

Litt om meg:

Født i Østerrike 1967

Utdannet geolog

I Norge siden 1998

3 år i Skottland (Aberdeen)

2 år i København

Siden 2010 i Oslo

Senior geolog

For disse selskaper har jeg jobbet:

- Schlumberger
- ConocoPhillips
- Maersk Oil & Gas
- AGR
- Concedo (siden 2013)

Østerrikes høyeste fjell



Hva er en blow out (utblåsning)?

Hvordan leter man etter olje/gass?

The Petroleum Play Concept

- Hva er en kildebergart
- Hvordan strømmer olje/gass til en felle?

Kan man se olje/gass i seismiske data?

Hvordan får en oljeselskap en borelisens?

Hvor mye olje produserer hele verden?

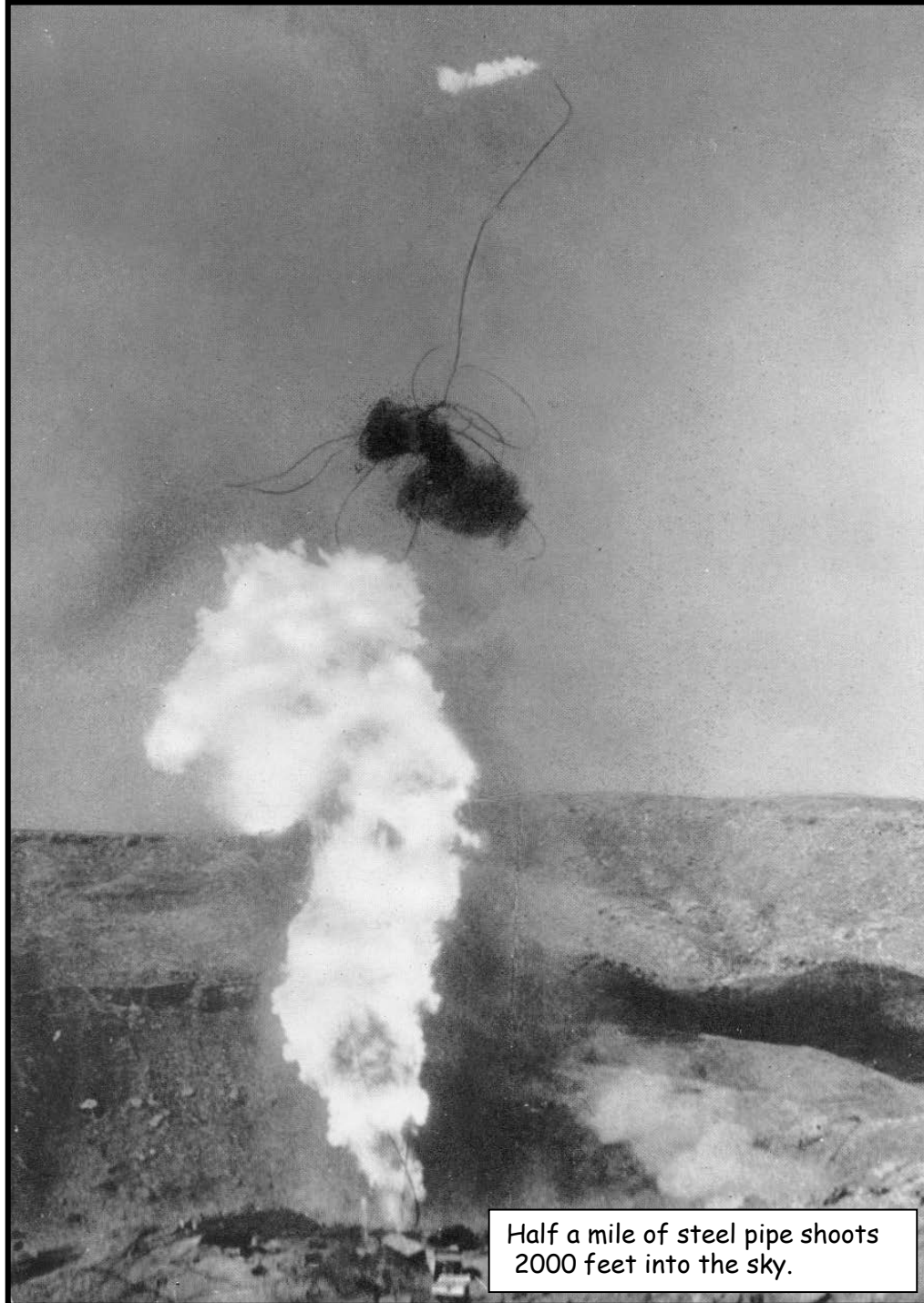
Verdens lengste horisontal brønn

What is a Blow Out (utblåsning)?

Vi skal IKKE snakke om disse utblåsninger!!



Gulf of Mexico, April 2010 – Deepwater Horizon

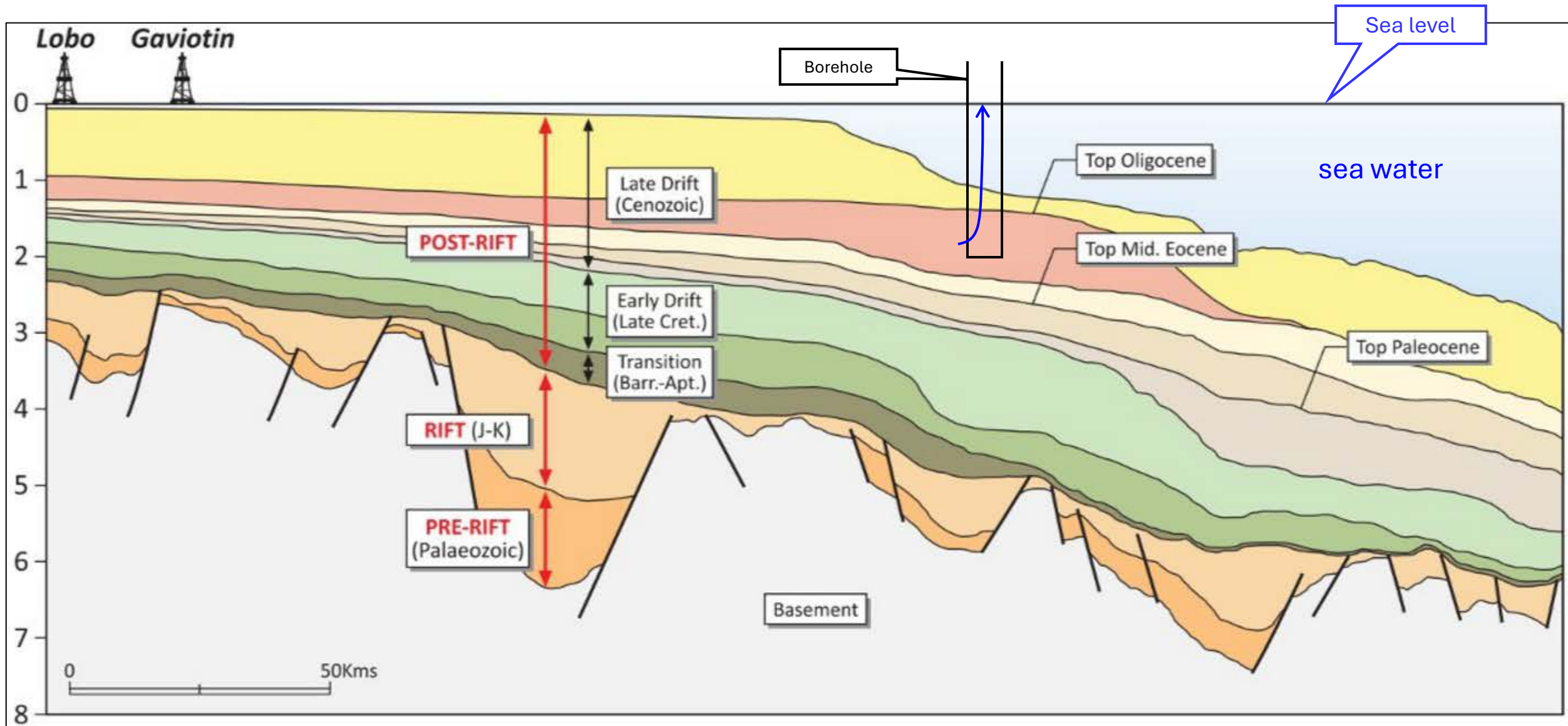


Half a mile of steel pipe shoots 2000 feet into the sky.



Blow out (Lucas Gusher), Spindletop, Texas, 1901

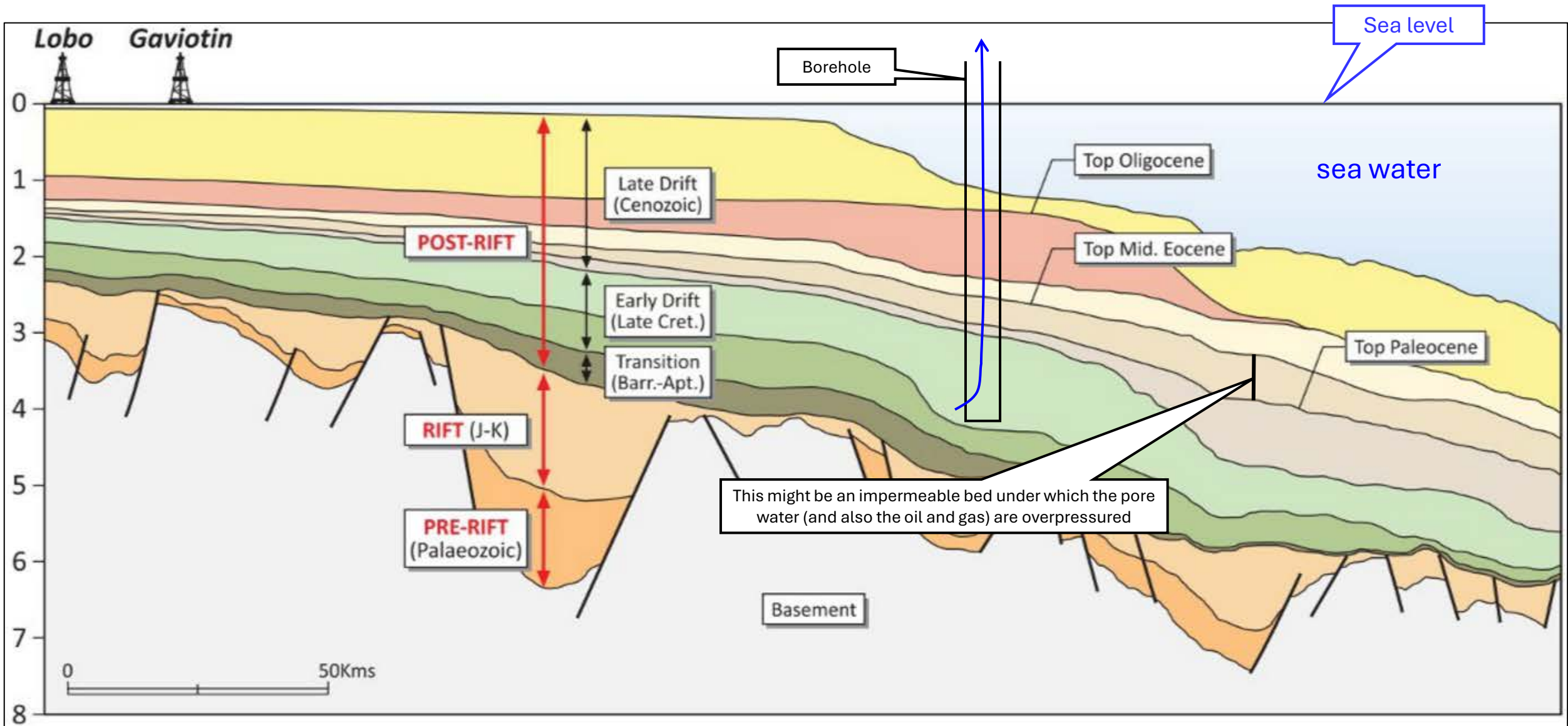




Water in a borehole from shallow sediments will rise to the present sea level.

This is called **hydrostatic pressure**.

The sea water and the pore water of the shallow sediments communicate with each other.



Water in a borehole from deeper sediments will rise **ABOVE** the present sea level.

This is called **overpressure**.

The sea water and the pore water of the deeper sediments don't communicate with each other.

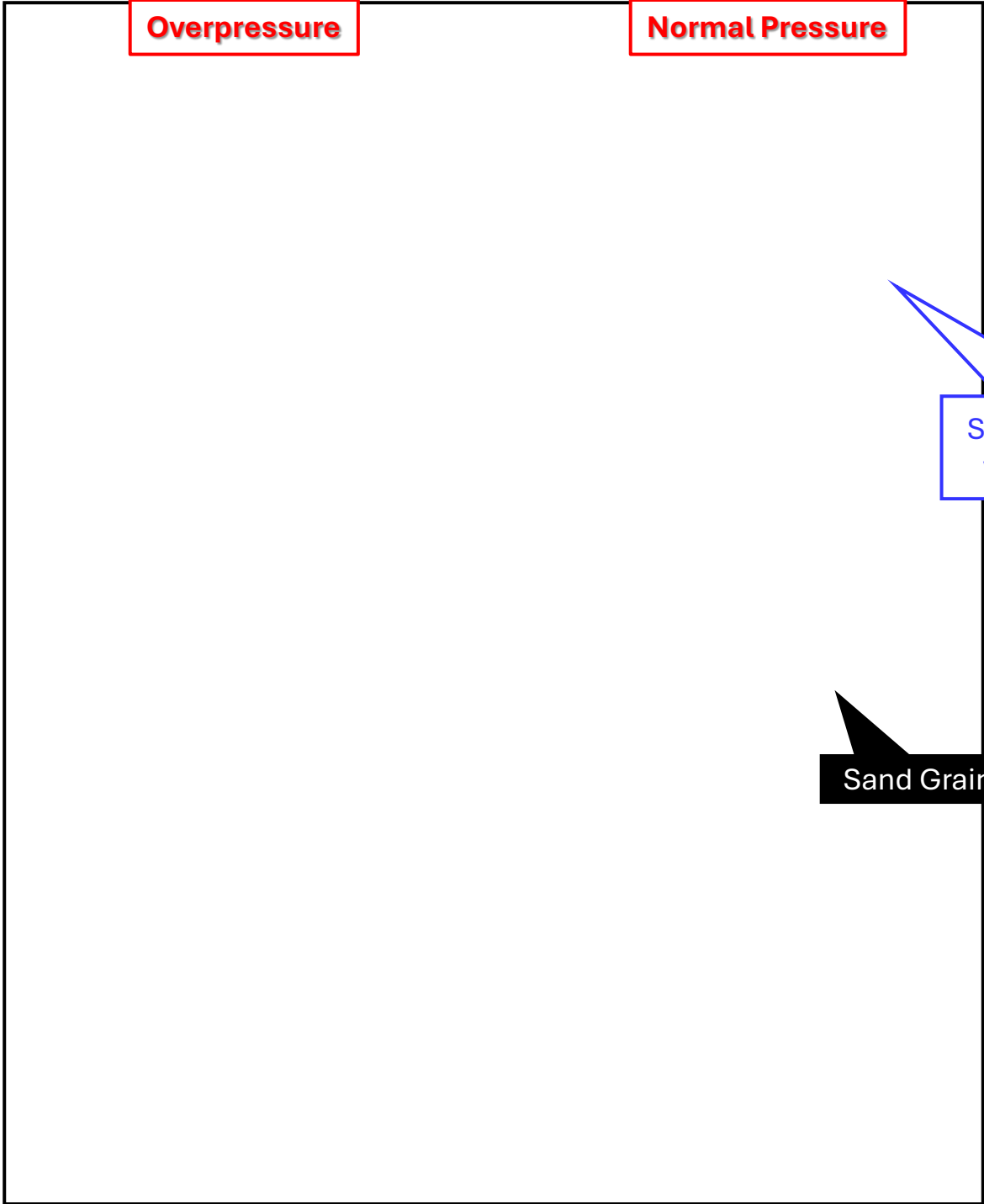
The water in deeper sediments carries the load of the rock above!!

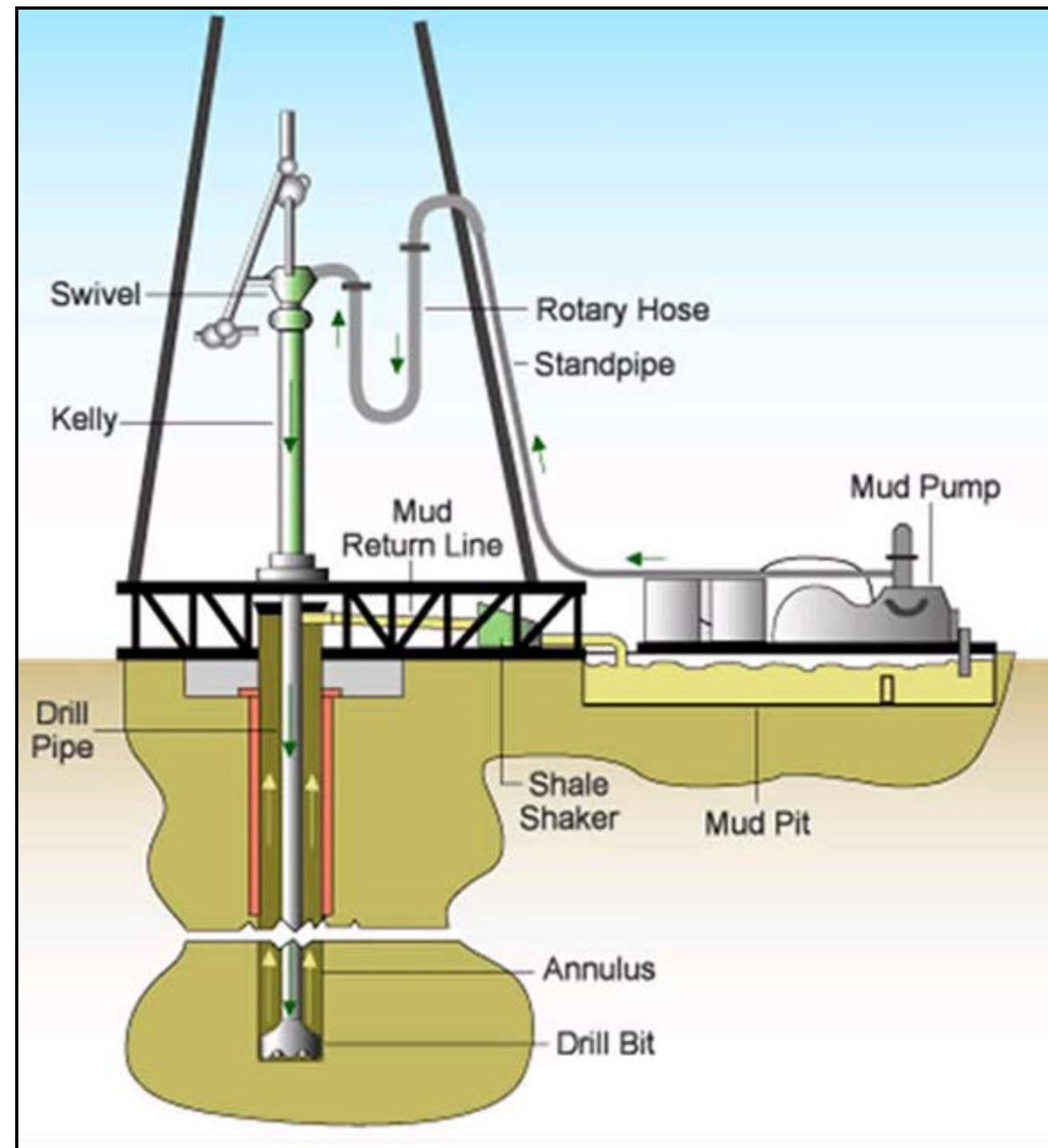
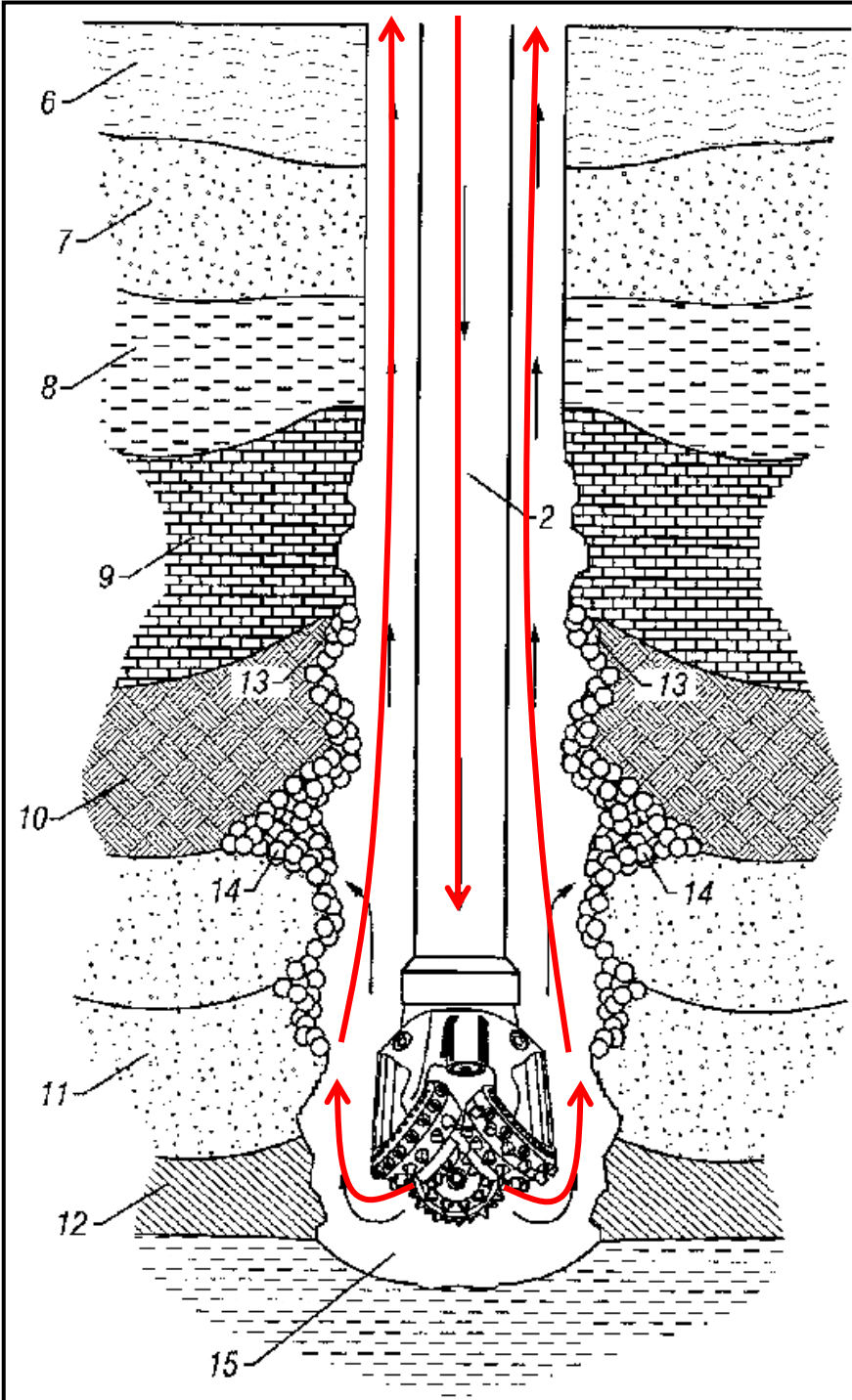
Overpressure

Normal Pressure

Small pores filled with
water and/or oil/gas

Sand Grains





Overbalanced drilling

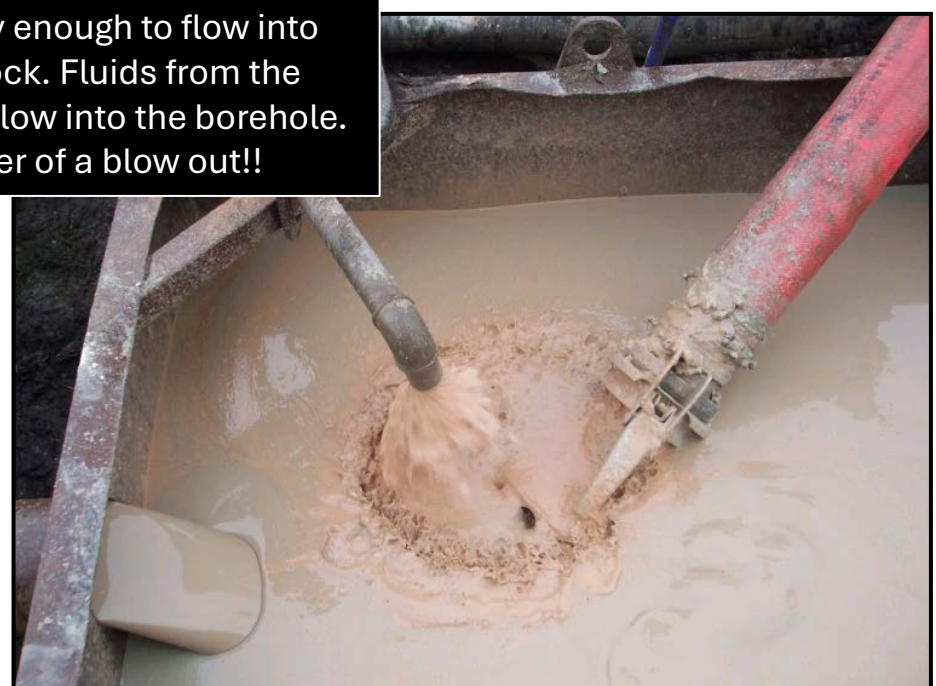
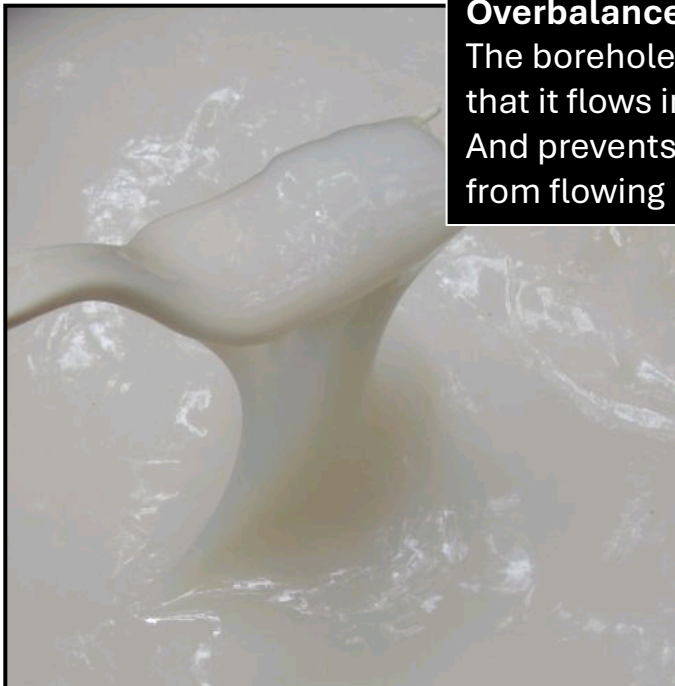
Underbalanced drilling

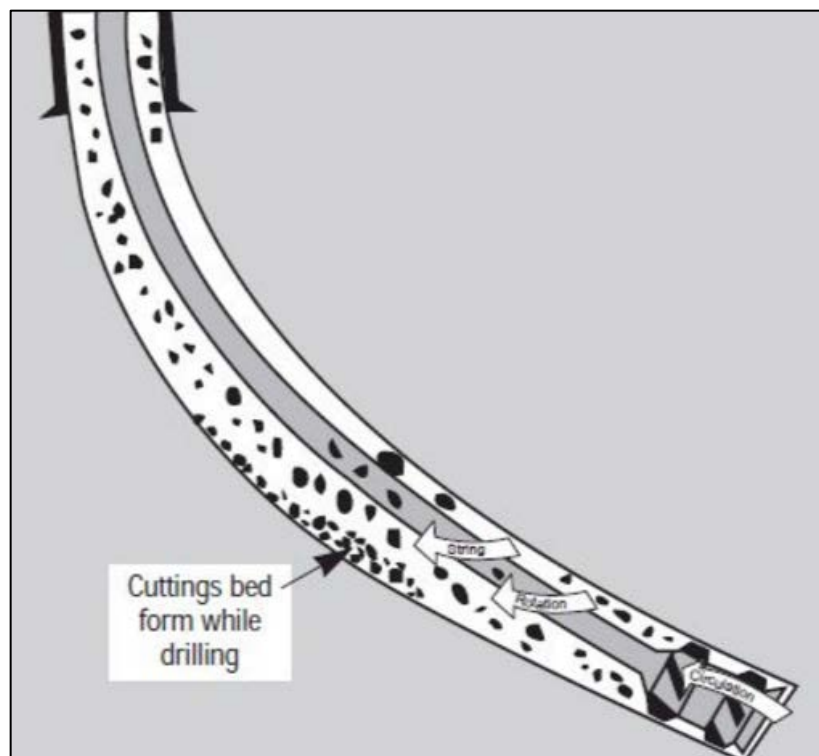
Overbalanced drilling

The borehole mud is so heavy that it flows into the rock and prevents the fluids (oil, gas) from flowing into the borehole.

Underbalanced drilling

The borehole mud is not heavy enough to flow into the rock. Fluids from the rock flow into the borehole. Danger of a blow out!!



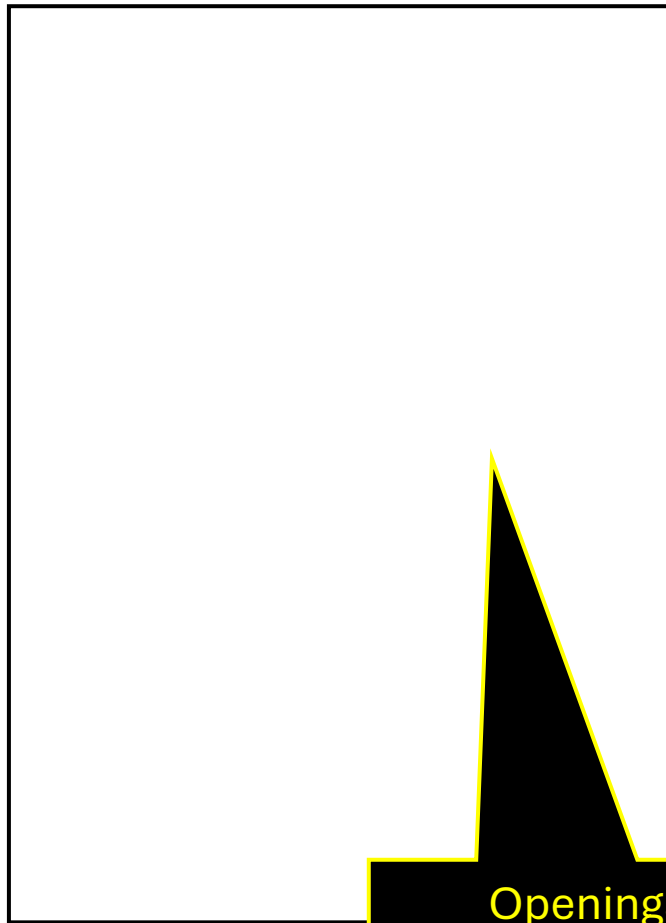


Drill cuttings are used for:

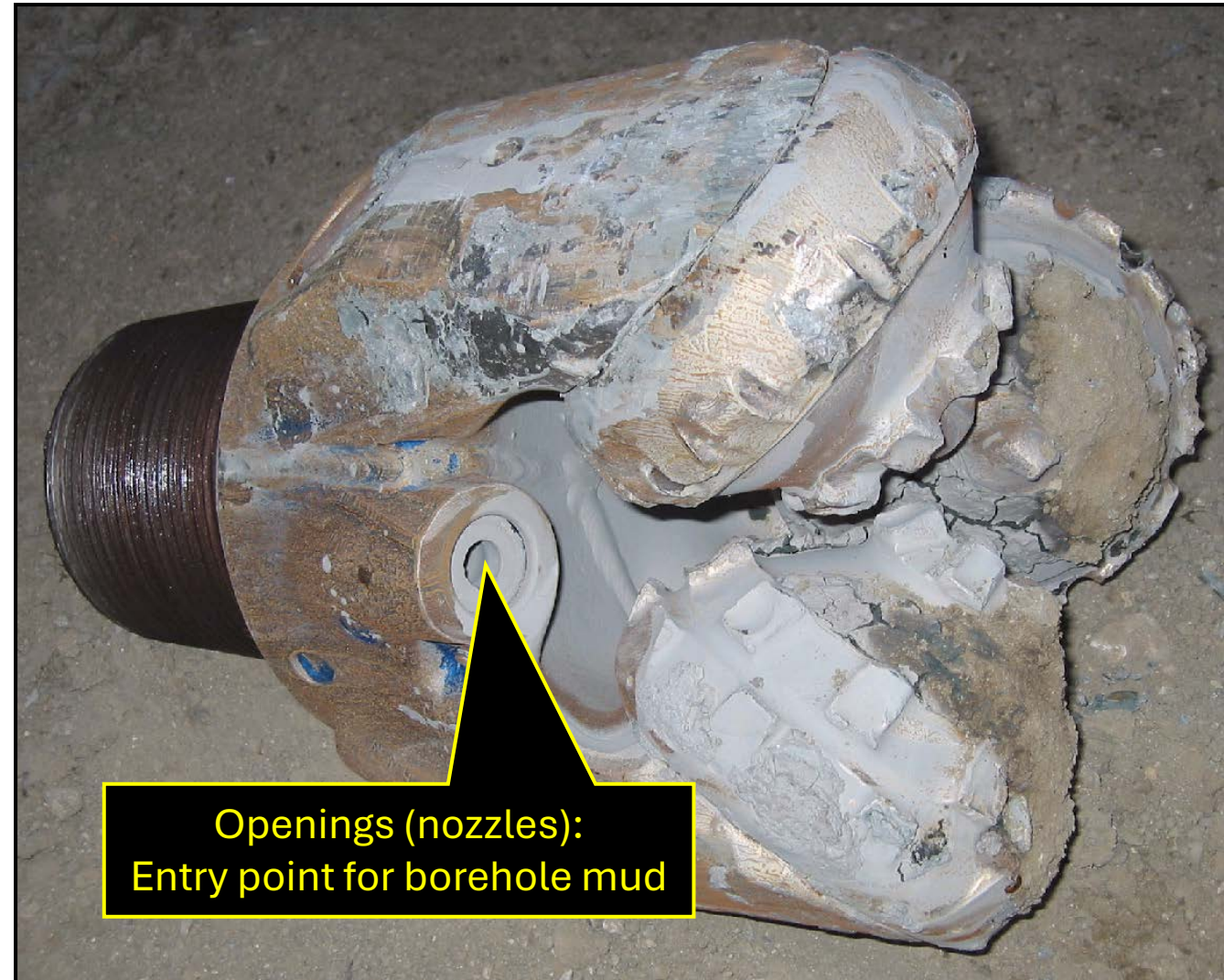
- Lithology
- Hydrocarbons (gas/oil)
- Micro- & Nanofossils



Openings (nozzles):
Entry point for borehole mud



Openings (nozzles):
Entry point for borehole mud

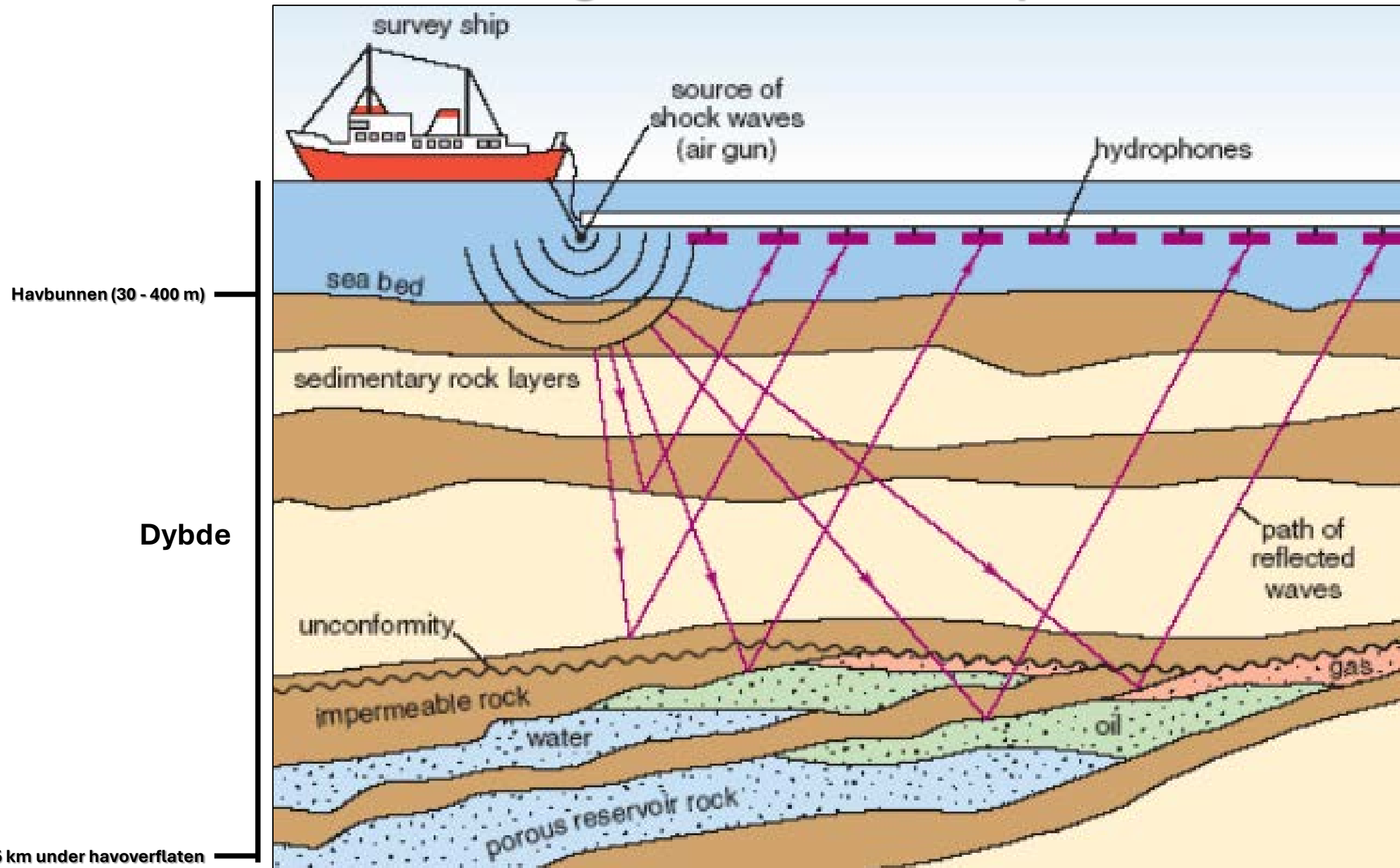


Openings (nozzles):
Entry point for borehole mud

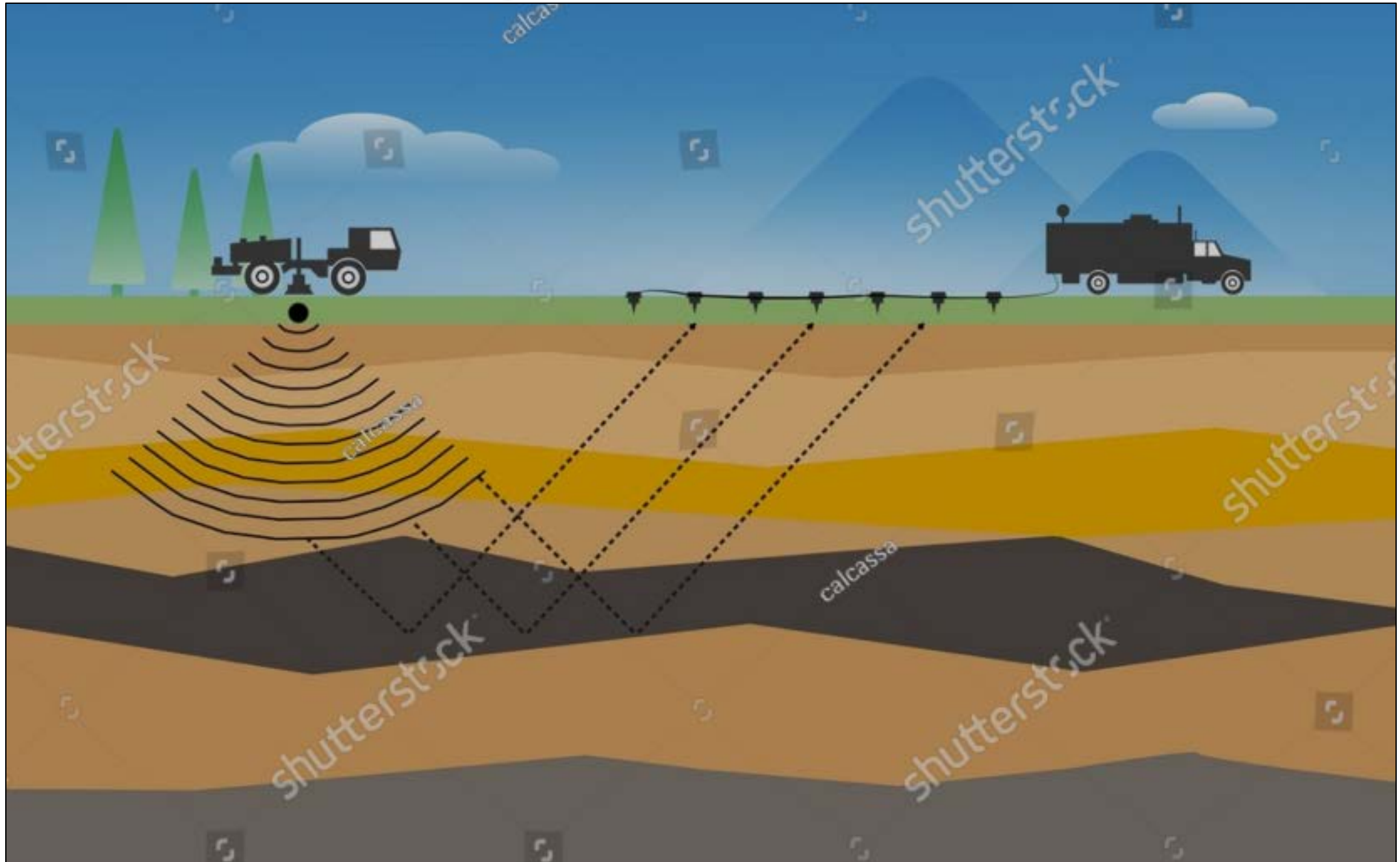
Hvordan leter en geolog/geofysiker etter olje/gass??

Vi bruker seismiske data (veldig ofte 3D) og tolker dem geologisk

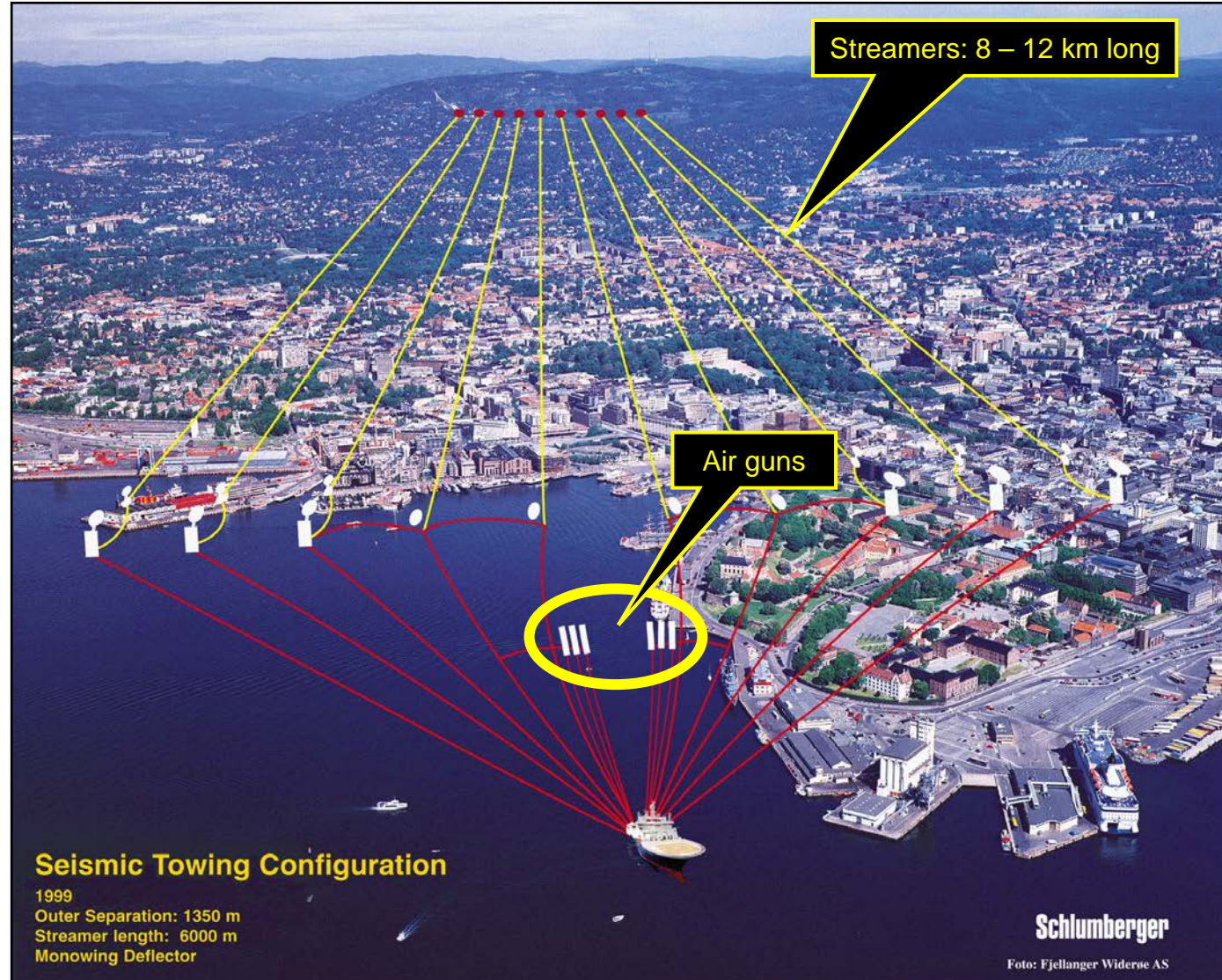
Innsamling av seismiske data på havet



Innsamling av seismiske data på landet



Innsamling av seismiske data på havet

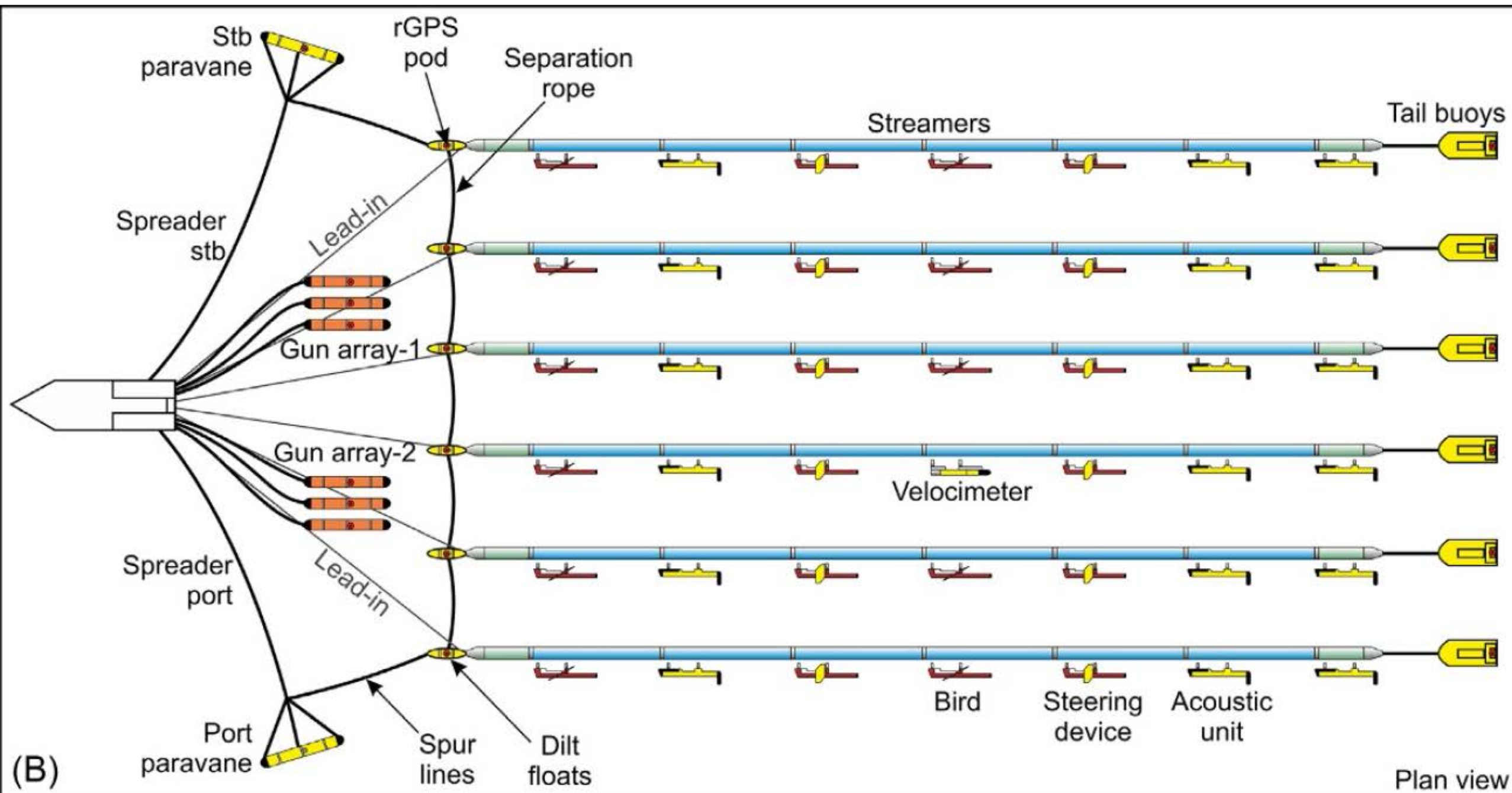


Seismic Towing Configuration

1999
Outer Separation: 1350 m
Streamer length: 6000 m
Monowing Deflector

Schlumberger

Foto: Fjellanger Widerøe AS



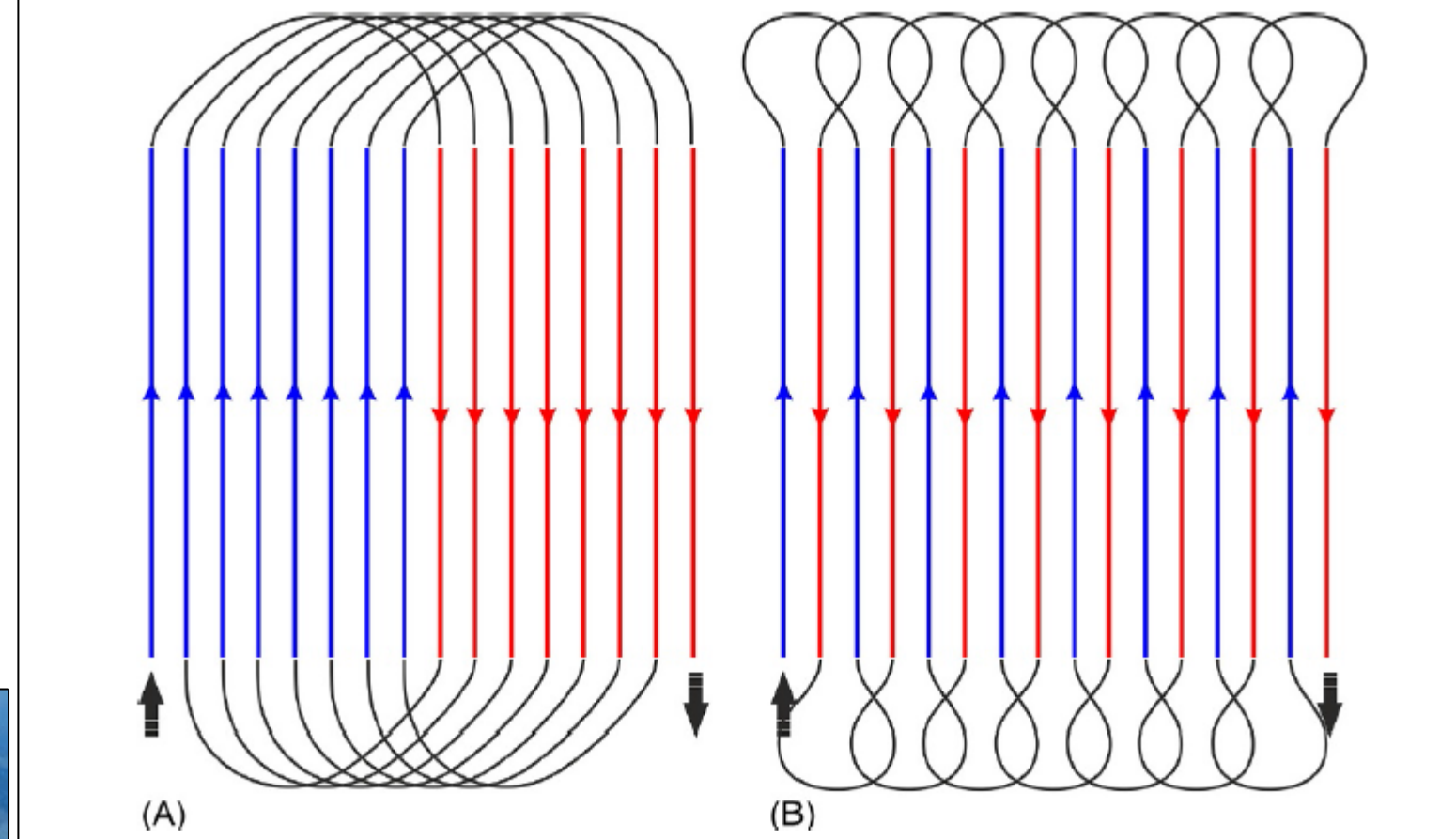
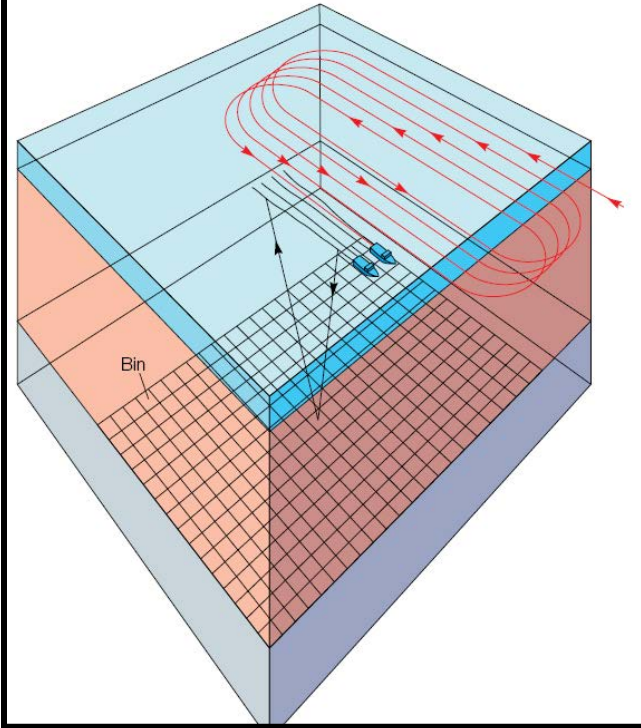


FIG. 2.40 Typical acquisition patterns for conventional 3D surveys. (A) Racetrack and (B) antiparallel survey patterns.

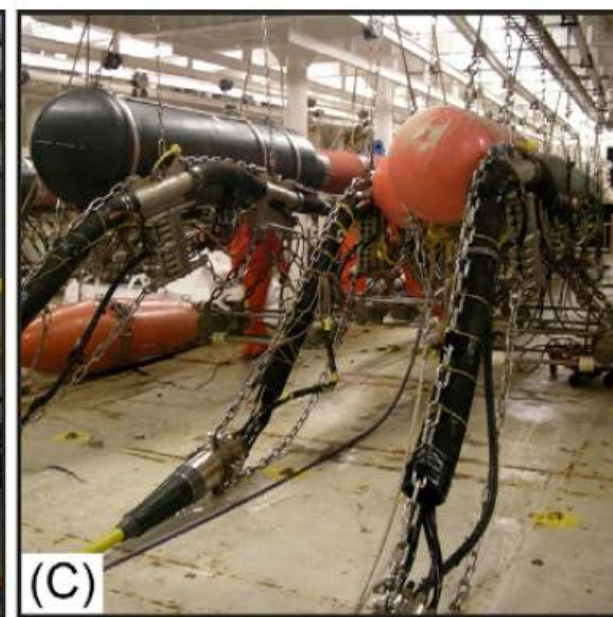
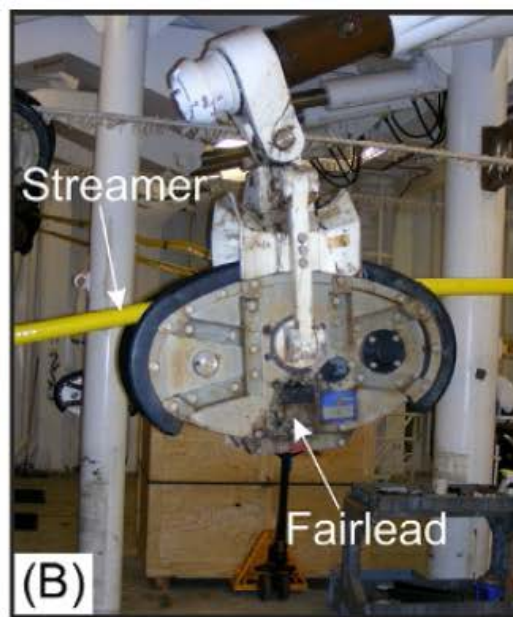


FIG. 2.4 (A) Stern photo of Sanco Sword 3D seismic vessel of Dolphin Geophysical, (B) fairleads used to deploy the streamers, (C) gun deck, (D) streamer deck, and (E) instrument room of R/V Marcus Langseth operated by Columbia University.

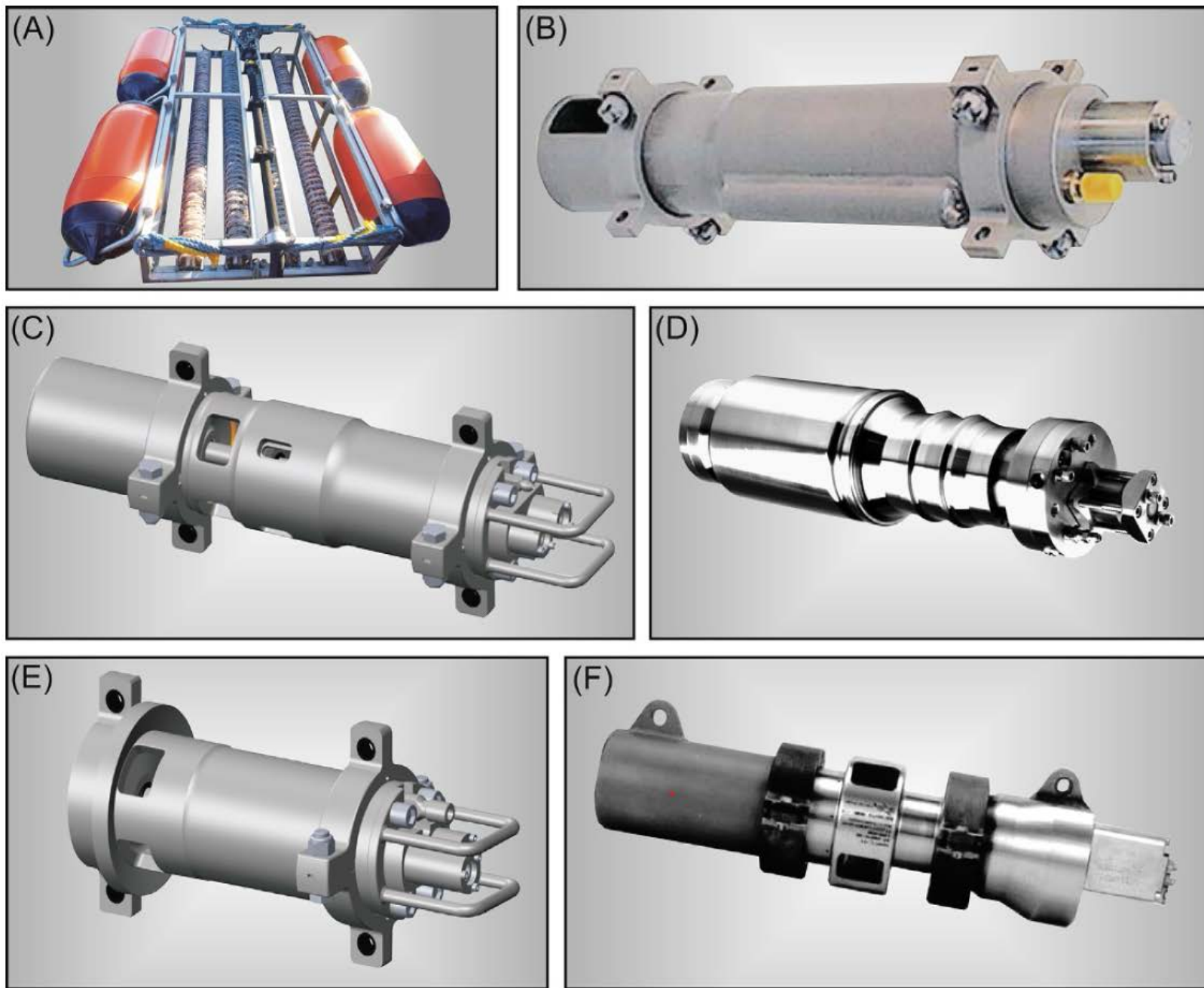


FIG. 2.13 Common marine seismic energy sources. (A) GeoMarine 6000-J sparker array, (B) water gun (Sercel), (C) GI gun (Sercel), (D) sleeve gun (Seamap), (E) G gun (Sercel), and (F) LL gun (Teledyne Bolt).

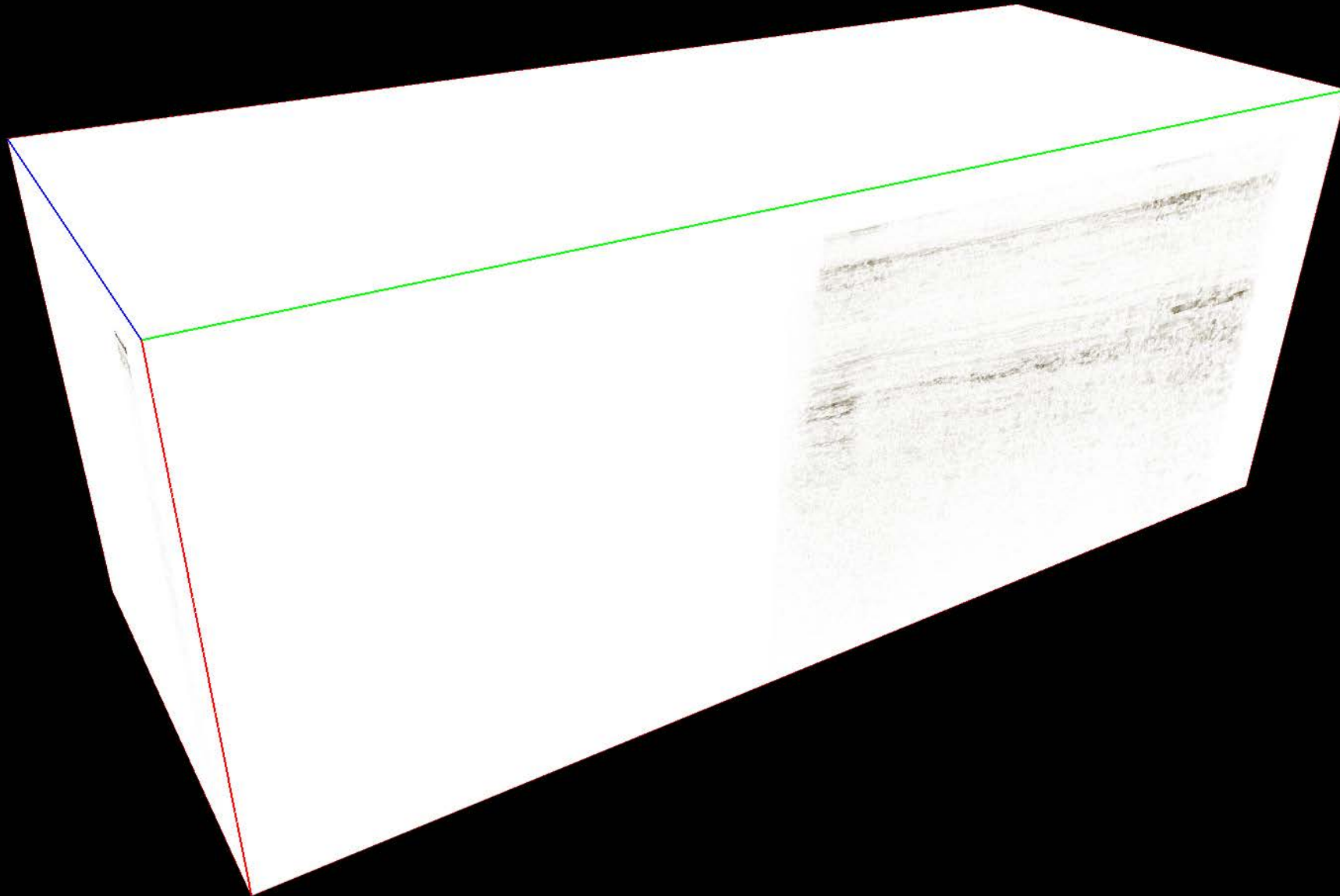
Innsamling av seismiske data på landet



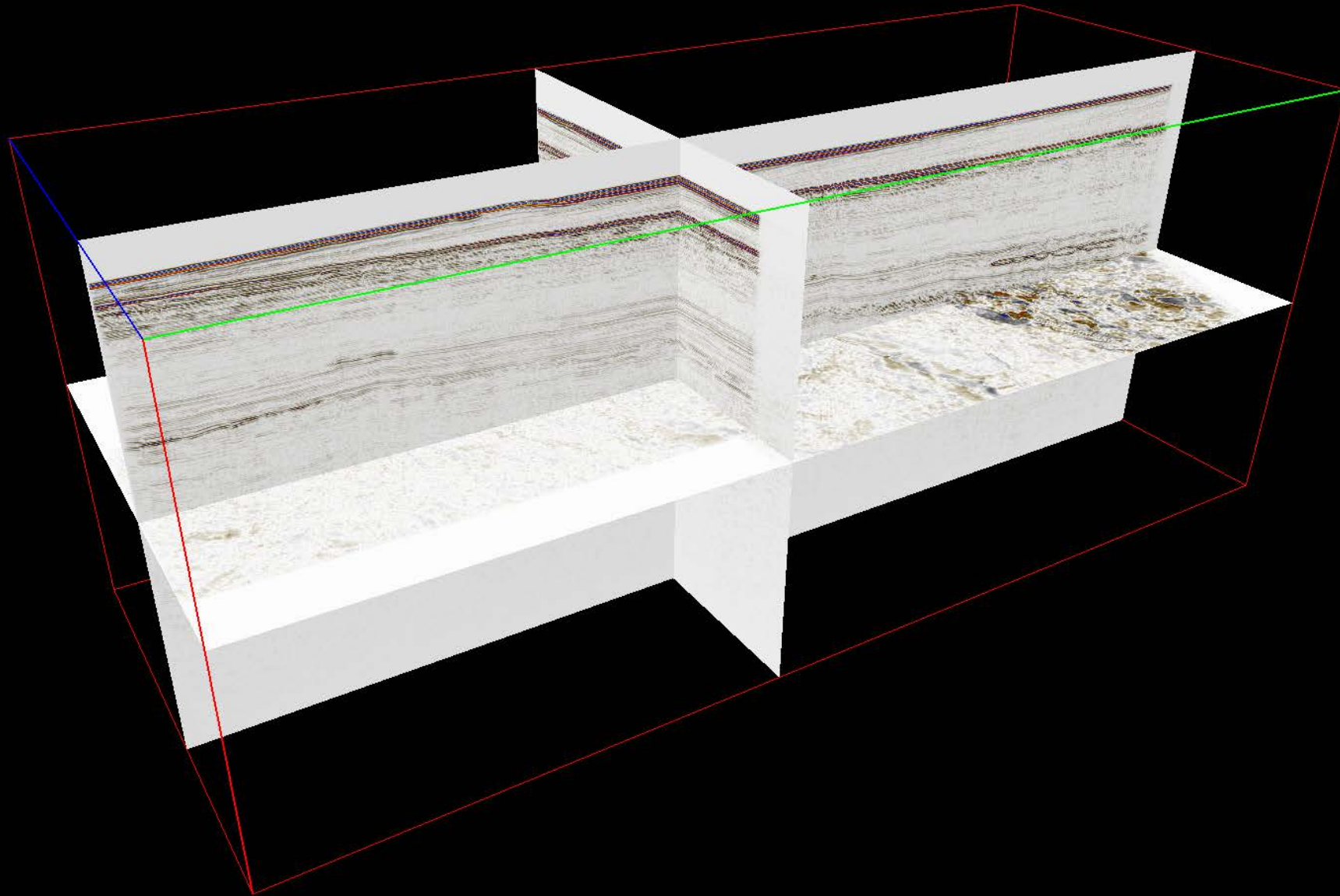
Figure 11.4 Impact source. A half-ton weight being dropped from a portable crane during a survey of the low-velocity layer.

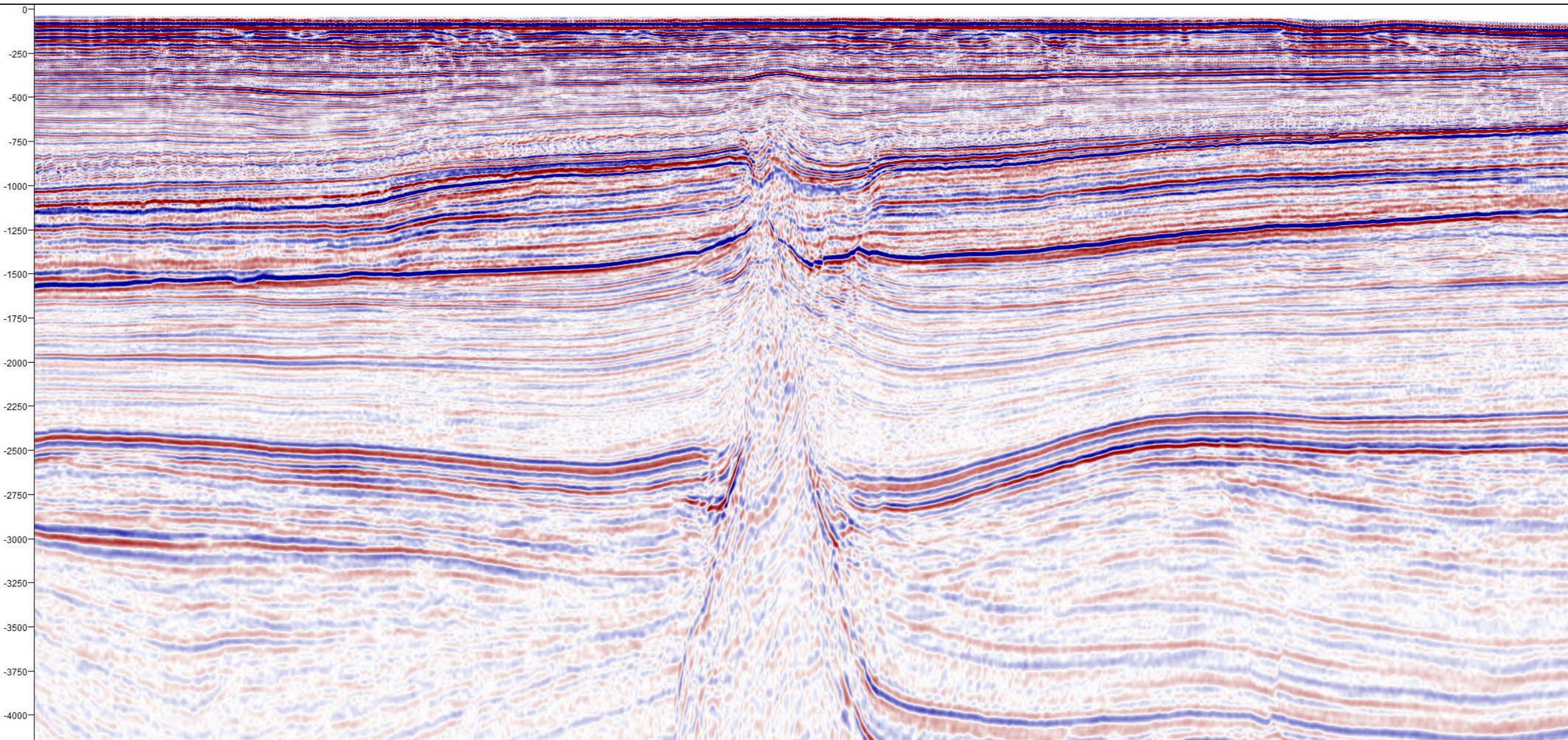


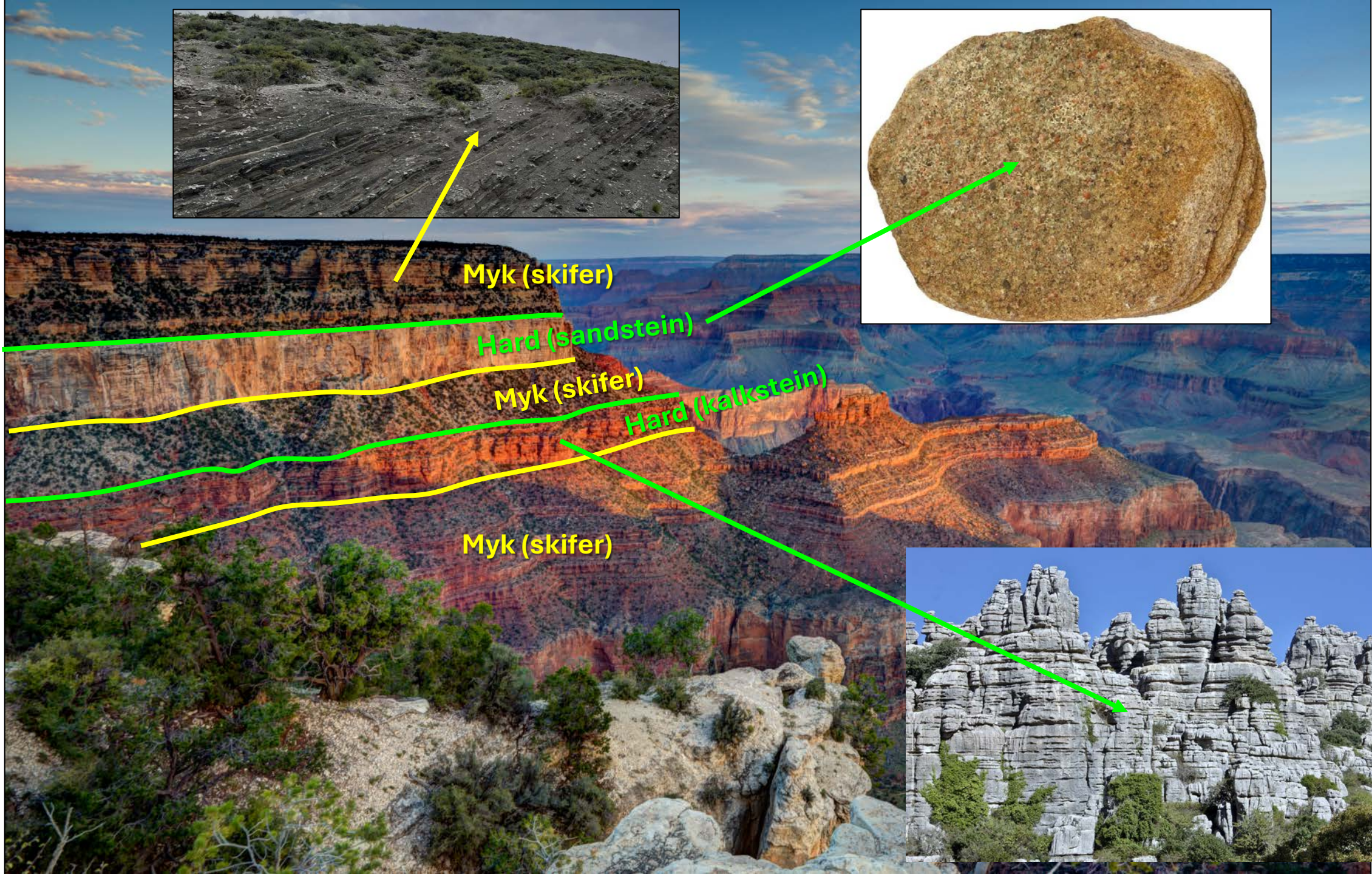
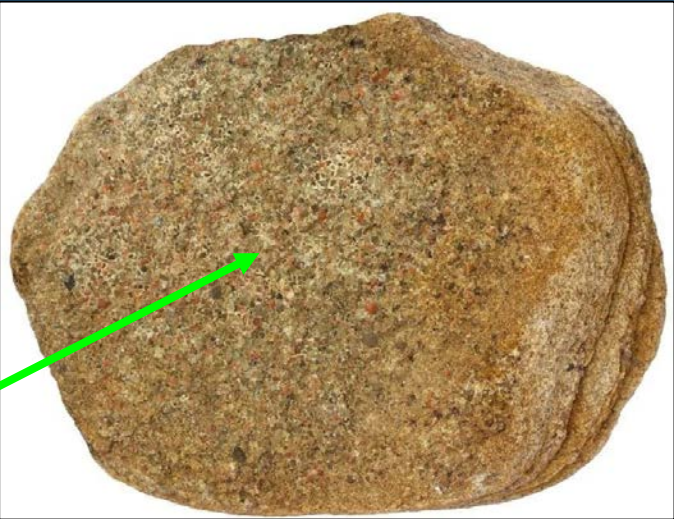
En 3D seismisk volumen



En 3D seismisk volumen







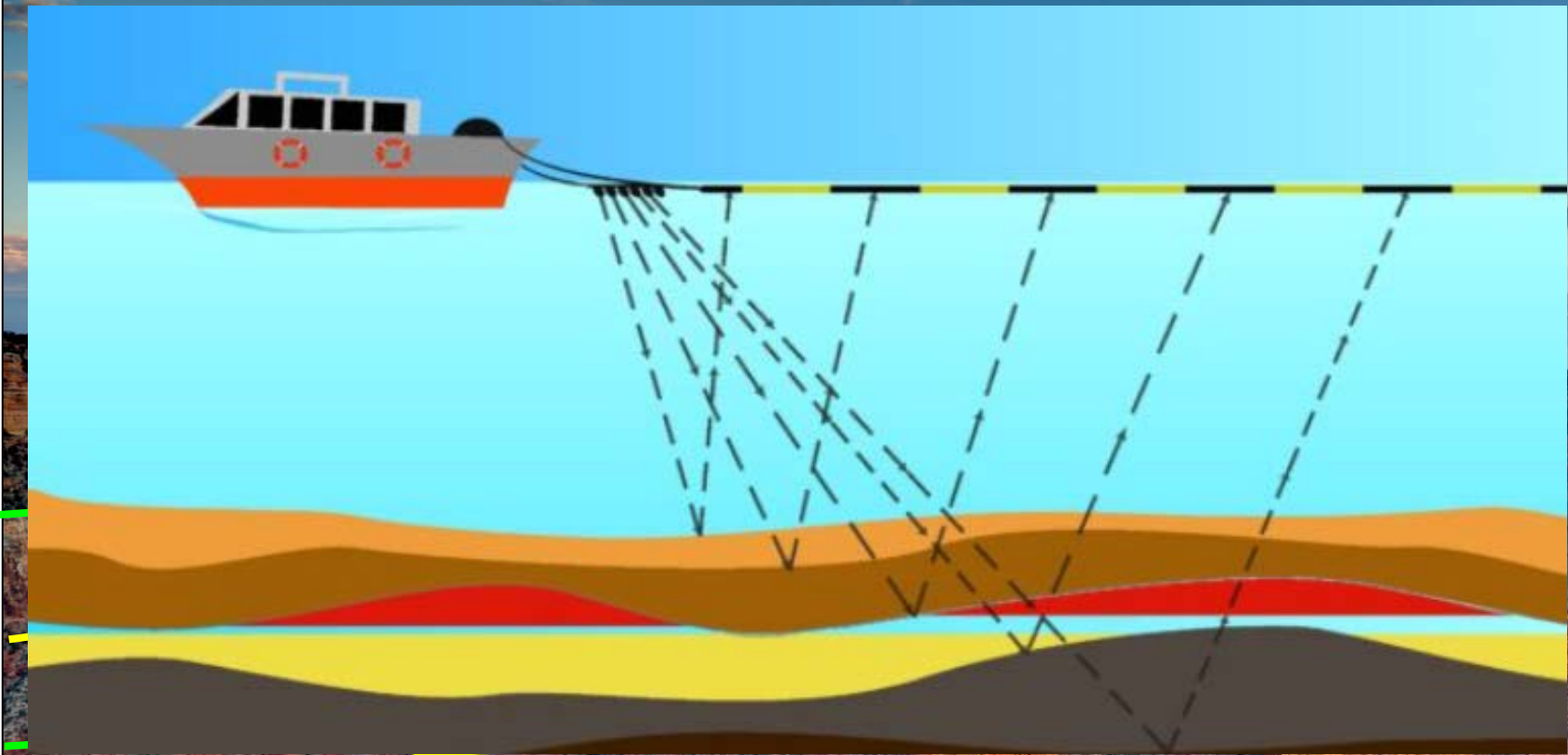
Myk (skifer)

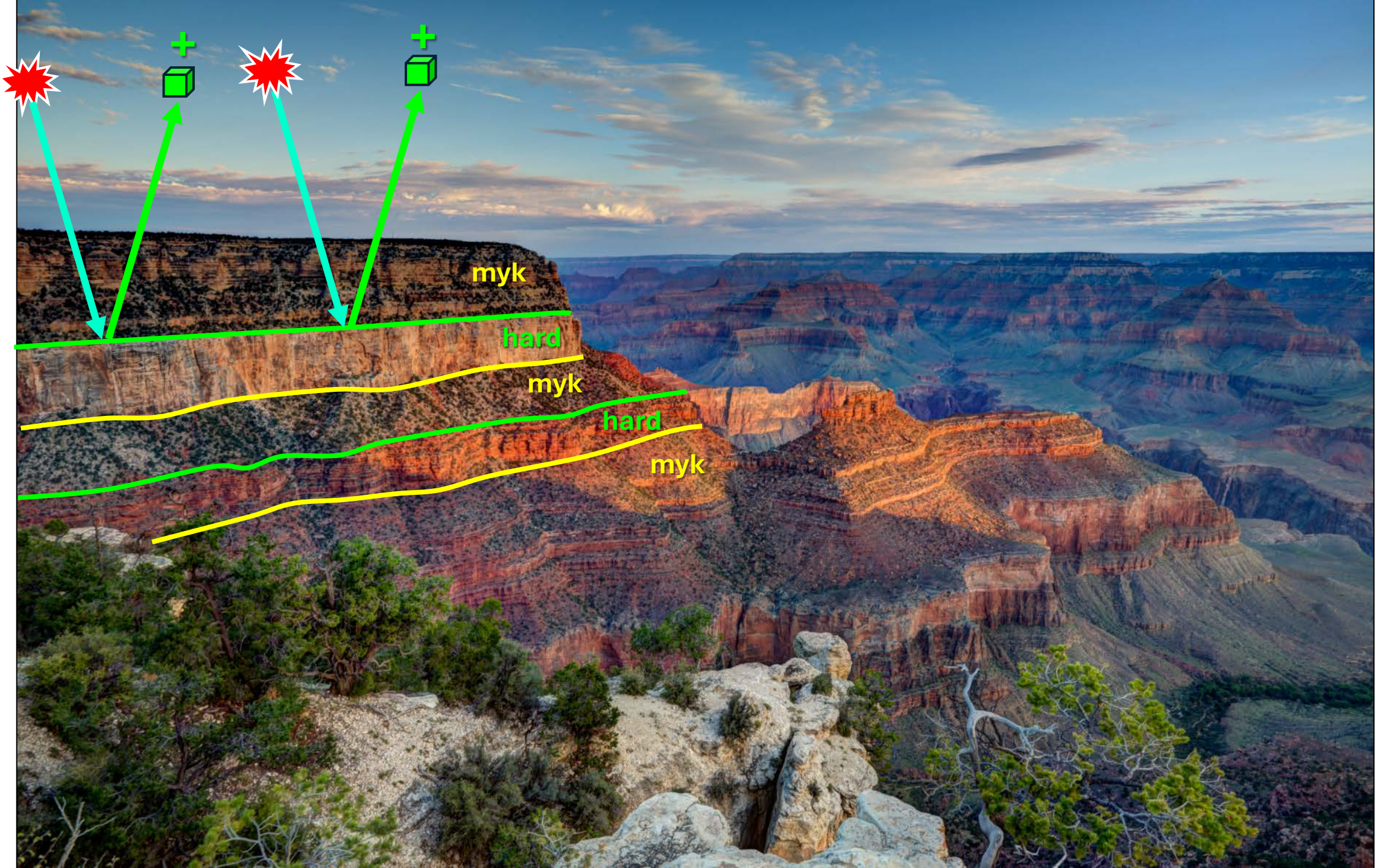
Hard (sandstein)

Myk (skifer)

Hard (kalkstein)

Myk (skifer)





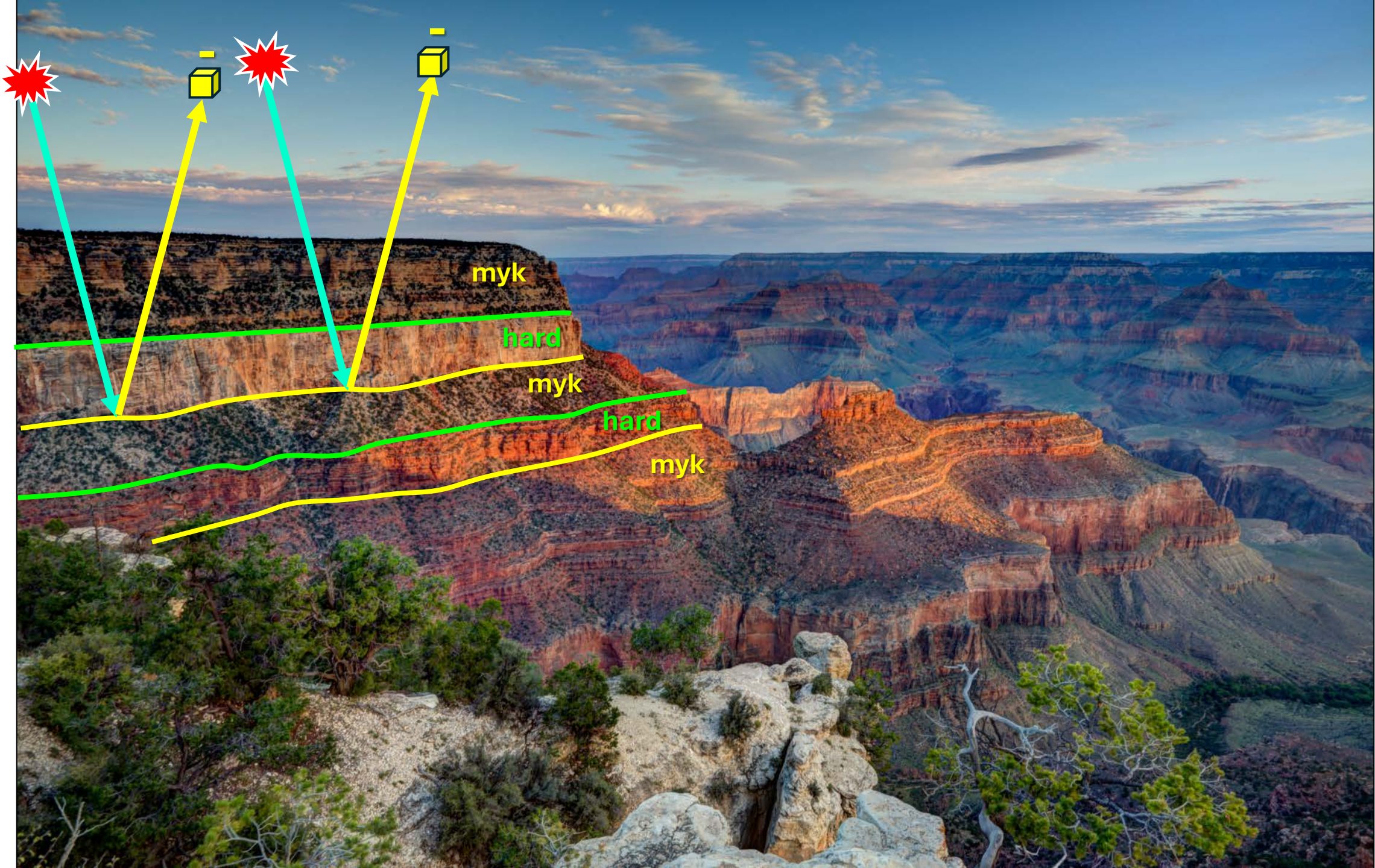
myk

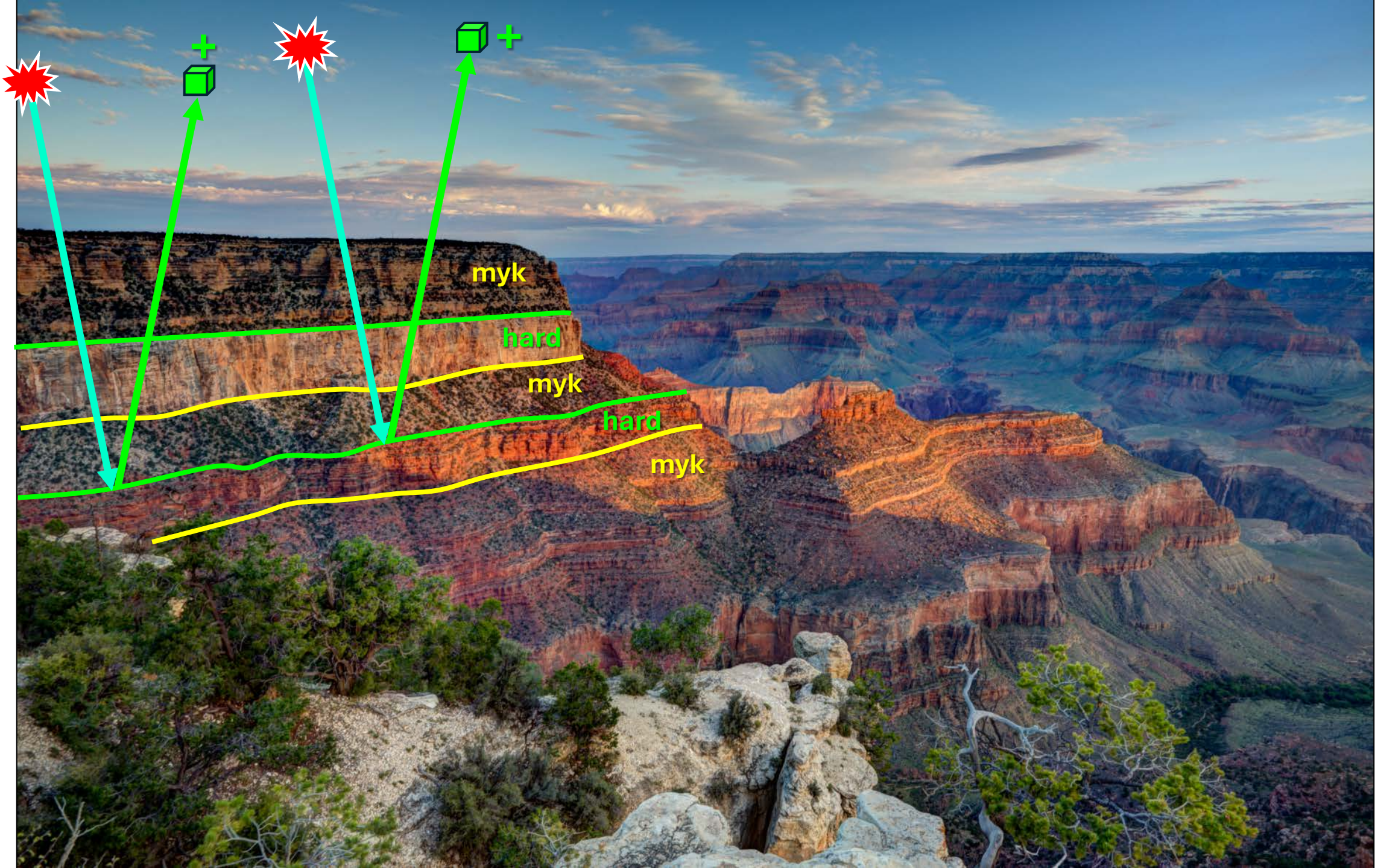
hard

myk

hard

myk





myk

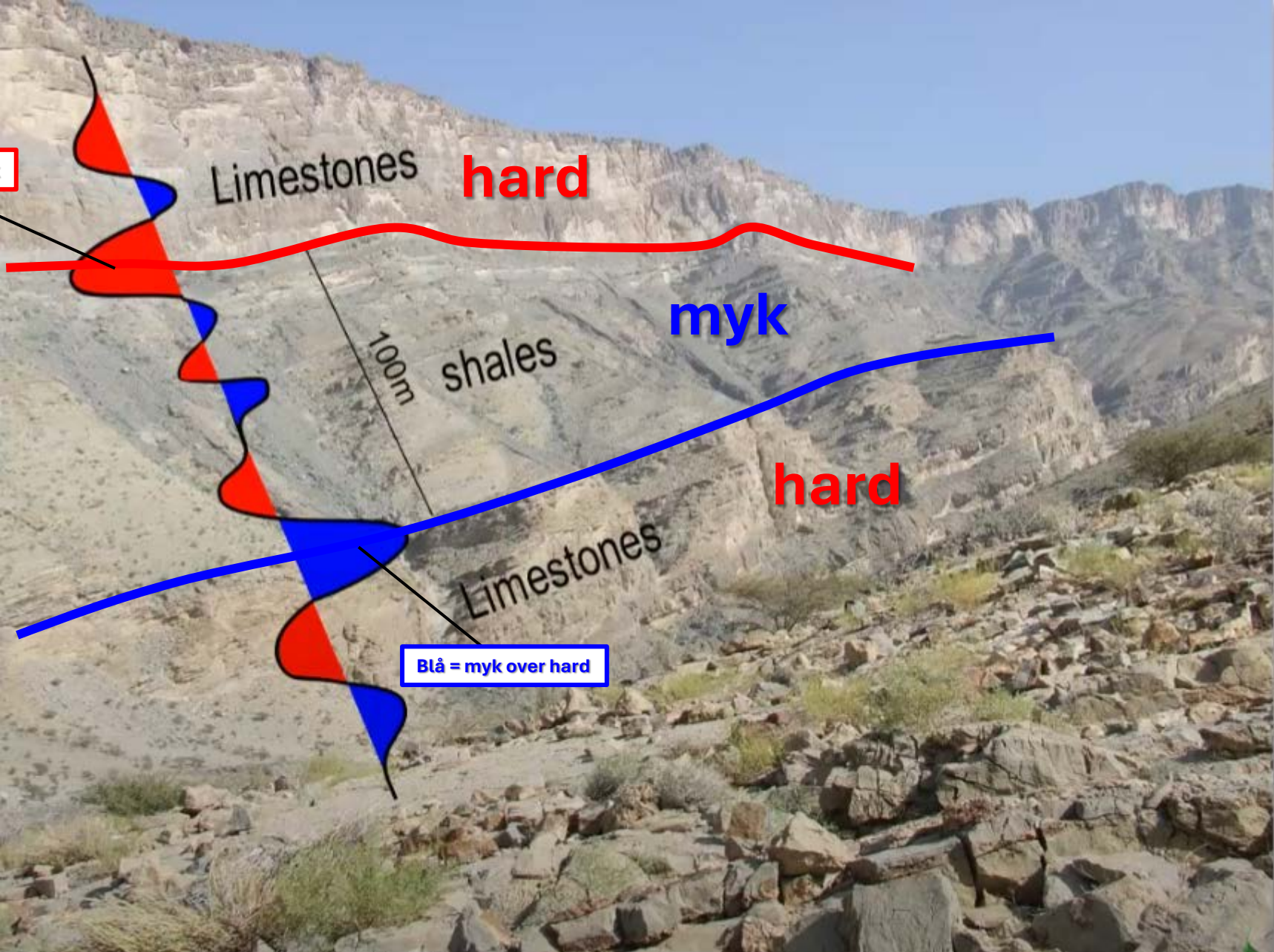
hard

myk

hard

myk

Rødt = hard over myk



Limestones **hard**

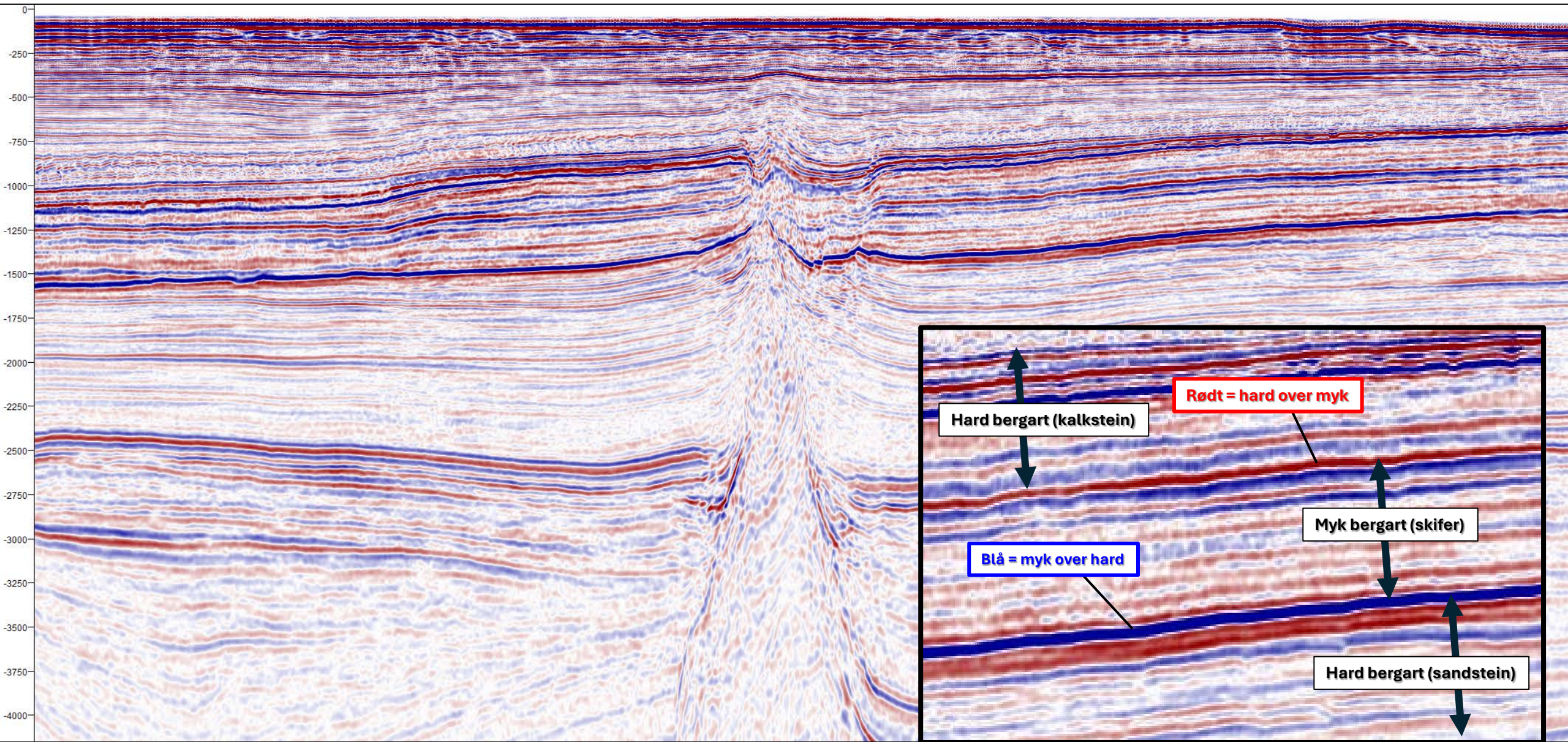
myk

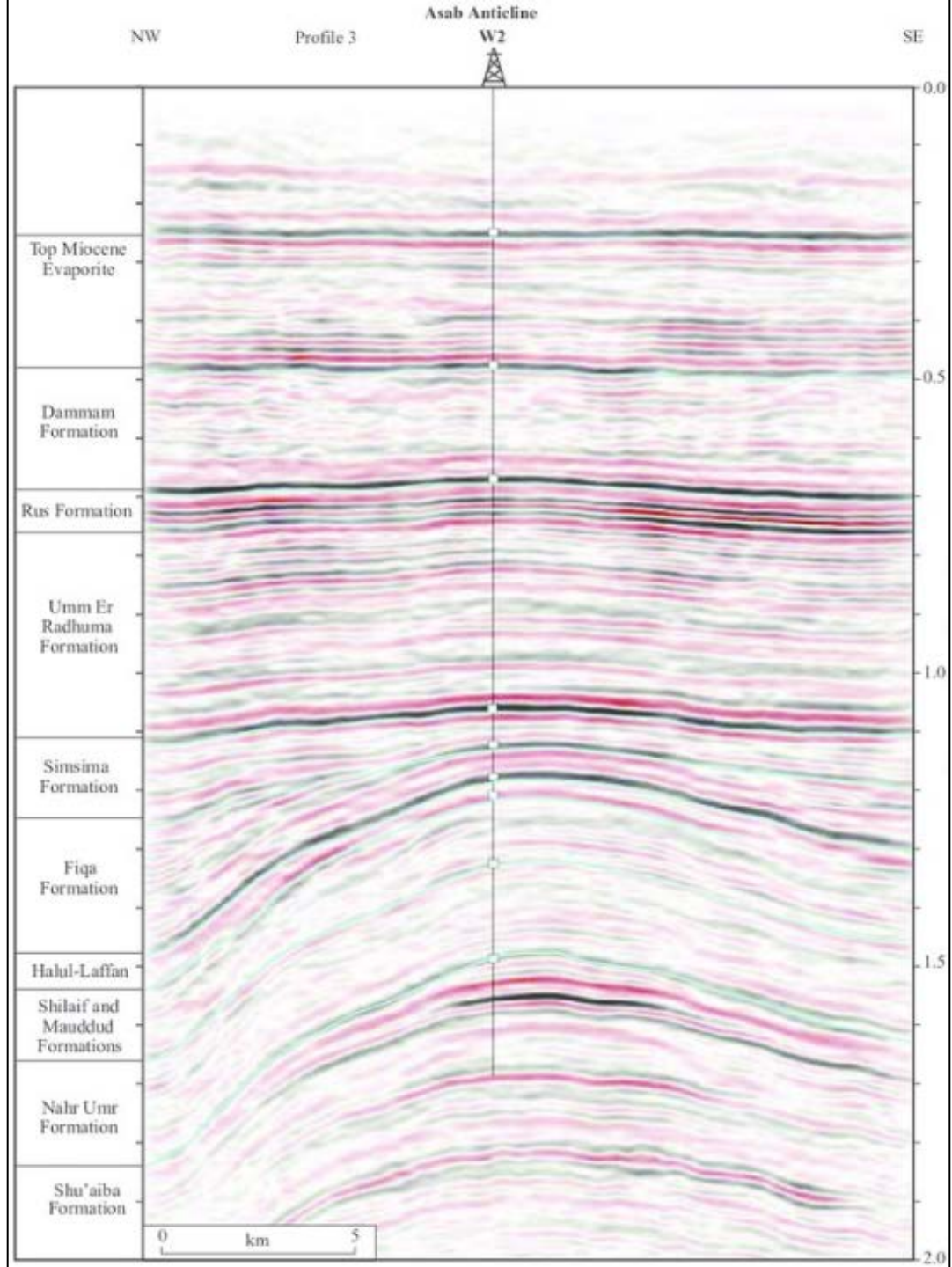
100m shales

hard

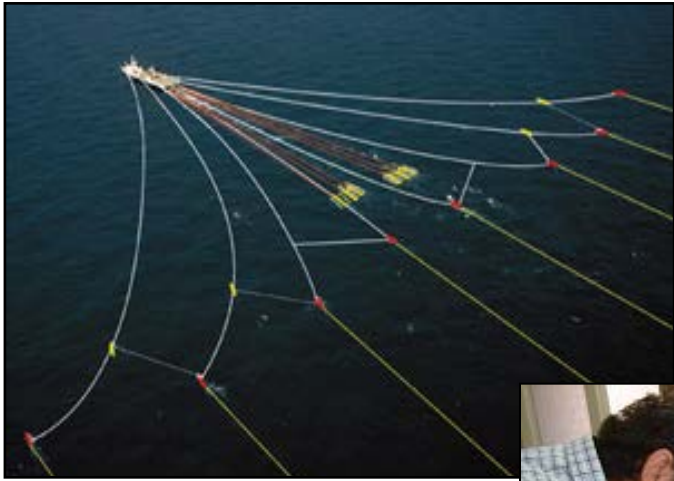
Limestones

Blå = myk over hard





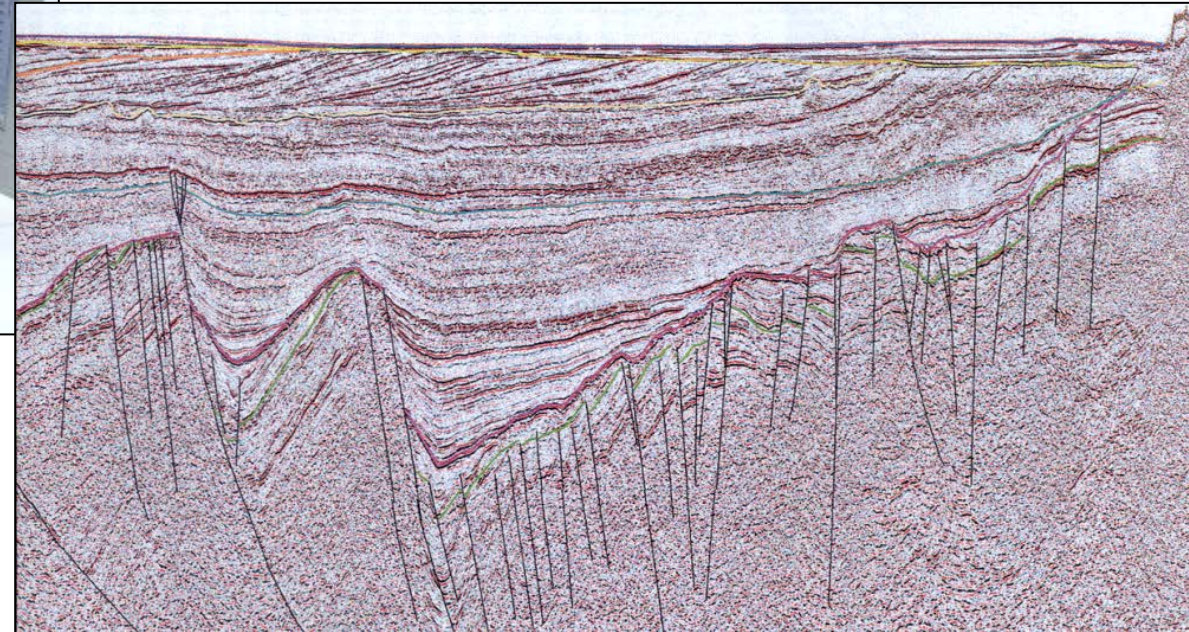
1. Seismic **Acquisition** (Geophysicists)



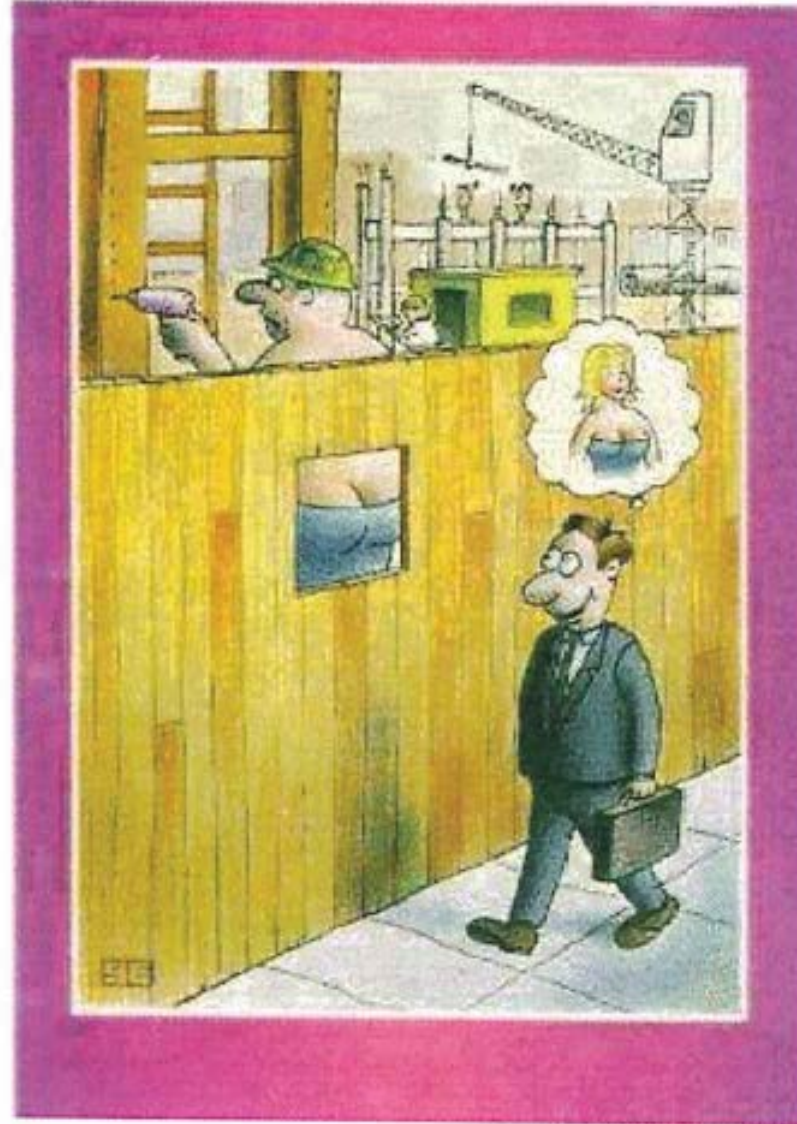
2. Seismic **Processing** (Geophysicists)



3. Geological **Interpretation** (mainly Geologists & some Geophysicists)



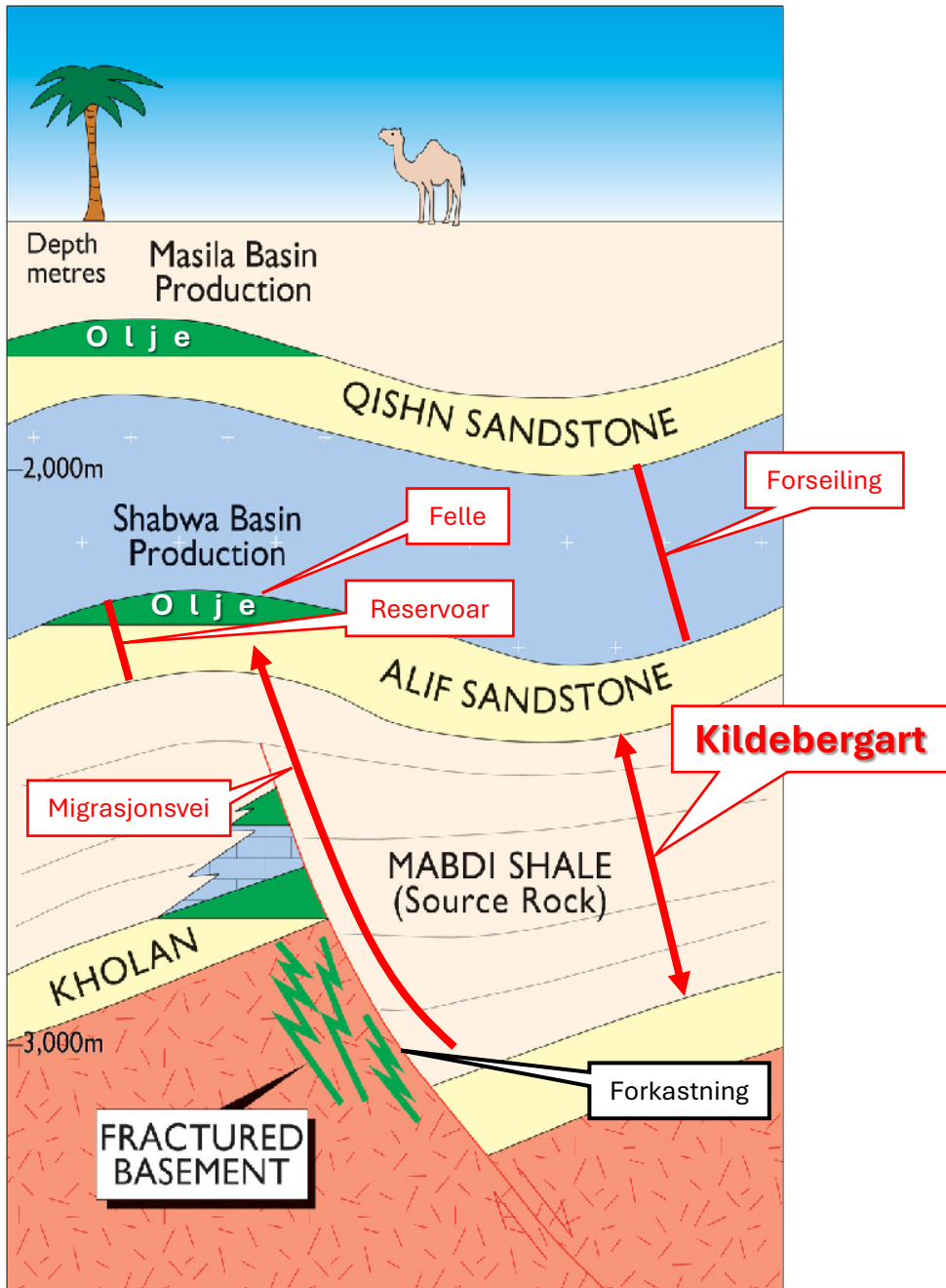
You only see a small part of the story!



Make sure you interpret it properly

The Petroleum Play Concept

The Petroleum Play Concept



The term “**petroleum play**” has nothing to do with playing.

It refers to several processes that must play together in a chronological sequence.

A basic condition is the existence of a mature source rock. Without a mature source rock, no oil/gas can be generated

As an example: when the migration of oil/gas happens then a trap, a porous reservoir and a tight seal must exist such that hydrocarbons can accumulate.

If oil/gas migrates upward and there is a reservoir but no trap, then the hydrocarbons will not accumulate but continue to migrate upward until they reach the surface of the Earth or the sea bottom.

A petroleum geologist must establish the timing of the principal components of the petroleum play.

The largest trap combined with the best reservoir is useless if the trap formed a long time after peak oil/gas migration.

Hva er en kildebergart?

Uten kildebergart ingen olje/gass!!