The source is available for methodological reproduction and critique in the original corpus's spirit. No unperformed test is scored; no new test or numerical threshold is inserted into the current author-controlled research program.

42 Paper-I Evidence Architecture Summary

The evidence structure of this first draft is compact. The largest positive result is a formally defined two-leg length equality on a reference sphere with one selected direct chord and eight selected successive chords. Its exactness in the controlling four-decimal totals follows from how the entrance was solved. A second positive geometric result is the nonzero turn-to-Denali displacement along Leg 2. The Malpelo entrance designation, Denali middle-mountain role, and northern terminal designation are interpretive claims tied to the geometry but not thereby proven causally. The nominal 64 Ma research framing is not treated as a fully corroborated regional chronology. The structure thus mirrors Paper I's geometry-first scientific grammar.

43 Downstream Model-Comparison Firewall

The original five-paper sequence keeps the functions of the papers separate. This Paper I supplies the source-identified geometric and regional candidate roles. It does not claim that Paper II's mechanics have been completed, Paper III's global sequence has been derived, or Paper IV's replacement comparison has been settled. No later-paper output is invented to fill Paper I's evidence gaps. The fact that no new mechanics are publicly included here also reflects the Principal Investigator's intellectual-property boundary, not an undisclosed statistical conclusion.

44 Integrated Discussion

The North American application translates the canonical first paper's scientific architecture into a distinct geometrical object. Both cases begin with a named geographic arrangement and then separate calculations from the claimed historical interpretation. In the Denali record, however, the length symmetry itself is explicitly constructed by solving an entrance point after fixing the turn and northern segment chain. That provenance is intrinsic to the calculation, and the document accurately preserves it.

44.1 The Finding That Initiated the Investigation

The source's central research interest is the placement of Denali relative to a fixed middle turn within a long route beginning in the Malpelo region and ending in the north. The mathematical task solved in the later note was to hold the midpoint and northern corridor fixed and locate an entrance whose direct chord matched the summed chords of the second leg. The resulting numerical equality is the initiating finding of this manuscript.

44.2 The Geometry Produced a Specific Result

The source states a matched value of 8061.8708 km for both legs. It separately records the turn-to-Denali displacement of 222.678 km. Leg 1 is a single direct chord while Leg 2 is a path accumulated across eight successive straight-line chord segments. This distinction is essential and is carried through every statement of the result.

44.3 The Corrected Finding Is More Precise

The later note supersedes the earlier, simpler exploratory route descriptions for this working draft. The present wording does not call Denali the exact turn, and it does not call the whole path one straight chord. It attributes equality to the configured distance rule, not to an independent discovery of an unselected perfect midpoint.

44.4 Why the Mountain's Offset Matters

Denali is approximately 222.678 km after the mathematical turn. That is a defined point-to-point segment within the source's route, not zero. The distinction prevents the geometric midpoint and the mountain's interpretive role from being mistaken for the same location. No physical offset mechanism is introduced.

44.5 Geometry Is the First Gate, Not the Final Proof

The length relation is mathematically meaningful under its declared model but does not itself establish that a physical event traversed the path or produced regional structures. This chapter applies the same original division of geometry, regional assignment, and causal explanation, without demanding a different style of evidence merely because the geography changed.

44.6 The Event Must Be Reconstructed as One System

The source gives the corridor an ordered architecture: entrance, turn, Denali, named intermediate stations, and terminal. A complete historical interpretation would additionally require evidentiary connections among those roles. The current manuscript does not claim those links have already been established by the selected distances.

44.7 The Mechanics Are More Restrictive Than the Map

Only geometric metrics are disclosed here. No claim of actual penetration, rebound, energy transfer, or pressure concentration is made. The author has reserved those subjects from the present public draft.

44.8 The Absence of Expected Consequences Is Evidence

The original source distinguishes a searched-for absence from an unsearched or unavailable field. The present Denali documents are numerical and developmental records, not a comprehensive negative-results survey. No unfurnished absence is counted for or against the proposed historical interpretation.

45 What Paper I Currently Establishes

At this initial complete-draft stage, *establishes* is used narrowly and consistently with the source classes. The numeric results are reproducible consequences of selected positions and equations. The reported equality exists to the precision of the working calculation, and its fit origin is openly specified. No causal age or regional mechanical conclusion is promoted to a mathematical finding.

45.1 Established Mathematical Results

Within a spherical reference model with $R = 6371\,\text{km}$, the working note reports $L_1 = c(E, M) \simeq 8061.8708\,\text{km}$ and $L_2 = \sum c(W_k, W_{k+1}) \simeq 8061.8708\,\text{km}$. Denali is 222.678 km after the fixed turn along the first chord of Leg 2. Both geometric statements depend on the route and coordinate declarations.

45.2 Established Methodological Results

The calculation distinguishes straight Euclidean chords from spherical surface arcs and from cumulative route sums. It labels the solved entrance as a fitted selection. It preserves the documented first-segment rounding limitation and keeps the mountain's geographic identity separate from the exact turn station.

45.3 Established Audit Corrections

The mathematical mirror corrects one recurring ambiguity: the two equal legs are **not** two single entrance-to-midpoint and midpoint-to-terminal chords. The second total contains eight component chords. A point on the mountain does not automatically provide the equality station. The source data remain in their original coordinate precision.

46 What Paper I Does Not Establish

This paper does not derive the historical reality of an initiating astro-ballistic event, identify a physical mode of interior passage, prove Denali's genesis, establish regional event chronology from independent dated markers, demonstrate a terminal geophysical response, reconstruct the route across deep time, assign geological uncertainty intervals, or establish a statistical preference over other explanations. Those matters are not filled with invention. The deterministic geometry still stands on its own specified terms.

47 Relationship to Plate Tectonics

The relationship chapter occupies its canonical Paper-I position without importing a new North American replacement argument. The original ABC Sequencing program treats observed plate motion as a phenomenon to explain and reserves matched causal replacement adjudication for Paper IV. The Denali figures do not change that division of responsibilities.

47.1 Plate Motion Is Evidence Shared by Both Frameworks

No measurements of current plate velocities are in the supplied exact-distance and corridor spreadsheet records. The manuscript does not reject plate motion or present an alternative numerical motion field.

47.2 The Competing Causal Structures

The wider ABC source frames a causal comparison. The present North American draft contributes a defined candidate geometry, not an independently established competing global explanation. Its geographical assignments cannot substitute for a model-comparison result.

47.3 Description Versus Origin

The selected coordinates and named features are descriptors of places in the current geometry. Their proposed historical origins are separate interpretations. The mathematics of arc and chord length cannot alone determine those origins.

47.4 The Required Replacement Test

The source corpus already assigns this role to its later comparative paper. No new North America-specific replacement standard is devised here.

47.5 Boundary-Origin Test

No published map of boundary ages or independently reconstructed boundary origins is added. This original scientific slot remains unpopulated for the current Denali sources.

47.6 The Framework Must Explain Continuing Motion

The North American geometric notes contain no dynamic plate-motion solution. This paper therefore claims no such solution.

47.7 The Replacement Standard

The original five-paper architecture retains the comparison decision outside Paper I. The existence of the fitted chord equality neither wins nor loses the wider comparison.

48 Decisive Research Priorities

The canonical chapter enumerates the existing program's order of documentary and scientific obligations. This adaptation preserves those priorities without turning them into a new initiative proposed by the assistant. In this draft, their purpose is to state accurately which original methodological functions have source-backed North American content and which do not.

48.1 Priority 1: Freeze the Geographic Targets

The working file already specifies the entrance, turn, Denali reference, waypoint order, and terminal. The current draft preserves their numerical values and statuses exactly as reported. No alternative target selection is undertaken.

48.2 Priority 2: Complete the Statistical Null Tests

The original test category is retained. The supplied files do not contain executed null tests, and no test campaign is added in this draft.

48.3 Priority 3: Reconstruct the Relevant Materials

The original category is retained. Present-coordinate geometry is available; a full material-history reconstruction is not included in the supplied numerical material.

48.4 Priority 4: Search for Dated Physical Markers

The original category is retained. The older 64 Ma working title is not treated as independently dated marker evidence.

48.5 Priority 5: Build the Minimum Numerical Mechanics

Not publicly developed in this adaptation. Mechanics and bounce-back energy details remain beyond the Principal Investigator's requested disclosure boundary.

48.6 Priority 6: Produce Predictions Before Map Fitting

The inherited logical distinction is retained. The source's solved entrance is labeled fitted, not promoted to a held-out geological prediction.

48.7 Priority 7: Publish Negative Results

No completed negative statistical or regional empirical result is part of the supplied record. The draft records unresolved fields accurately rather than assigning a favorable or unfavorable outcome to missing research.

49 Limitations of Paper I

This section mirrors the original limitations chapter by delimiting what the completed initial draft actually contains. It does not add a new critique or broaden the author's research beyond the source record. Every limitation is attached to a specific source or scope boundary.

49.1 Coordinate Limitation

The source contains several point coordinates, named intermediate waypoints, and calculated segment lengths, but not a complete independently surveyed uncertainty distribution for every feature.

49.2 Deep-Time Limitation

The equal-leg geometry is present-coordinate geometry. The earlier chronological program label does not independently reconstruct the designated materials at a historical date.

49.3 Material-Identity Limitation

The present-day mountain, selected turn, and proposed ancient structures are not identified as the same material point through time.

49.4 Statistical Limitation

The entrance was solved to satisfy equality; a null frequency for this selection procedure has not been reported.

49.5 Chronological Limitation

The project files used for this draft do not establish a complete independently dated causal sequence.

49.6 Regional-Evidence Limitation

No instrument-level comparative regional measurement set was included alongside the geometry notes.

49.7 Mechanical Limitation

Proprietary mechanisms are deliberately not developed in this public draft, and no mechanical result is presented as source-verified.

49.8 Rheological Limitation

No numerical differentiated-Earth response is provided or inferred from the chord sum.

49.9 Preservation Limitation

No source-grounded quantitative preservation or non-detection model is available for the proposed regional features.

49.10 Comparison-Model Limitation

The specified geometry supplies no matched set of alternative model outputs, error-calibrated observations, or selection-corrected likelihoods. Equality follows after the entrance is solved against the author-selected second-leg sum. The original Paper-I null and comparison headings remain in place, but a residual near zero under that fitted definition is not a null-model rejection or an independent causal comparison. No comparative score or geological priority is asserted here.

49.11 Reserved-Scope Limitation

Mineralogy, geochemistry, bounce-back energetic mechanics, and proprietary parameterizations are explicitly outside the authorized public text.

49.12 Replacement Limitation

A geometric correspondence under declared inputs is not a conclusion that the original program's global replacement thesis has qualified.

50 Conclusions

Paper I of the North American adaptation records a specific, source-grounded equal-leg geometry centered on a declared middle turn near Denali. It mirrors the original ABC Sequencing Paper-I progression from thesis, through geometry and regional roles, to status-qualified conclusions and the transfer of only appropriate outputs to the next manuscript. The result is a complete **first-draft architecture**, not a new canonical freeze and not a finished independent regional empirical study.

50.1 Conclusion 1: A Reproducible Bilateral Calculation Exists

The source-defined Leg 1 is a direct interior chord from the solved Malpelo-region entrance to the fixed turn; the source-defined Leg 2 is the sum of eight successive interior chord segments running from that turn to the terminal. Both are reported as 8061.8708 km at four decimal places. The entrance solution was selected to satisfy that equality.

50.2 Conclusion 2: The Selected Denali Coordinate Is Offset From the Fixed Turn

The current source places Denali approximately 222.678 km after the turn. The fixed turn and named mountain therefore perform different roles in the calculation. This relation is retained rather than forcing the two to coincide.

50.3 Conclusion 3: The Route Is Not One Straight Chord Axis

The equality registered here compares $c(E, M)$, one direct entrance-to-turn chord, with $\sum_{i=0}^{7} c(W_i, W_{i+1})$, eight consecutive turn-to-terminal segment chords. This second value is a *cumulative length on a prescribed broken line*, not the single chord $c(M, T)$. No collinearity of Malpelo, the turn, Denali, the intermediate waypoints, or the Arctic terminal follows from the equality. This conclusion describes the reported geometry only; it neither supplies a continuous material tunnel nor establishes a historical response.

50.4 Conclusion 4: The Flagship Claim Remains a Distinct Historical Interpretation

The geometry is stated as a mathematical construction. A proposed initiating event, material history, and mountain role remain scientific interpretations requiring evidence beyond the current source arithmetic.

50.5 Conclusion 5: Physical Mechanics Are Not Established in This Paper

No energetic, mineralogical, or bounce-back mechanism is publicly disclosed or derived. A physical path is not inferred from the equality of calculated lengths.

50.6 Conclusion 6: Regional Roles Remain Differentiated

Malpelo is the entrance designation, the fixed turn is the distance station, Denali is the nearby mountain reference, and the Arctic coordinate is the terminal designation. None of these labels is treated as an automatically verified event signature.

50.7 Conclusion 7: Comparative Replacement Remains a Later-Paper Function

No global replacement decision is reached in Paper I. The new draft inherits the original five-paper division without importing later-paper results.

50.8 Final Paper-I Statement

The complete positive numerical result supplied by the fixed-turn Denali record is the equality, to reported precision, of one direct Malpelo-region entrance-to-turn chord and eight accumulated turn-to-terminal station chords. The unrounded reproduction is $L_1 \approx L_2 = 8{,}061.870761355\,\text{km}$ under the declared 6,371 km sphere; the associated surface-arc sum is separately $8{,}085.044329017\,\text{km}$. The first second-leg chord is computed from the turn and Denali references; seven succeeding segment pairs are supplied in the workbook. The entrance was fitted after the corridor sum was selected. These statements exhaust the source-supported numerical conclusion of Paper I, while the original chapter architecture and later-paper handoff remain intact.

Appendix A — Reference Constants and Declared Inputs

The first appendix of canonical Paper I registers constants and values so that mathematical reproduction does not depend on prose interpretation. The North American source quantities are summarized here. All latitude and longitude entries are author-selected or source-recorded coordinates used by the existing working computation; they are not retrospective instrument estimates of a past path.

Symbol	Meaning	Value or statement	Origin
R	Reference spherical Earth radius	6371 km	Denali mathematical working record
E	Malpelo-region solved entrance	0.448874°N, 81.429273°W	Denali Exact
M	Fixed turn / geometric midpoint station	62.3843°N, 146.8997°W	Denali Exact
D	Denali reference	63.0695°N, 151.0074°W	Denali Exact working calculation
C	Chukchi/under-Siberia waypoint	73°N, 170°E	Denali Exact
T	Northern terminal	80.5°N, 140°E	Denali Exact
L_1	Direct chord $E \to M$	8061.8708 km	Denali Exact
L_2	Sum of eight chords $M \to T$ along given corridor	8061.8708 km	Denali Exact
$c(M, D)$	First Leg-2 chord	222.678 km	Denali Exact

The full ordered Leg-2 path is $M \to D \to$ Juneau $\to$ Unalaska $\to$ Adak $\to$ Amchitka $\to$ Attu $\to C \to T$. These are geographic references in the exact source, with no newly assigned mechanism or age.

Appendix B — Coordinate and Vector Results

50.9 Unit Vectors

For a source coordinate (ϕ, λ), the canonical spherical Cartesian unit-vector mapping is

$$\mathbf{u}(\phi, \lambda) = \begin{pmatrix} \cos\phi \cos\lambda \\ \cos\phi \sin\lambda \\ \sin\phi \end{pmatrix}.$$

The mapping requires signed longitudes and radian angular arguments. The source coordinate entries in Appendix A determine each declared point's vector without imposing a time-dependent palaeographic interpretation.

50.10 Dot Products

For any two declared points, $\mathbf{u}_i \cdot \mathbf{u}_j = \cos\theta_{ij}$. This provides an independent algebraic form for the central angle and yields $c_{ij} = R\|\mathbf{u}_i - \mathbf{u}_j\|$. It is identical in meaning to the chord definition already used; it does not add a separate numerical observation.

50.11 Midpoint Direction

The normalized vector $\left(\mathbf{u}_i + \mathbf{u}_j\right)/\|\mathbf{u}_i + \mathbf{u}_j\|$ identifies the midpoint direction for one nonantipodal great-circle arc. The author's fixed turn M is **not claimed to be this midpoint direction for the entire Malpelo-to-terminal route**. The two-leg equality is instead established through its selected cumulative chord lengths.

Appendix C — Audited Geometry Summary

Segment	Central angle (degrees)	Surface arc (km)	Chord (km)
Turn → Denali	2.002688844828	222.688839193	222.677503129 (recomputed from source coordinates; rounded to 222.678 in PDF)
Denali → Juneau	9.37747746715922	1042.72791907177	1041.56448672623
Juneau → Unalaska	18.2356863944696	2027.71581094622	2019.16819733245
Unalaska → Adak	6.42924090350875	714.898970645852	714.523963789273
Adak → Amchitka	1.73184607856304	192.572497665484	192.565166865369
Amchitka → Attu	4.84476975469326	538.713817482893	538.553341857014
Attu → Chukchi	20.1457967091099	2240.11038726566	2228.58884451716
Chukchi → terminal	9.94304434662659	1105.61608674674	1104.22925713830

The workbook contains seven full-precision chord entries. The first turn-to-Denali chord was rounded to 222.678 km in the PDF; from the fixed turn and recorded Denali coordinates it recalculates to 222.677503129 km. The seven workbook chords total 7839.193258226 km, giving an eight-chord total of 8061.870761355 km. The precise entrance-to-turn chord independently calculates to 8061.870761355 km at the shown precision. Using the rounded 222.678 instead yields 8061.871258226 km: the prior 0.458 m discrepancy is a rounding artifact, **not** a difference between the two unrounded chord constructions. No parameter has been tuned or changed in this pass.

The exact note also quotes the reference Leg-2 **surface-arc sum** as 8085.0443 km and the Leg-1 **surface arc** as approximately 8728.7236 km. Neither is substituted for the stated chord metric.

Appendix D — Equation Registry

ID	Equation	Function
NA-E01	$\mathbf{u} = (\cos\phi\cos\lambda, \cos\phi\sin\lambda, \sin\phi)$	Spherical unit-vector map
NA-E02	$\cos\theta = \mathbf{u}_i \cdot \mathbf{u}_j$	Angular separation
NA-E03	$s_{ij} = R\theta_{ij}$	Surface arc
NA-E04	$c_{ij} = 2R\sin(\theta_{ij}/2)$	Interior chord
NA-E05	$L_1 = c(E, M)$	First-leg metric
NA-E06	$L_2 = \sum_{k=0}^{7} c(W_k, W_{k+1})$	Second-leg metric
NA-E07	$\Delta L = L_1 - L_2$	Equality residual
NA-E08	$r_{\mathrm{mid}} = R\cos(\theta/2)$	Midpoint radius of an individual chord

These equations constitute the public mathematical register actually used. No energy, pressure, mineralogical, bounce-back, or physical-transmission equation is inserted by this adaptation.

Appendix E — Claim Registry

The principal source-backed mathematical claims are NA-G01 through NA-G05 as specified in Chapter 39. Their status is conditional on the declared reference sphere, inputs, metric, route order, and coordinate solution. The geographical interpretation categories NA-H01 through NA-H03 are not promoted to observational facts. The provisional chronological category NA-T01 remains separate from the source computation. This appendix deliberately does not duplicate Paper V's full atlas or create findings that have not been reported.

Appendix F — Required Figures

The canonical structural slot for required figures is preserved. **No new research map or inferred subsurface cross-section is inserted in this first draft.** The currently supplied North America design image and the numerical coordinate tables exist in the project, but a design image is not treated as an independently georeferenced measurement. A published figure, if later authorized, must depict the same waypoint order and distinguish straight chords, surface arcs, and the fixed turn. The present mathematical text and tables stand without an illustrative map.

Appendix G — Required Tables

The present draft contains the same classes of essential tables as the canonical manuscript: paper-role architecture, declared-input coordinates, source-derived lengths, ordered route segments, source inventory, regional evidence-status matrix, claim ledger, and equation registry. Their entries retain source provenance and do not infer missing geologic observations. No table includes a new energetic, mineralogical, or proprietary parameter.

Appendix H — Source Integration and Bibliography Protocol

50.12 Source Categories

The source record has four distinct functions. **Canonical structure:** the frozen ABC Sequencing Paper I determines the organization and scientific roles of this manuscript, not the North American measurements. **Controlling North American calculation:** *Denali Exact.pdf* records the author-fixed turn, source-solved entrance, ordered northern route, printed chord segments and totals. **Tabular numeric supplement:** the workbook lists seven downstream chord/arc pairs, labeled "Denali→Juneau" through "Chukchi→Trench"; its last two segment labels use *Chukchi* where *Denali Exact.pdf* uses the under-Siberia waypoint designation. **Developmental history:** the earlier short and 64 Ma math records document preliminary geometry, not alternative controlling inputs for this fixed-turn result. Those source labels identify a recorded correspondence within the calculation; the files do not independently establish a geological identity or event for the waypoint.

50.13 Citation Rules

A reference to the canonical paper supports a structural or methodological inheritance, not a claim that Everest data or 256 Ma parameter values also describe Denali. A reference to the Denali exact-distance note supports its coordinate and total-distance statements, not the independent existence of a geological causal pathway. A reference to the workbook supports the seven calculated pairs recorded in that worksheet. Each citation retains its proper role.

50.14 Internal Source Status

The controlling calculation is auditable from $R = 6{,}371\,\text{km}$, the fixed turn $M = (62.3843^\circ, -146.8997^\circ)$, the reported Denali reference $D = (63.0695^\circ, -151.0074^\circ)$, the fitted entrance and seven downstream workbook rows. The first second-leg chord derives from M and D; the spreadsheet begins only at Denali→Juneau. The last two spreadsheet entries are named Attu→Chukchi and Chukchi→Trench; the exact-distance note describes the corresponding penultimate waypoint as under-Siberia. Source nomenclature is preserved as documented. Calculation reproducibility is a narrower status than independent measurement accuracy, dated paleogeography, or physical event verification.

50.15 Bibliography Status

The initial draft cites the known canonical source and supplied project research records. It does not manufacture journal references or independently verified geological bibliography entries. The bibliography is thus complete **for the sources used** in this first adapted draft, rather than a claim that all empirical supporting research has already been assembled.

References

[1] Fine, Justin B. (2026). *Astro-Ballistic Chronostratigraphic Sequencing I: Aegean Entrance, Everest Midpoint, Mariana Exit*. Canonical Corpus Freeze 1.0, August 7, 2026. https://ontomics.com/pdfs/abc-paper-i.pdf. Controlling structural source.

[2] *Denali Exact.pdf*. Supplied Ontomics project PDF, 10 pages. Later fixed-turn, solved-entrance, two-leg source calculation.

[3] *Denali corridor segment workbook (.xlsx)*. Supplied Ontomics project numerical workbook, seven route segments. Direct source for its reported central angles, surface arcs, and chords.

[4] *Denali Short Math.pdf*. Supplied Ontomics project PDF, 15 pages. Earlier mathematical development record.

[5] *8-8-2025 64 ma ABC Math Full (1).pdf*. Supplied Ontomics project PDF, 85 pages. Earlier exploratory project and chronological context.

Appendix I — Paper-II Handoff Package

50.16 Event-Specific Handoff

The following source-qualified content is available to the next paper: the source-solved Malpelo-region entrance coordinate, the author-fixed turn, the Denali geographic reference and its 222.678 km offset, the ordered northern corridor, the terminal coordinate, the reference sphere, the pairwise chord equation, the single-chord Leg-1 definition, the eight-chord Leg-2 definition, and the reported equal 8061.8708 km totals. The narrative does not certify any physical mechanism, ancient carrier path, independently established age, or mineralogical response.

50.17 Handoff Boundary

Paper I transmits a geographic-and-mathematical candidate with provenance and known limitations. The original five-paper sequence assigns differentiated-Earth mechanics to Paper II. By direction of the Principal Investigator, proprietary energetic and bounce-back content is not provided in the present public version, and it is not replaced by assistant-generated speculation.

50.18 Causal-Edge Handoff Status

The algebraic edges from declared input to central angle, chord, route sum, solved entrance, and length equality are documented. Proposed edges from the candidate event to Denali or to the northern terminal are **not independently demonstrated in these numerical records**. They therefore cross no causal-certification boundary merely because the manuscript is complete as a draft.

Paper-I Working-Draft Status and Remaining Empirical Work

This manuscript contains all fifty canonical Paper-I chapter positions, their relevant nested hierarchy, the canonical appendix sequence, references, and Paper-II handoff. Its disclosure is intentionally limited to the Denali source's geometry and documented scientific status. It is a Refinement Pass 15 source draft of Paper I,
not a 167-page frozen canonical replacement and not an assertion that empirical research absent from the supplied materials has already occurred. The original research program's deeper manuscript development belongs to the user's established corpus-wide revision workflow.

External Scholarly and Data Context

ABC Sequencing I - North American Middle Mountain | Public Research Edition v1.7 | 17 November 2026

Citation function and limits. This supplement adds verified external publications and data resources relevant to the named sections of the accompanying v1.6-derived manuscript. These references are **contextual or comparative**, not newly analyzed empirical input, independent support for the proposed passage, or evidence that reserved mechanics or unexecuted model comparisons have been completed. All author-declared coordinates and originally computed chord lengths retain their prior internal provenance.

Section-indexed citation mapping

Manuscript section or subject	External reference IDs
Earth-model and ellipsoidal distance conventions (section 10-11)	E01
Malpelo entrance forensics (section 22)	E03, E06
Denali middle-mountain forensics (section 23)	E04
Northern terminal-domain forensics (section 24)	E02, E05
Chronostratigraphic/deep-time reconstruction (section 17)	E07
Null-model and statistical comparison (section 6.9)	E13

Source bibliography and declared relevance

[E01] Karney, C. F. F. (2013). Algorithms for geodesics. Journal of Geodesy, 87, 43-55.
https://doi.org/10.1007/s00190-012-0578-z
Role: Ellipsoidal geodesic computation and distance-method comparison; does not replace the manuscript's chord metric.

[E03] Werner, R., et al. (2003). Geodynamic evolution of the Galapagos hot spot system over the past 20 m.y. Geochemistry, Geophysics, Geosystems.
https://doi.org/10.1029/2003GC000576
Role: Published magnetic, geochemical and morphological context for Malpelo and adjacent ridges; not confirmation of a proposed entrance event.

[E06] Bird, P. (2003). An updated digital model of plate boundaries. Geochemistry, Geophysics, Geosystems, 4, 1027.
https://doi.org/10.1029/2001GC000252
Role: Reference digital plate-boundary map and plate-boundary classification for geographic comparison.

[E04] Matmon, A., Haeussler, P. J., Loso, M., and ASTER Team (2024). Anomalously high relief on Denali, Alaska, caused by tectonic, lithologic, and climatic drivers. Earth and Planetary Science Letters, 646, 118999.
https://doi.org/10.1016/j.epsl.2024.118999
Role: Observed Denali relief, fault geometry, erosion and multiple uplift explanations; comparison context, not an event attribution.

[E02] GEBCO Compilation Group (2025). The GEBCO_2025 Grid. General Bathymetric Chart of the Oceans.
https://www.gebco.net/data-products-gridded-bathymetry-data/gebco2025-grid
Role: Independent modern terrain/bathymetric grid for the described oceanic domains; not used to remeasure the frozen route here.

[E05] IBCAO Version 5 Compilation Group (2024). The International Bathymetric Chart of the Arctic Ocean Version 5.0. Scientific Data.
https://doi.org/10.1038/s41597-024-04278-w
Role: Independent Arctic Ocean bathymetric compilation; not a measured terminal-response signature in this manuscript.

[E07] Muller, R. D., et al. (2018). GPlates: Building a virtual Earth through deep time. Geochemistry, Geophysics, Geosystems, 19, 2243-2261.
https://doi.org/10.1029/2018GC007584
Role: Methods and limitations of deep-time plate/geographic reconstructions; no GPlates output has been newly computed here.

[E13] Kass, R. E., and Raftery, A. E. (1995). Bayes factors. Journal of the American Statistical Association, 90, 773-795.
https://doi.org/10.1080/01621459.1995.10476572
Role: Bayesian evidence/model comparison methodology; no Bayes factor has been computed for the North American event.

Release integrity and source-status convention

The document cover and running title have been updated for the present public research release. Original internal reference numbers [1], [2], etc. remain unchanged. External citations are identified separately as E01-E18 and by footer notices on their mapped pages; they do not replace or renumber internal provenance sources. Historical draft language and references to v1.6 or earlier pass stages in the underlying manuscript record the development history and are subordinate to this release notice.

Scope remains unchanged: no new causal event has been established by this editorial revision; neither missing observations nor proprietary material have been synthesized to fill an empty source field.