

How reliable are 2D seismic surveys from the 1960s?

How reliable are 3D seismic surveys from the 1980s?

And how is RSS-NMR re-exploring these old deposits because science has advanced?

To understand why so many deposits discovered in the last century still hold hidden treasures, we must compare the technologies of the time with the scientific breakthrough brought about by **RSS-NMR** today.

Here is the assessment of historical reliability versus the power of modern re-exploration.

1. 2D Seismics of the 1960s: The Era of the "Blind Pioneers"

In the 1960s, seismic surveying enabled great discoveries, but its technological reliability was extremely limited by our current standards.

- **Technology:** Analog recording on magnetic tapes, primitive vibratory trucks or the massive use of dynamite. Data processing was done on computers with rudimentary capabilities.
- **Reliability (Low, approximately 20 to 30% geometric certainty): * The "Curtain" effect:** 2D only provides a vertical cross-section (like a slice of cake). Everything that happened between two seismic lines (sometimes several kilometers apart) was entirely extrapolated and guessed.
 - **No real relief:** Impossible to properly map complex stratigraphic traps, wedges or subtle faults.
 - **Signal quality:** The background noise was immense, masking deep or thin tanks.
- **As a result,** only the giant and obvious structures (the major anticlinal domes) were visible. Everything else was ignored.

2. 3D Seismics of the 1980s: The Revolution of Forms (But without Fluids)

The 80s introduced the goldmine of 3D texturing thanks to the arrival of the first supercomputers.

- **Technology:** Digital recording, multiplication of sensors (geophones/hydrophones) and three-dimensional meshing of the subsoil.



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- **Reliability (Average to Good geometrically, 50 to 60% for the structure):**
 - **Visualization of volumes:** For the first time, we were able to see the real shape of the structures and identify the major faults that compartmentalize a deposit.
 - **Limitations of the time:** Resolution (separation power) remained low. Thin tanks (less than 20-30 meters thick) went undetected by radar.
 - **The problem with the contents:** 3D modeling from the 1980s shows the shape of the container (the rock), but is unable to definitively determine its contents (salt water, oil, gas?). Many wells were drilled into magnificent 3D structures that turned out to be aquifers (filled with water).

3. How the RSS-NMR is Re-Exploring These Old Deposits

Between 1960/1980 and 2026, science has taken a giant leap. The combination of **Spectral Resonance Survey (SRS)** and **Nuclear Magnetic Resonance (NMR)** no longer seeks only to send shock waves to make an "ultrasound" of the rock; it directly interrogates the atoms.

A. Removing the uncertainty of " Pay to See "

With older seismic methods, exploration was a game of poker: drilling was a "pay and see" approach to oil detection. RSS-NMR provides **scientific certainty before drilling** . By exciting the hydrogen nuclei in subsurface fluids, it obtains a unique spectral response. If the oil resonance signal is detected, the fluid is present. It's a **direct detection** .

B. Shedding light on the "Ghost Areas" of old data

Where data from the 1960s and 1980s collide and become blurred (due to salt layers, surface gas formations, or complex sedimentary wedges), the RSS-NMR cuts through . allow of :

 RSS NMR THE SIMPLE WAY OF EXPLORATION	Michel L. Friedman-Matarese (Destom LH 67/11)	
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- **Uncovering subtle stratigraphic traps:** Oil pockets isolated by variations in rock that old 3D considered a single compact and sterile mass.
- **Identifying Unswept Areas:** In an old oil field that has been in production for 40 years, water has pushed the oil, but unevenly. NMR precisely identifies the highly porous compartments where the oil has remained trapped and intact.

C. Characterize the rock from a distance

Modern science now makes it possible to obtain microscopic details from the surface via NMR or through optimized well analyses:

- **Effective porosity:** What is the pore size?
- **Permeability:** Will the oil flow easily towards the well to rise to the surface and be commercial?
- **Distinction between Mobile Fluid and Bound Fluid:** It eliminates the risk of drilling in an area where the oil is heavy or so stuck to the rock that it will never come out.

In conclusion: A second life for the Brownfields

Re-exploring an old deposit with RSS-NMR is like putting on infrared goggles in a room where you previously walked with just a candle (the 2D of the 1960s) or a flashlight (the 3D of the 1980s). You use the existing infrastructure (the wells already drilled), but you adjust the trajectories (sidetracks) with millimeter precision to target the millions of barrels left behind due to a lack of technology.