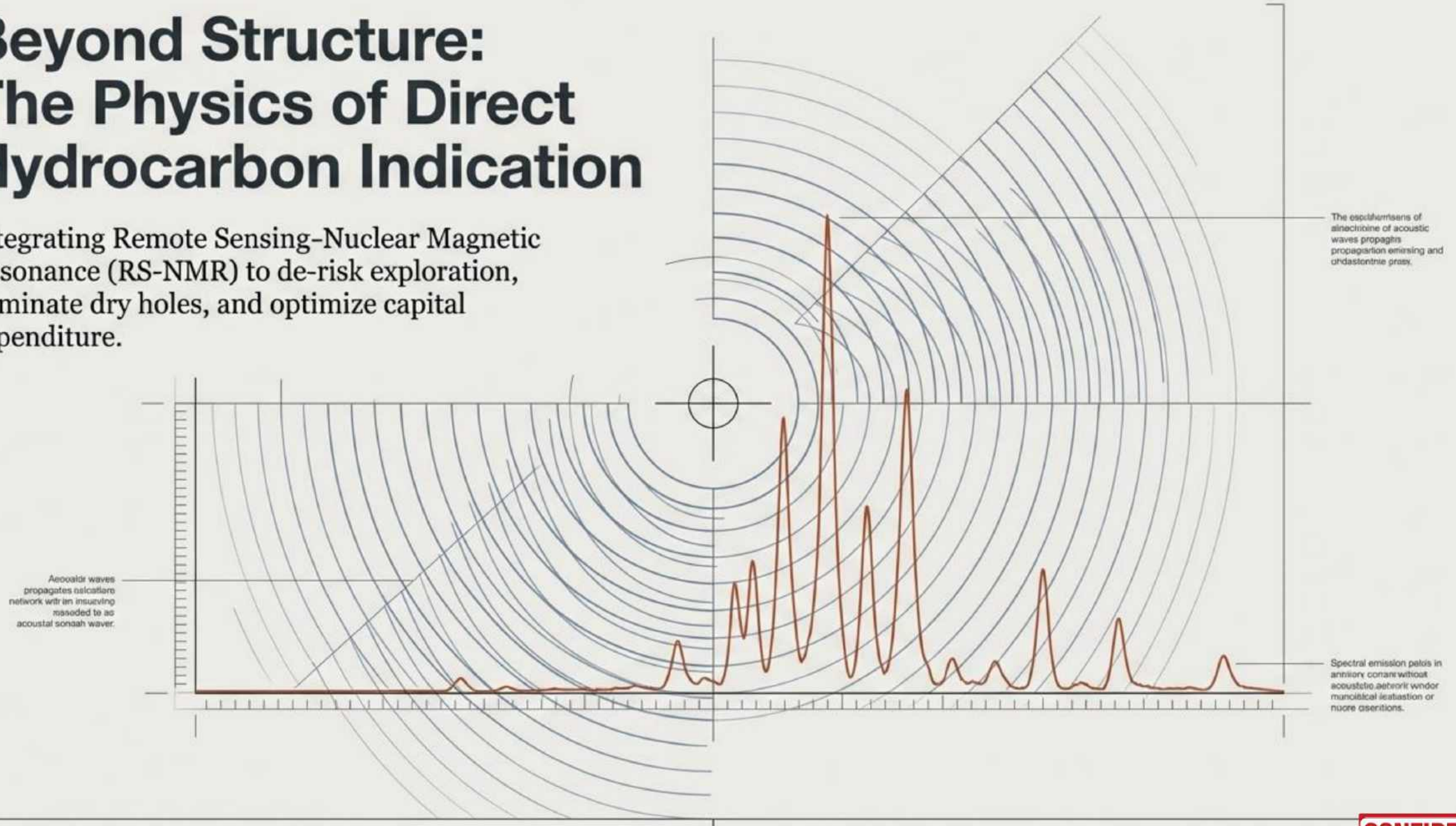
Beyond Structure: The Physics of Direct Hydrocarbon Indication

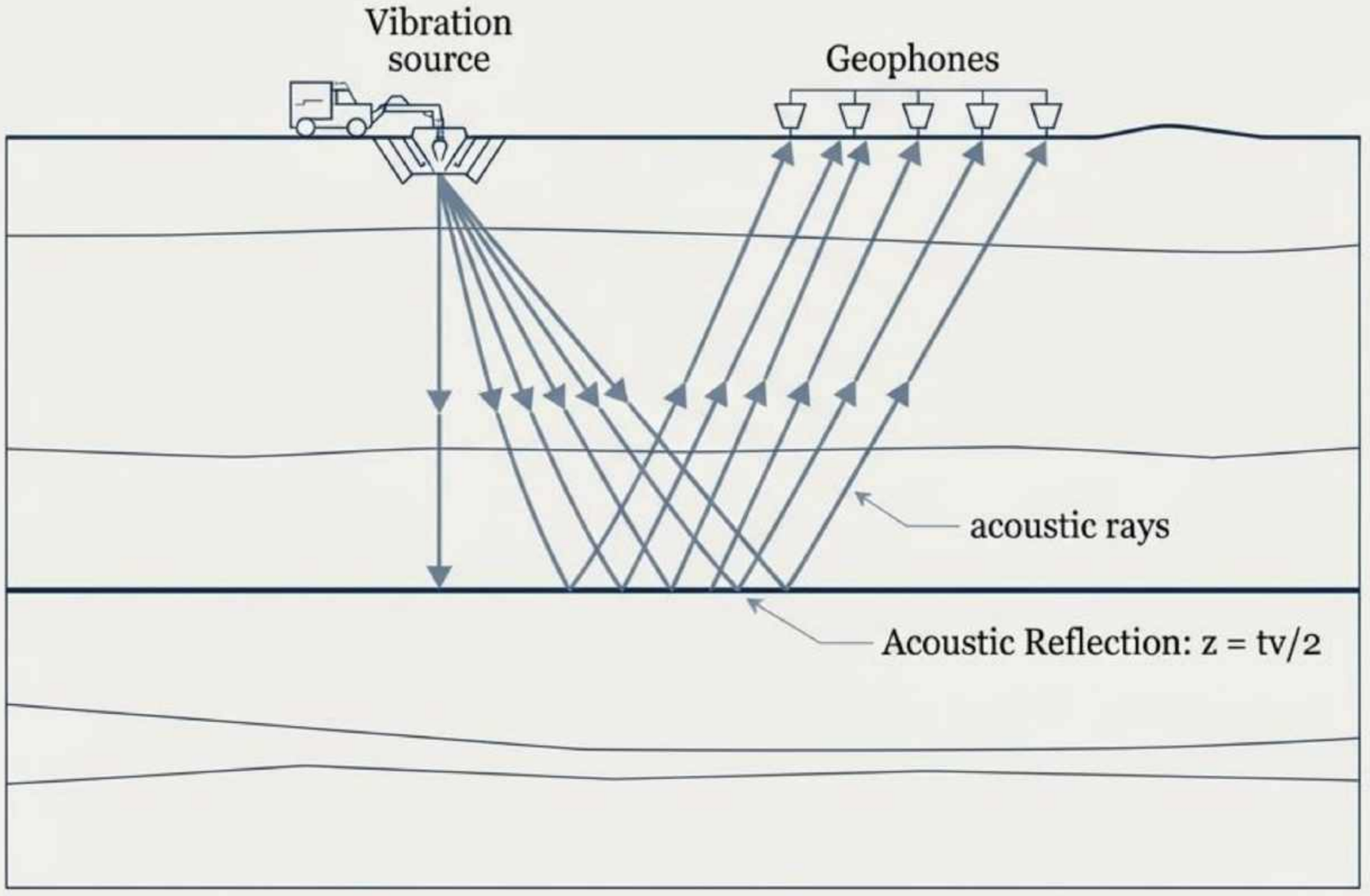
Integrating Remote Sensing-Nuclear Magnetic Resonance (RS-NMR) to de-risk exploration, eliminate dry holes, and optimize capital expenditure.



The Baseline: Acoustic Mapping of the Deep Earth

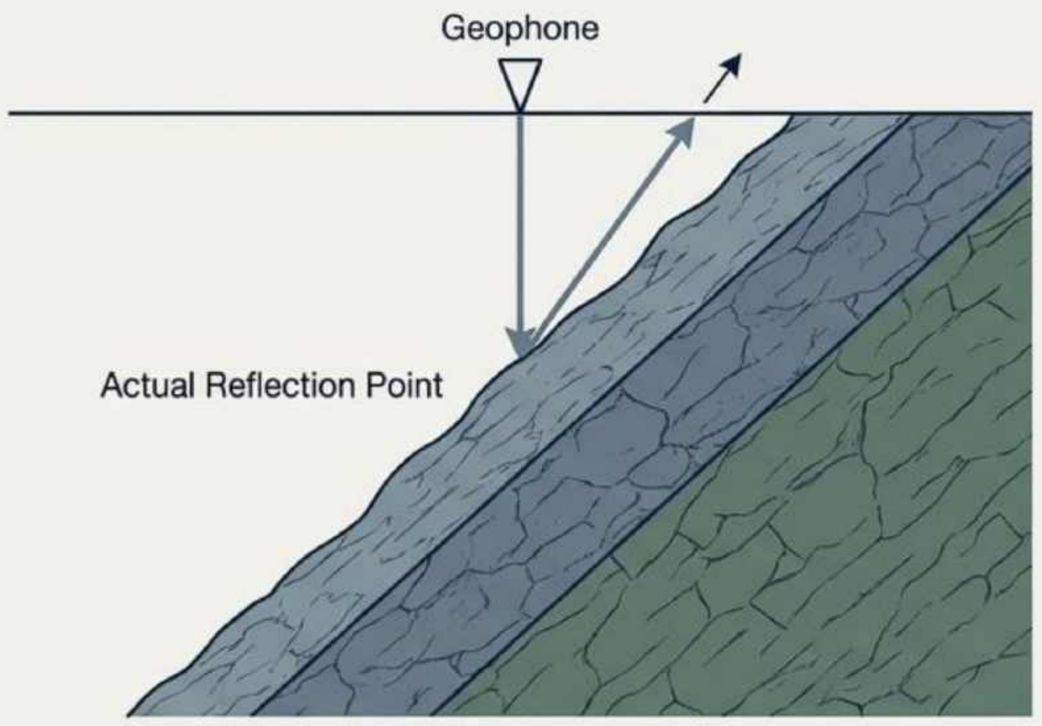
Traditional seismic exploration relies on acoustic wave propagation. By measuring the two-way travel time of sound waves reflecting off impedance contrasts, we map the physical architecture of the subsurface.

It is the undisputed gold standard for identifying structural traps, faults, and stratigraphic layers.

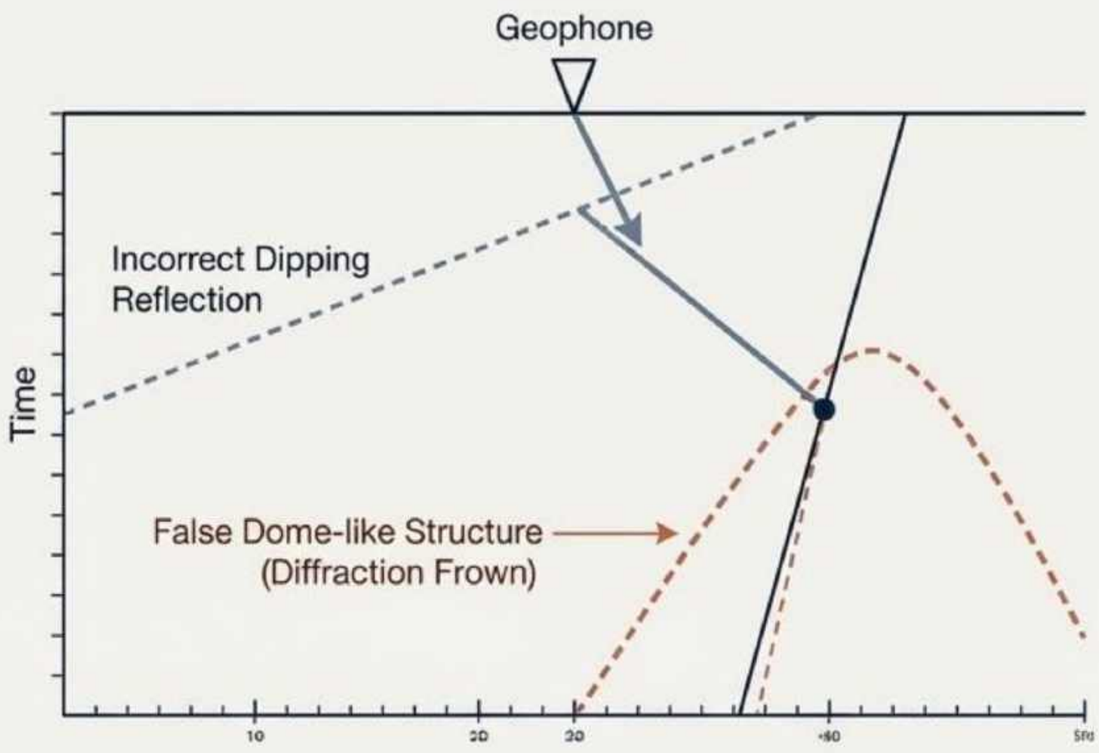


The Illusion of Depth: When Waves Deceive

The Reality



The Illusion

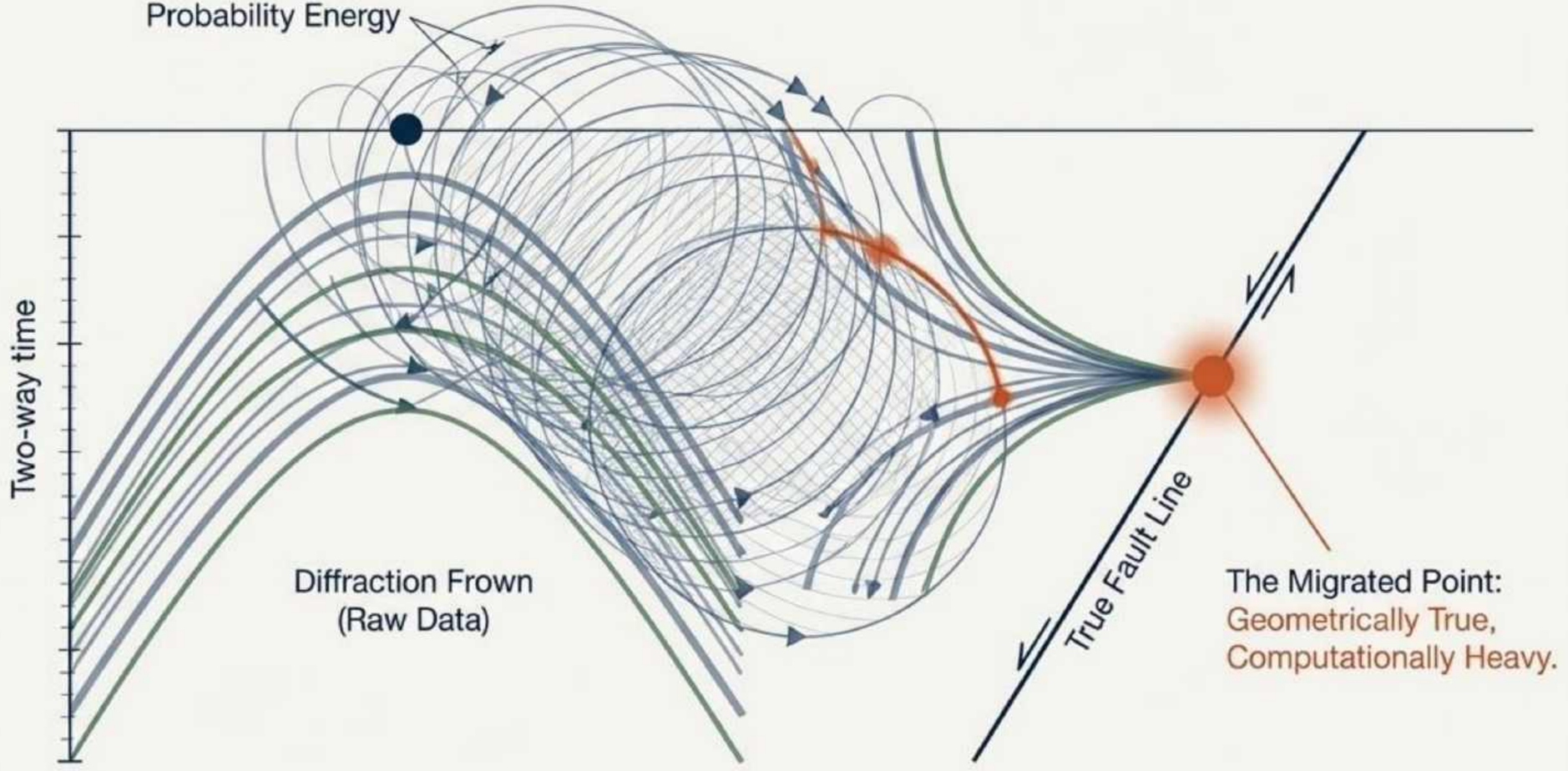


Raw zero-offset (ZO) data assumes reflections originate directly beneath the geophone. In complex geology, this assumption fails. Dipping layers appear with incorrect trajectories, and sudden faults scatter energy into diffraction frowns, creating false structural domes.

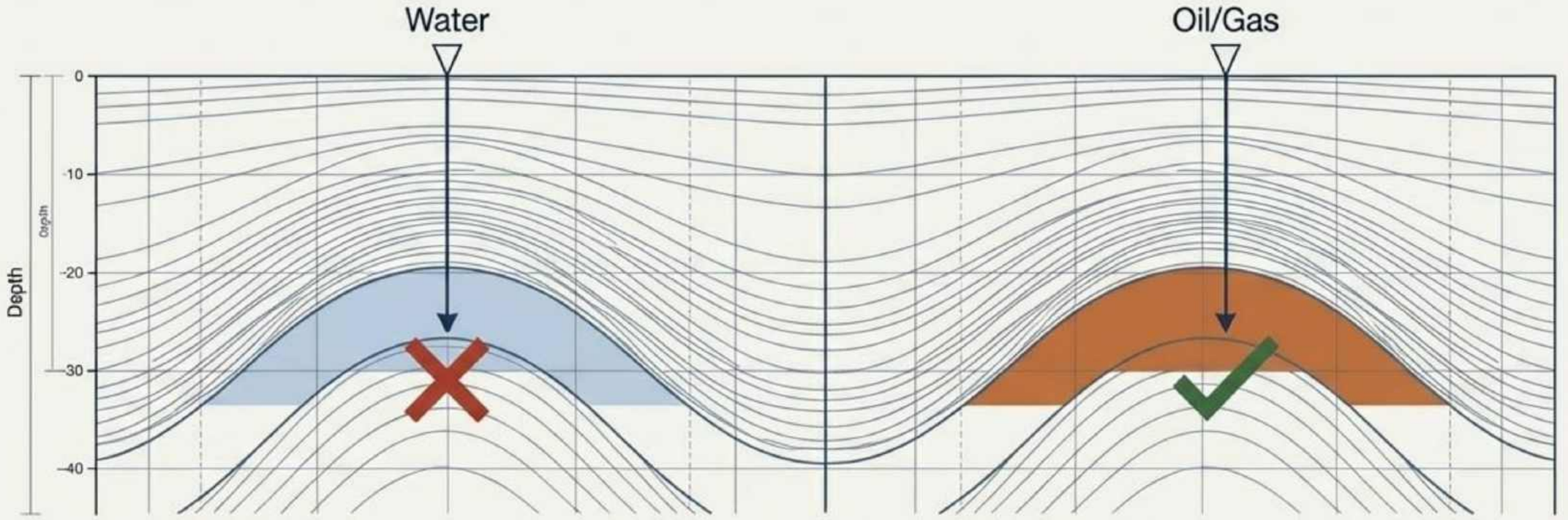
Migration: Forcing the Math to Match the Geometry

To correct these illusions, seismic migration smears and sums reflection energy along probability circles. The mathematical operation moves events back to their true origins, collapsing diffraction frowns into precise fault lines and correcting structural dips.

$$m \approx [L^T L]^{-1} L^T \mathbf{d}$$



The Blind Spot: Structure Does Not Equal Substance



Seismic migration provides the absolute best view of the container. It reveals the shape of the underground, the traps, and the faults. But it cannot definitively tell us what is inside that container. A perfectly migrated structural trap is just as likely to hold brine as it is to hold hydrocarbons. We need a tool that targets substance, not just structure.

THE CONSTRAINTS OF TRADITIONAL EXPLORATION

Time-Intensive

Standard exploration cycles require 2–3 years to complete.

Low Success Rate

Traditional methods yield an accuracy rate of only 25–45%.

Indirect Detection

Relies on secondary physical field anomalies rather than detecting the resource itself.

Capital Risk

High financial expenditure required for uncertain results.

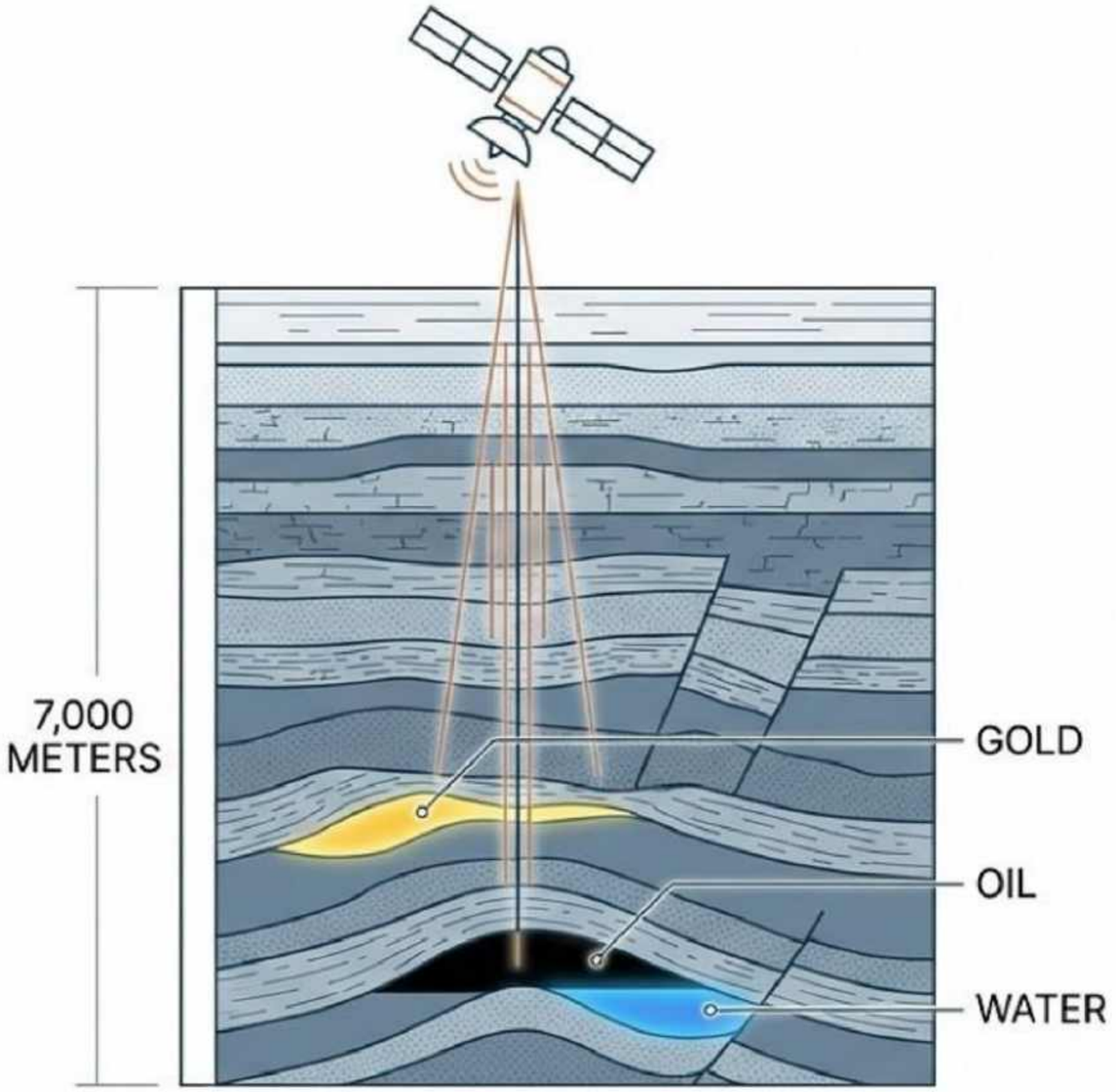
THE ‘POISK’ COMPLEX: DIRECT REMOTE DETECTION

CORE TECHNOLOGY:
- Utilizes Nuclear Magnetic Resonance (NMR) spectra analysis in the Earth’s magnetic field.

- Integrates with electromagnetic resonance testing via satellite or airborne sensing.

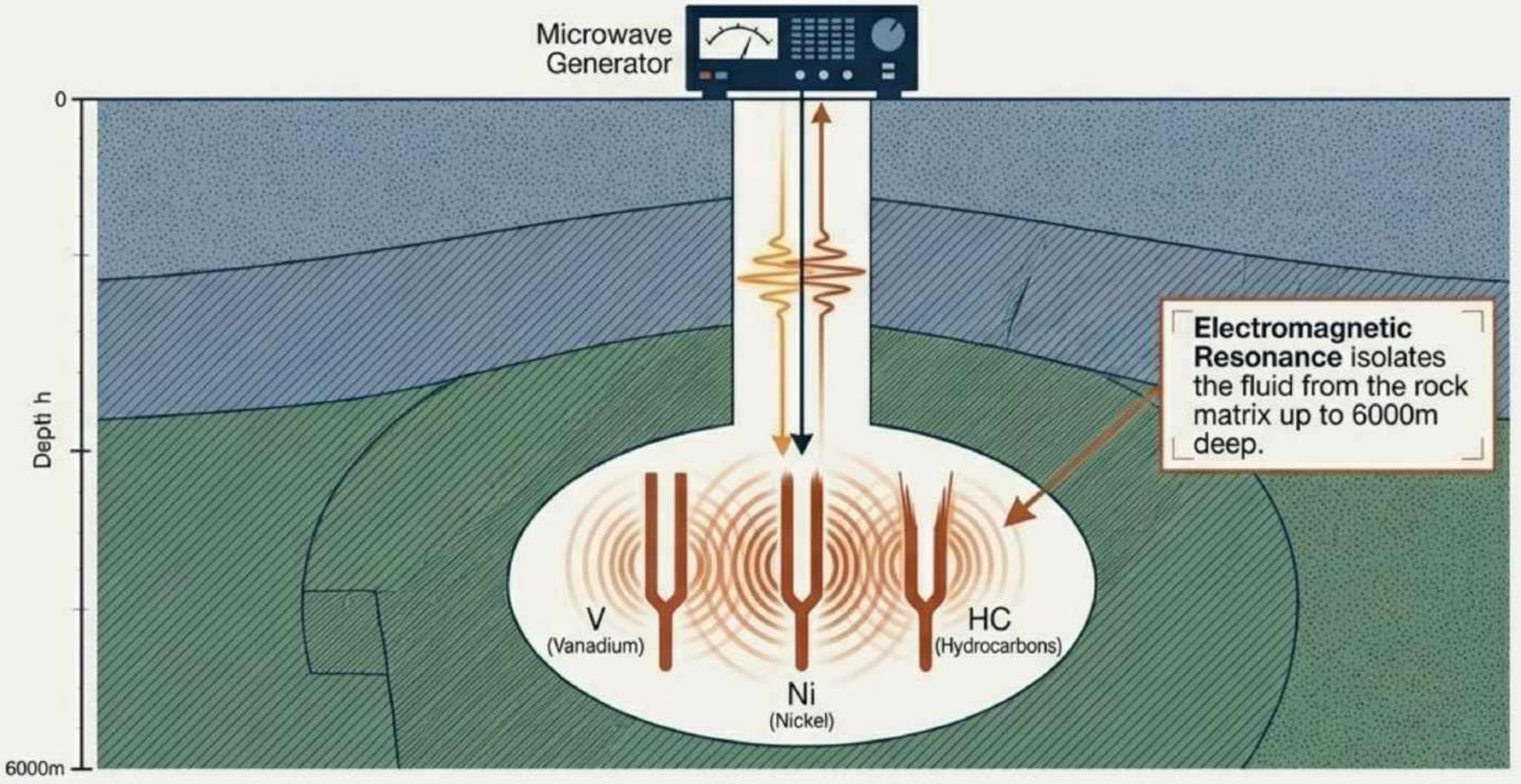
KEY DIFFERENTIATOR:
- Detects the specific material type (Oil, Gas, Water, Polymetals) rather than just rock anomalies.

OPERATIONAL DEPTH:
- Effective detection up to 7,000 meters into the Earth’s interior.

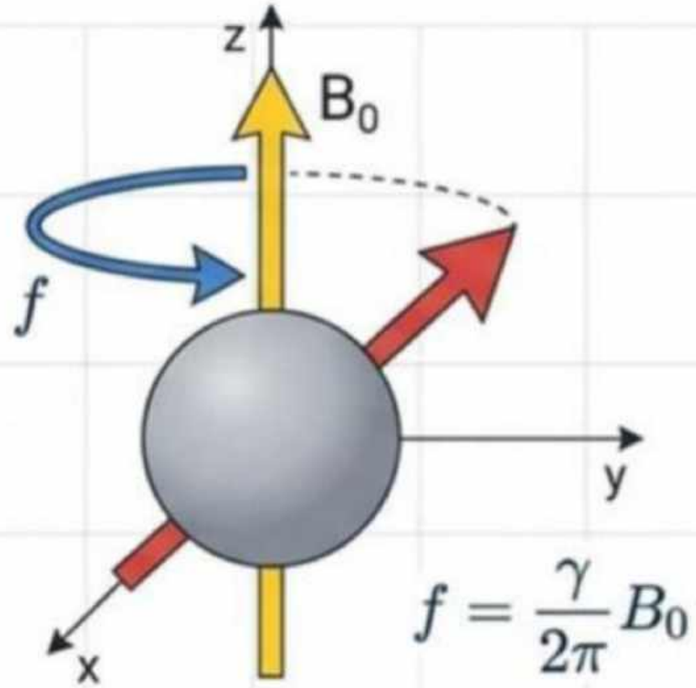


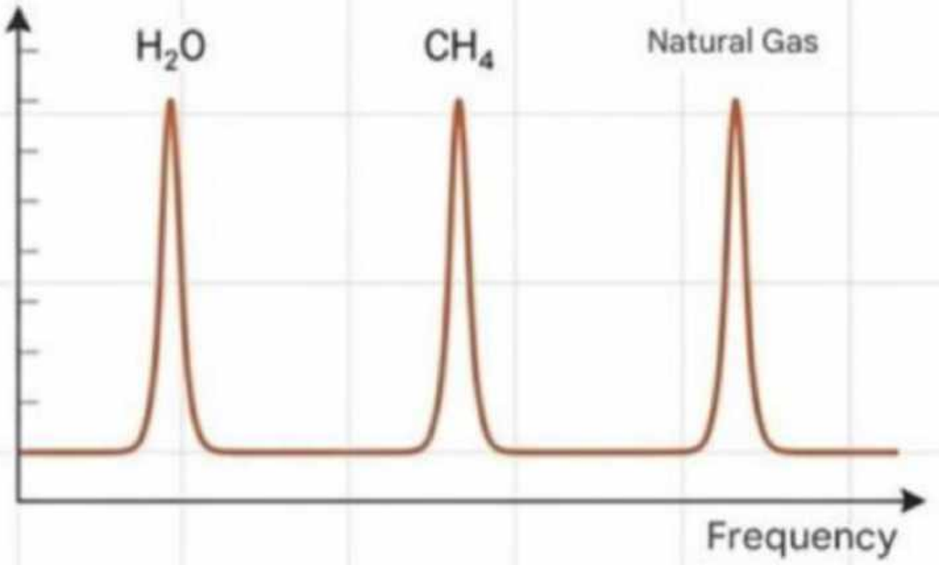
RS-NMR: The Physics of Atomic Resonance

Instead of acoustic waves bouncing off rock boundaries, POISK RS-NMR technology uses electromagnetic resonance to directly target the atoms the atoms inside the fluids. By transmitting specific gigahertz frequencies, only matching reference only matchnce elements ar (like the metals trapped in specific oil types) resonate and return a signal.



Each substance has a spectral "fingerprint" that we can read remotely.

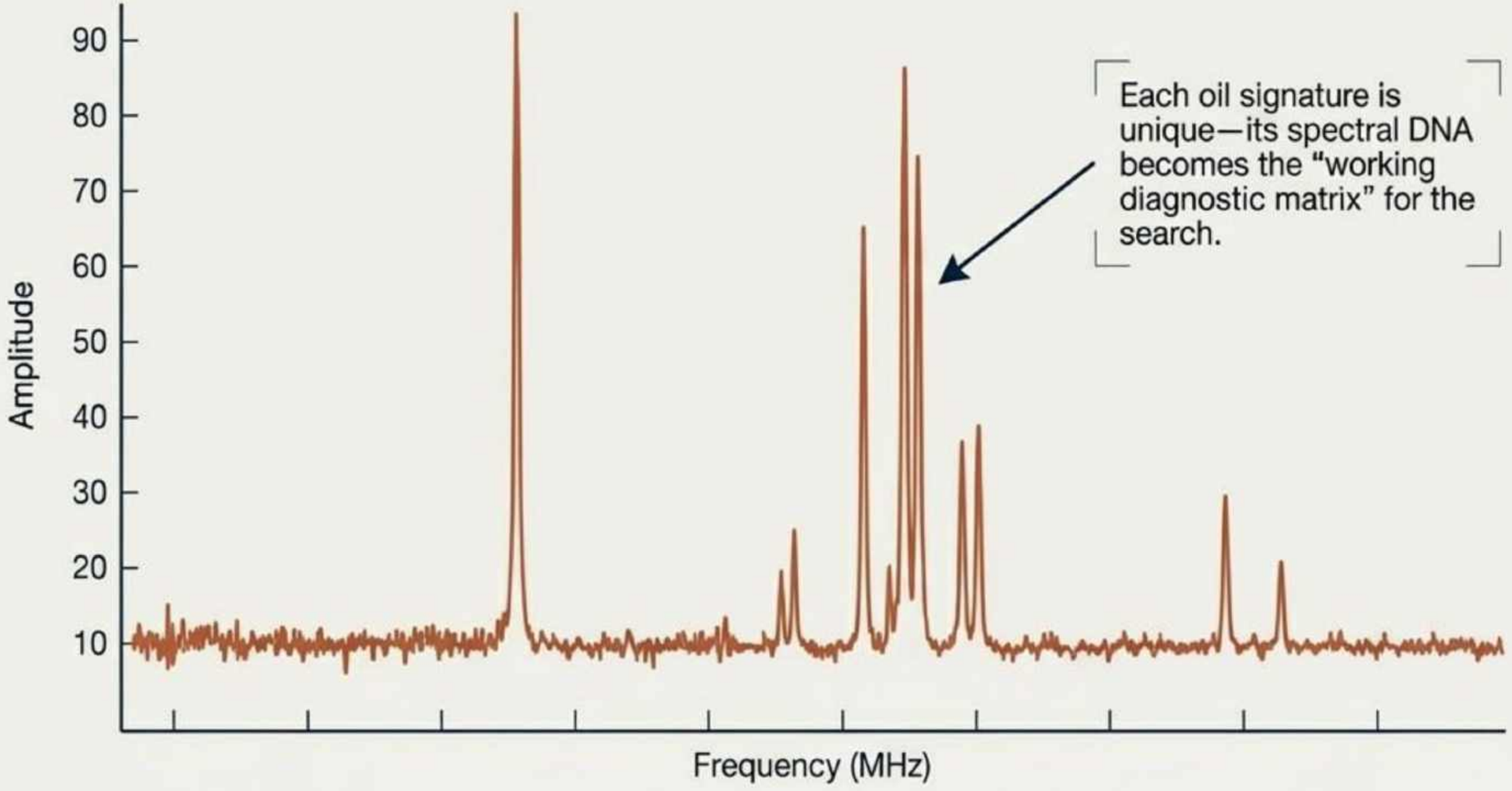




The technology is based on the effect of Nuclear Magnetic Resonance (NMR). By exciting atomic nuclei, we measure their resonance frequency. This "chemical shift" is unique to each molecule (water H_2O, methane CH4, etc.), allowing for unambiguous identification of the substance being sought, separating its signal from background noise.

Phase 1: The Library (Spectral Database)

Before ever looking at a map, we define the exact target. Using a neutron activation method in the lab, oil and gas samples from the target play are heated to 2500°C. We record the integral electromagnetic spectra of their reference elements (Vanadium, Nickel, Carbon, Sulfur).

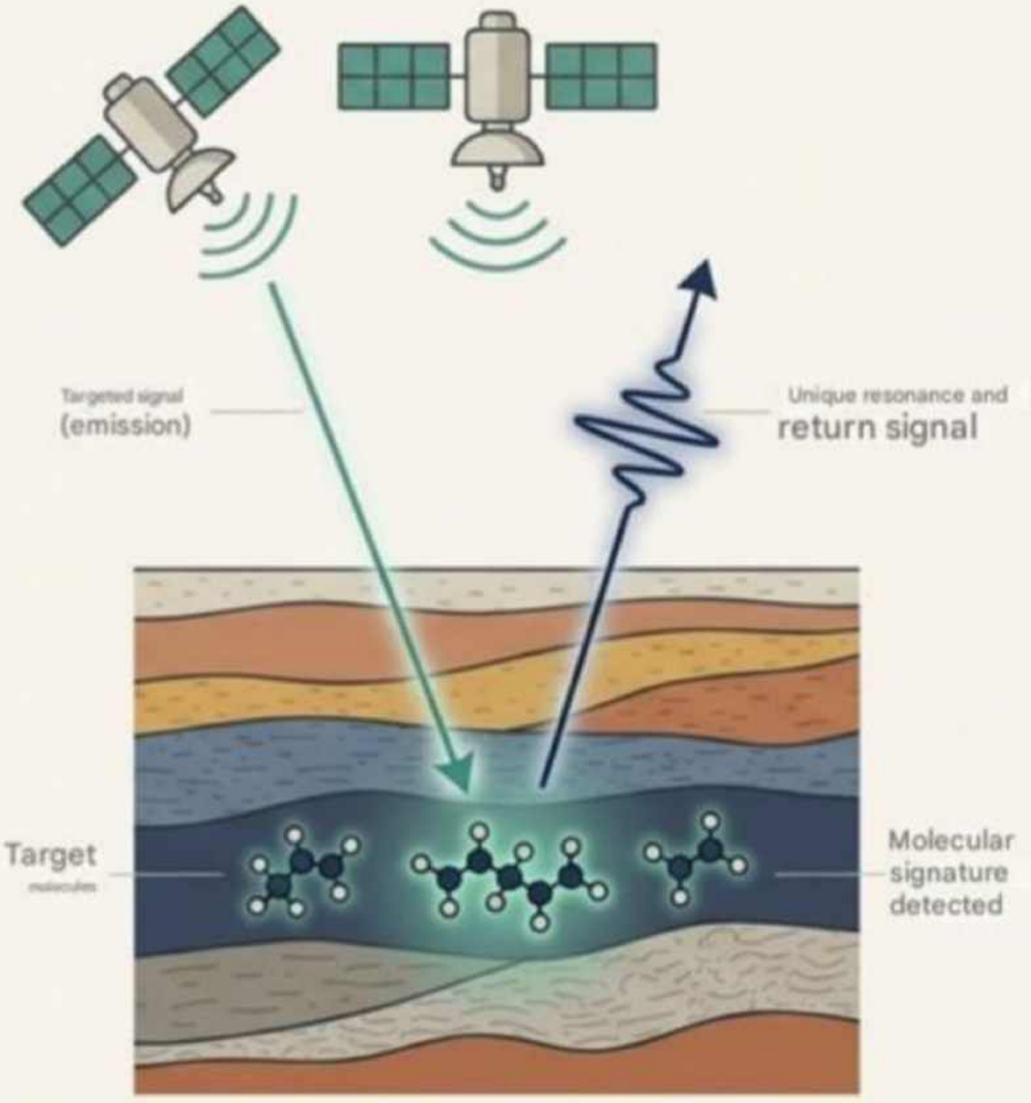


The solution: RSS-NMR technology for direct detection.

Instead of searching for geological structures, we directly detect the molecular signature of minerals.

The technology is based on Nuclear Magnetic Resonance (NMR), a physical phenomenon that allows the identification of specific substances. We excite the atomic nuclei of the mineral being sought (oil, gas, water) and measure their unique resonance signal, the Larmor frequency.

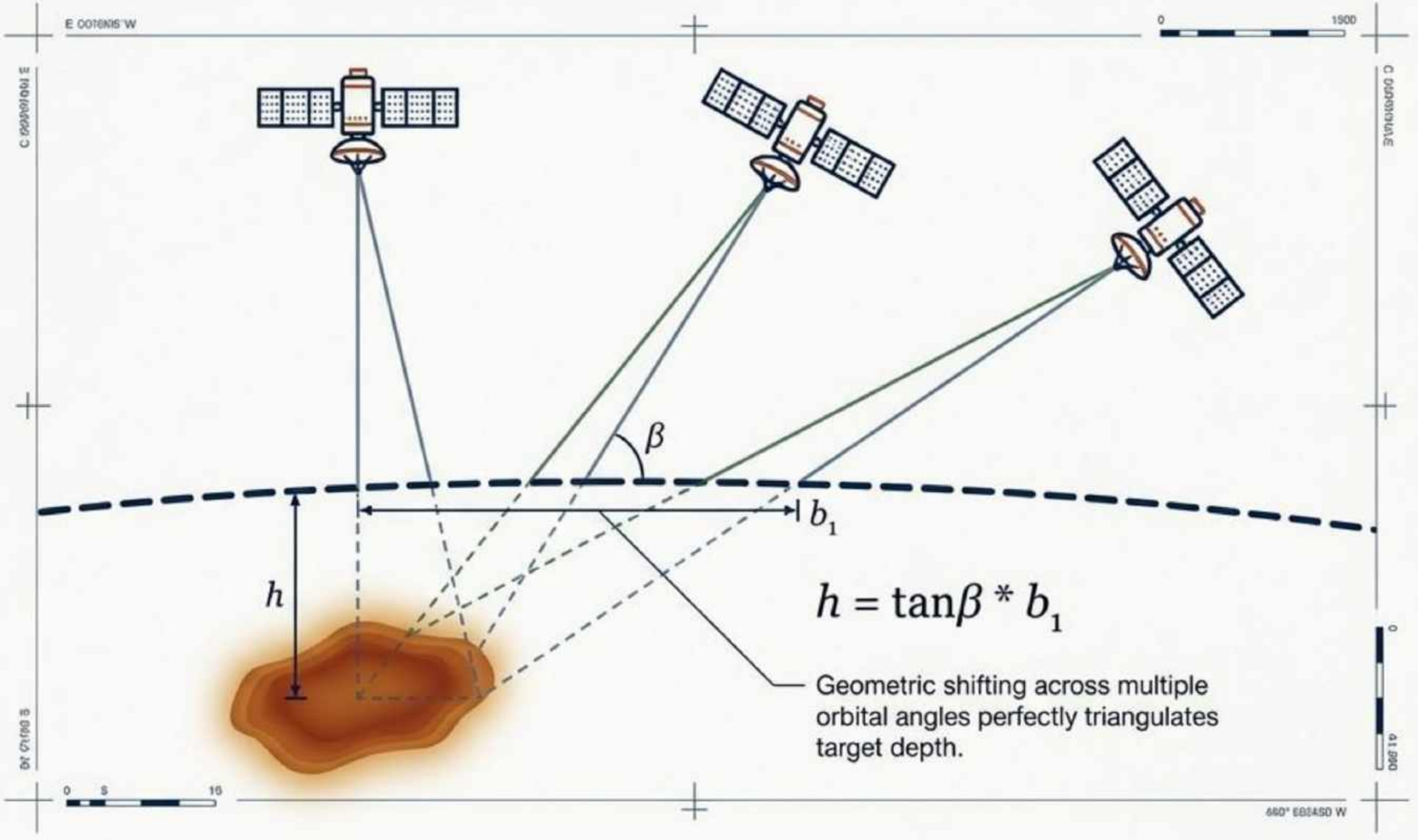
- Direct detection: Unambiguous identification of the mineral.
- Drilling depth: 0 to 7 km.
- Applicability: Onshore and offshore, with no terrain restrictions.
- Safety: Completely harmless to humans and the environment.



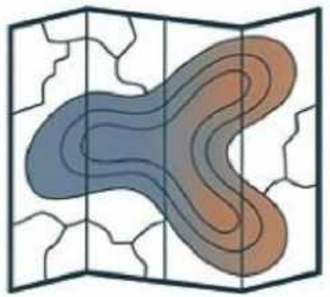
Phase 2: The Eye (Orbital Triangulation)

We scan vast acreages using satellite analog images processed with specific nanogels to visualize electromagnetic fields. Anomalies appear as high-brightness zones.

Because we know the exact angle of the satellite, we can mathematically forecast the depth of the geological body before ever stepping foot in the field.



TWO-STAGE EXPLORATION METHODOLOGY



STAGE 1: REMOTE GEOCHEMISTRY

Duration: 0–2 Months

- **Objective**: Identify dispersion halos over large territories.
- **Deliverable:** Conclusive report on presence/absence of anomalies.

STAGE 2: PRECISION DELINEATION

Duration: 2–3 Months

- **Objective:** Refine anomaly boundaries via satellite imagery.
- **Deliverable**: Exact drill point identification, tectonic fault mapping, depth analysis, and industrial concentration estimates.

DETECTION CAPABILITIES BY RESOURCE TYPE

HYDROCARBONS

- Oil
- Gas
- Gas Condensate

STRATEGIC ORES & MINERALS

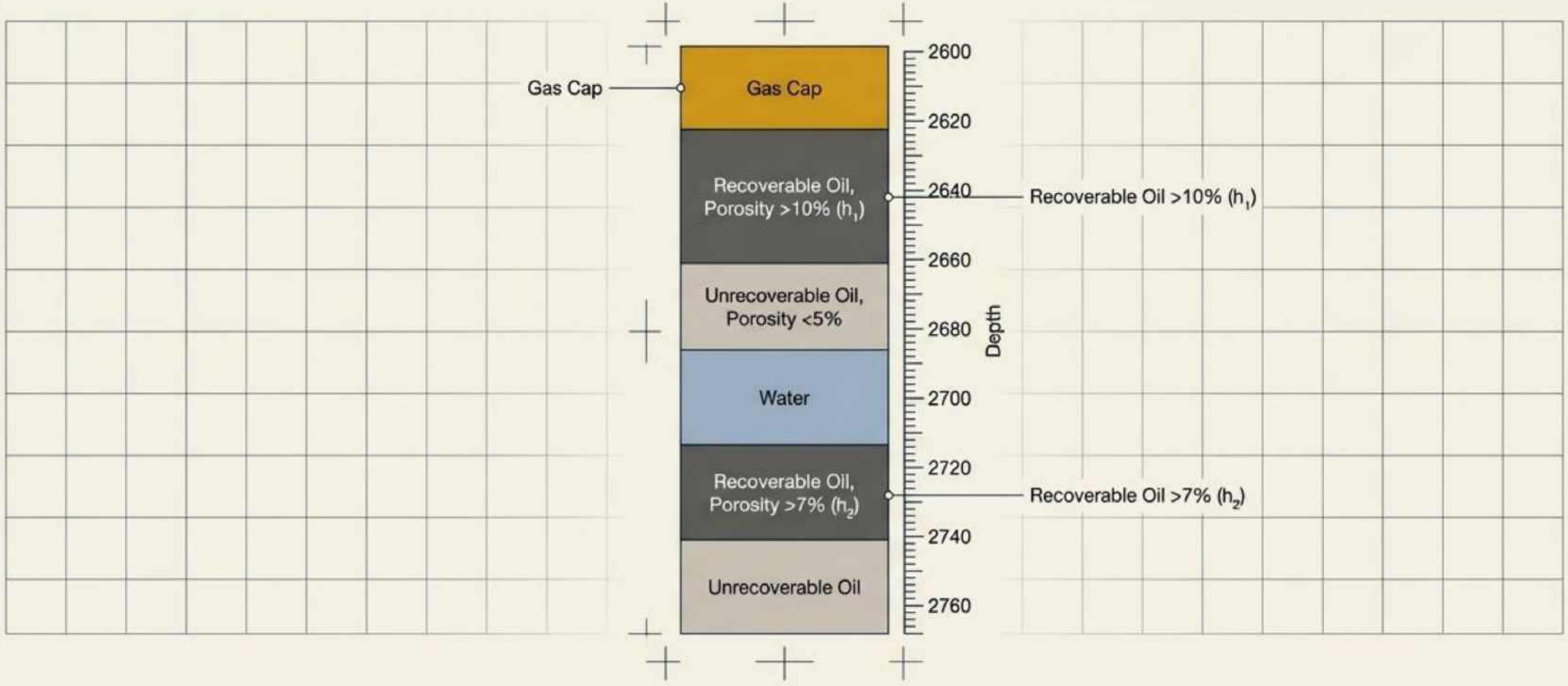
- Gold
- Copper
- Uranium
- Lithium
- Diamonds
- Nickel
- Lead

WATER RESOURCES

- Drinking Groundwater Accumulations
- Geothermal Sources

Methodology identifies specific material signatures, distinguishing them from general geological anomalies.

The Output: High-Resolution Fluid Stratigraphy

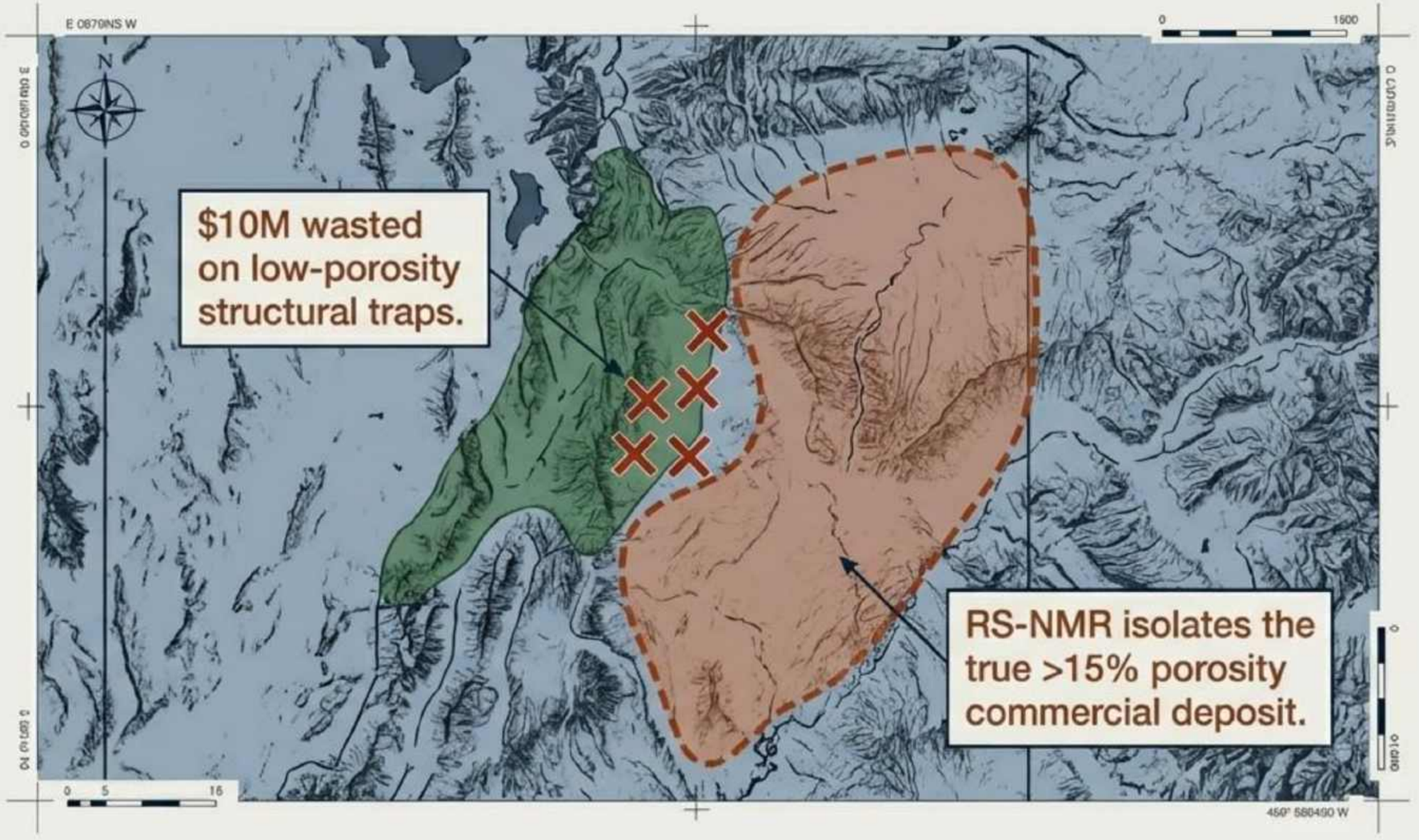


RS-NMR doesn't just say "oil is here." It differentiates between gas caps, water layers, and oil saturation. Crucially, it combines resonance data with client reservoir properties to map actual porosity, isolating the specific intervals (h_1, h_2) where oil is commercially recoverable versus trapped in dense rock.

Case Study: Correcting the $10M Blind Spot (Utah, USA)

An operator spent $10 million drilling 4 dry wells based on traditional structural data. Deploying RS-NMR, POISK identified that the structural anomalies had low porosity.

The survey uncovered a completely missed extension of the commercial deposit with >15% rock porosity. The client adjusted their drill locations to the RS-NMR targets and struck producing wells.

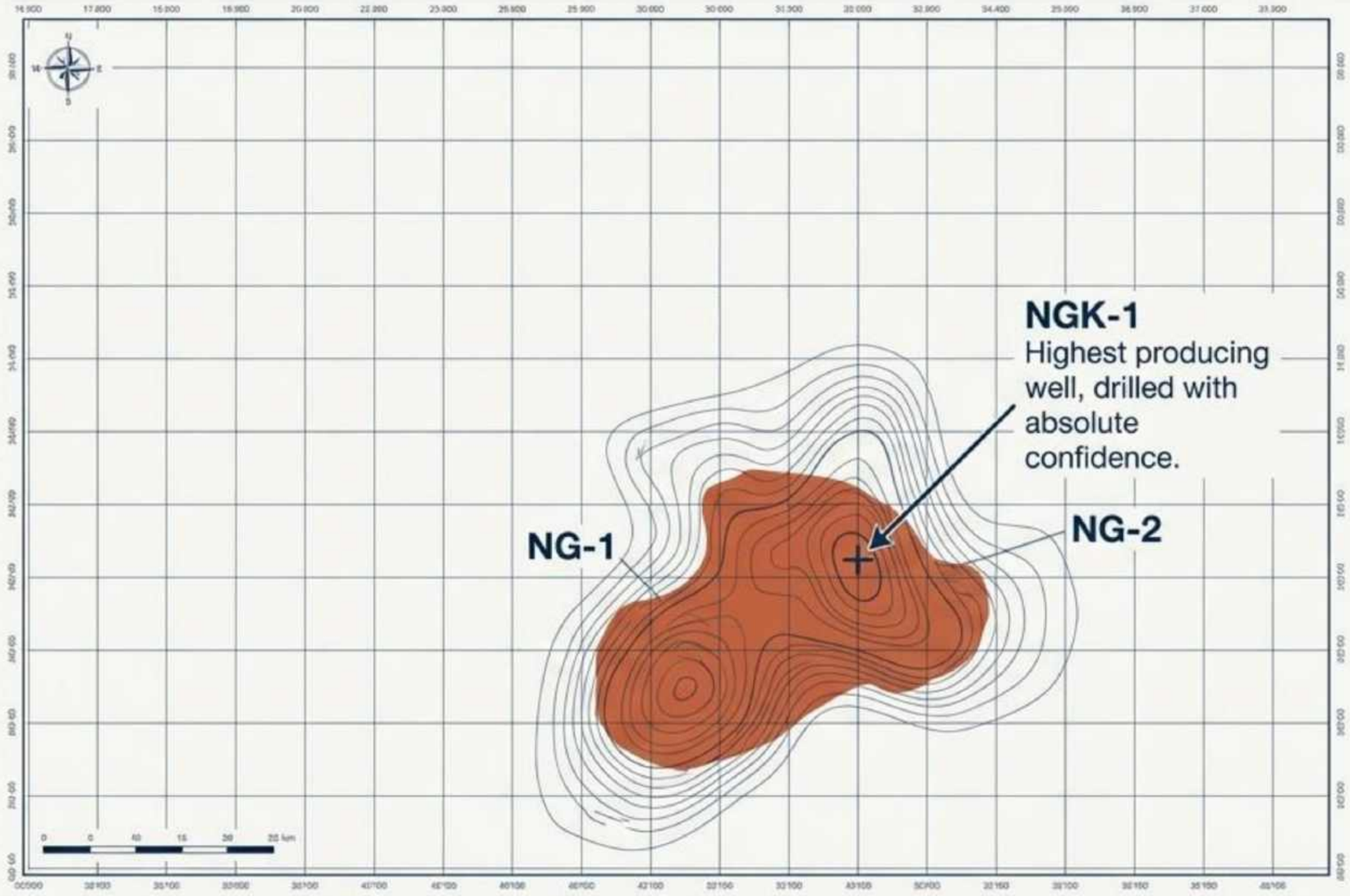


The Synthesis: Guiding the Seismic Scalpel (Atlantic Offshore)

In a 2021 blind test offshore West Africa, POISK scanned a massive block using only its orbital/spectral database. It pinpointed specific hydrocarbon anomalies.

Armed with this exact map, Armed with this exact map, the operator purchased only the 1000 LKM of 2D seismic data that crossed the anomalies—ignoring 3000 LKM of dead zones.

The subsequent NGK-1 well, drilled dead-center on the anomaly, became the highest-producing well in the area.



The Exploration Toolkit Matrix

Dimension	Traditional Seismic (2D/3D)	RS-NMR (POISK)
Core Mechanism	Acoustic wave reflection	Electromagnetic atomic resonance
Primary Deliverable	Structural traps, faults, and geometry	Direct fluid indication and mineral composition
Optimal Phase of Use	Post-discovery appraisal & volumetrics	Pre-drill screening & macro-reconnaissance
Cost Benchmark	Highly capital intensive	<1% the cost of a single dry well
Execution Time	Months to years for acquisition/processing	~2 months for 1000 sq. km

Synthesis: Use RS-NMR to find **WHERE** the fluid is. Use Seismic to map **HOW** to drill it.

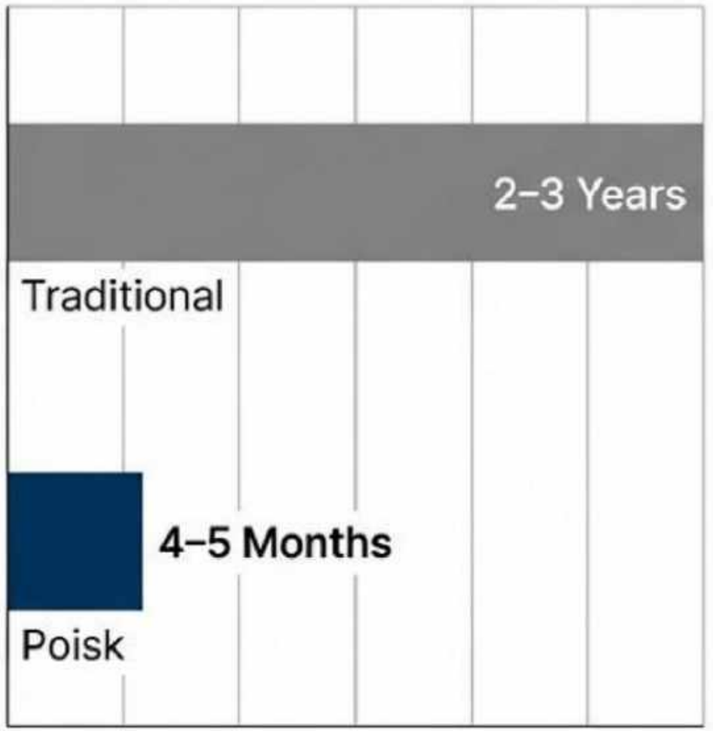
PERFORMANCE METRICS VS. TRADITIONAL METHODS

COST EFFICIENCY

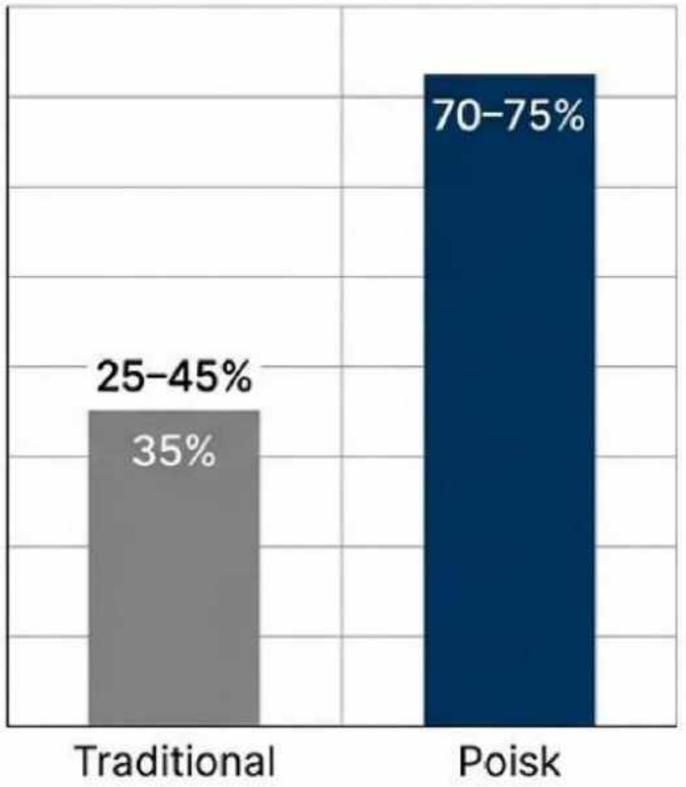
10–15x

Reduction in financial expenditure compared to standard exploration.

SPEED



ACCURACY



STRATEGIC BUSINESS IMPACT

RISK MITIGATION

Significantly reduces financial risks associated with "blind" exploration methods.

PRE-DRILLING INTELLIGENCE

Identification of tectonic faults and exact drilling points before heavy machinery is deployed.

RESOURCE ESTIMATION

Provides estimated volume of hydrocarbon/ore resources during the remote phase.

A Strategic Tool for Every Asset Lifecycle Stage

NEW FIELDS & LICENSING ROUNDS

- Rapidly explore large areas to identify and prioritize the most promising blocks.
- Enter licensing auctions with a significant information advantage.
- Drastically reduce the cost of systematic seismic across 100% of a new field when only 15% may be prospective.

MATURE FIELDS & M&A

- Determine the true potential of assets during merger or acquisition due diligence.
- Re-explore mature fields to find missed opportunities and increase production—a faster, cheaper path to value than a new greenfield project.

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