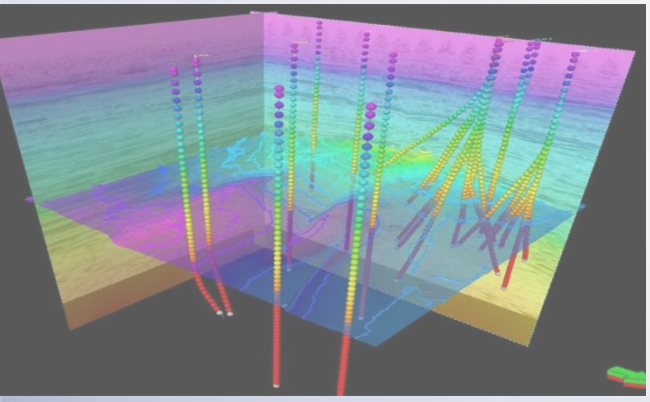
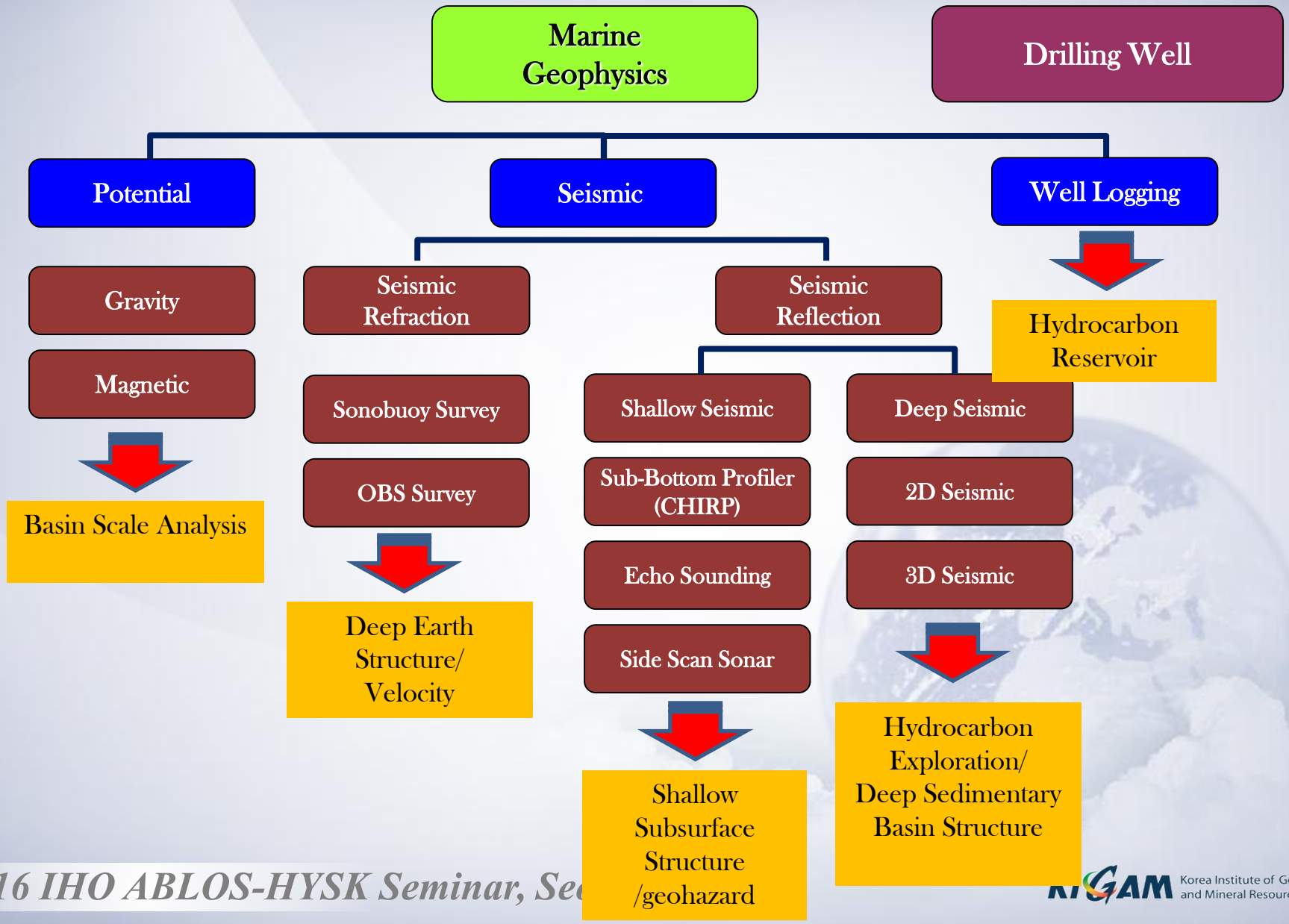
KIGAM

『 Application of Marine Seismic Survey to UNCLOS Outer Limits of the Continental Shelf and Naming of Undersea Features』

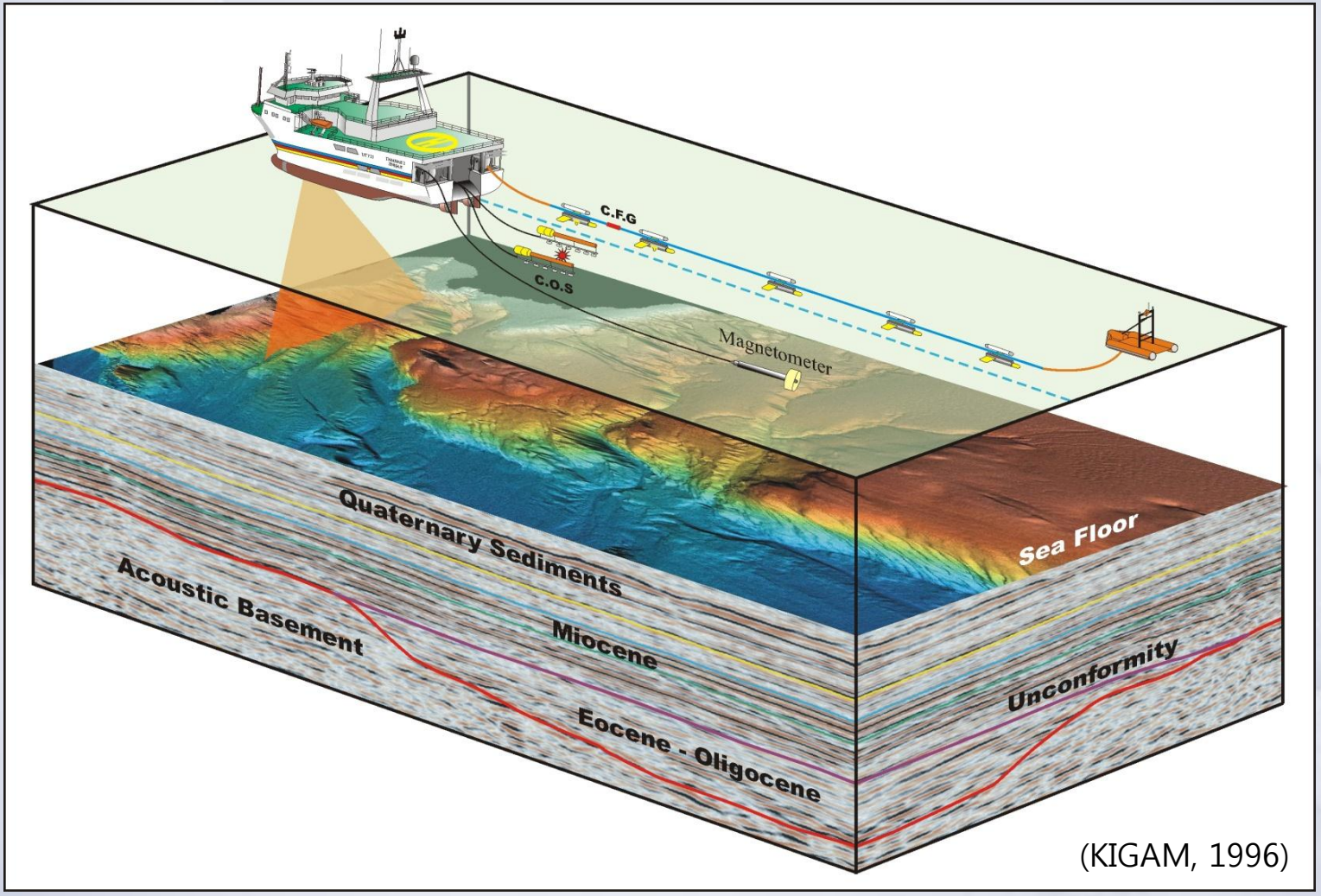
MOO-HEE KANG (karl@kigam.re.kr)



Marine Geophysical Survey

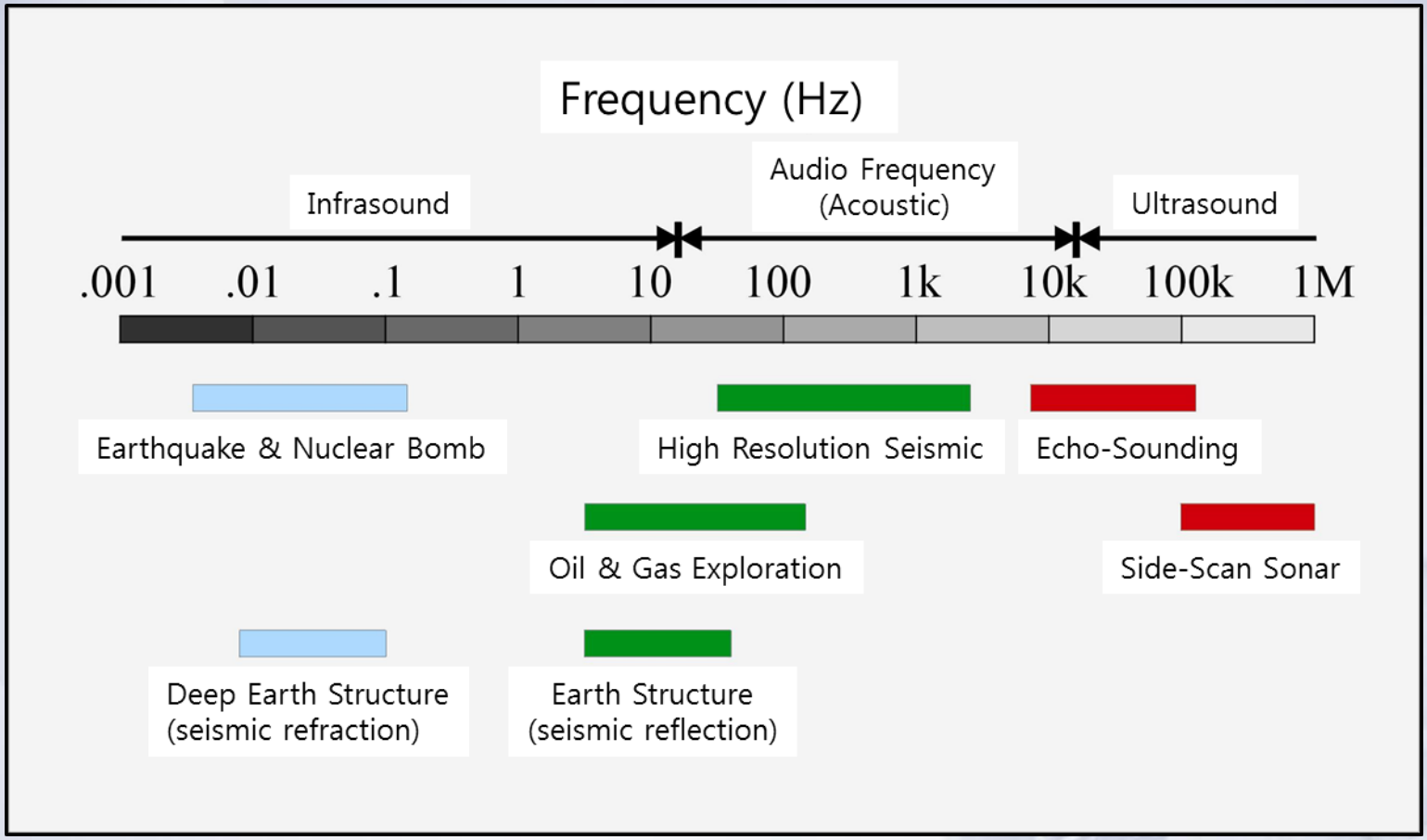


Schematic Cartoon



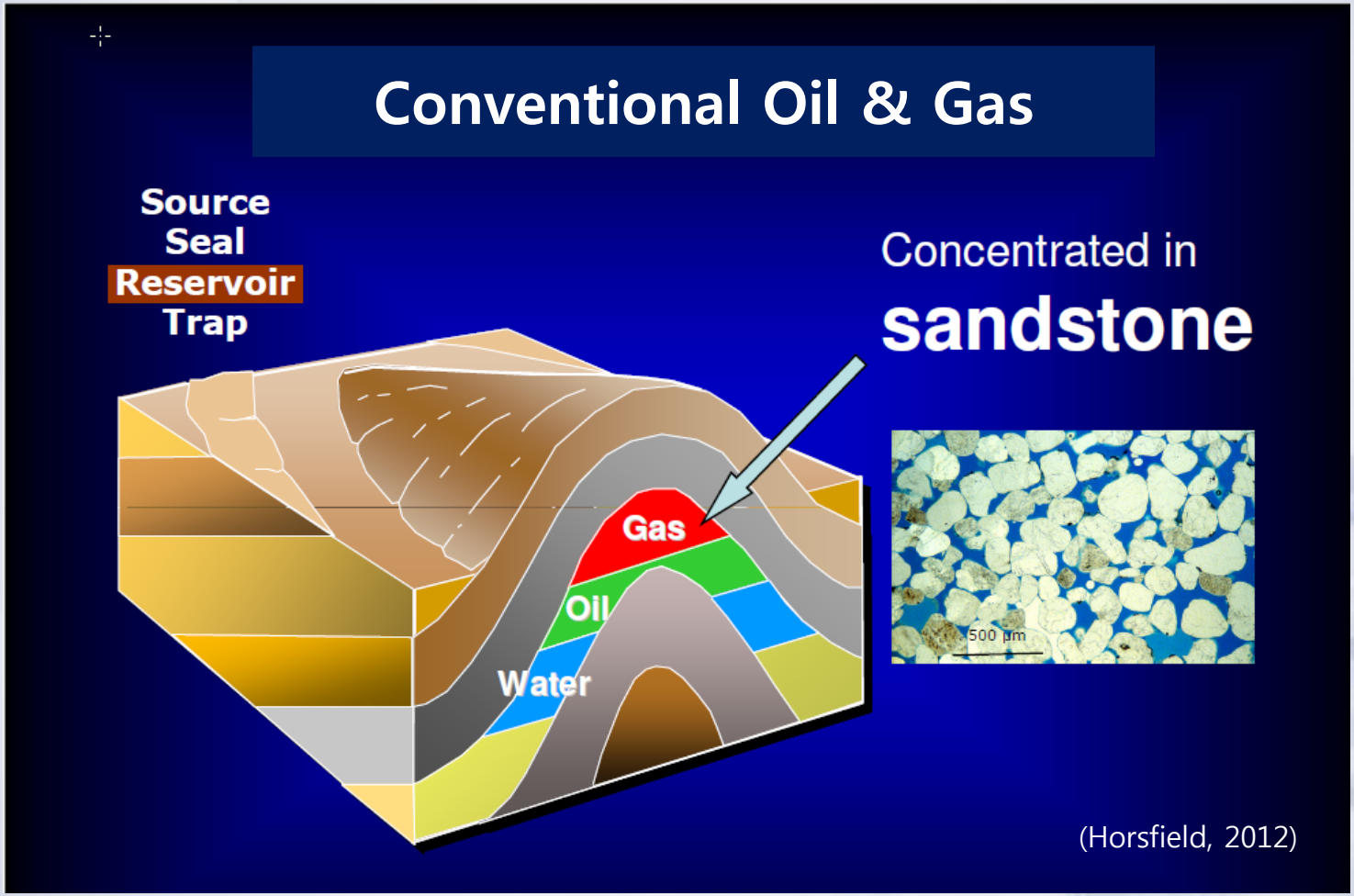
(KIGAM, 1996)

Frequency vs Penetration



✓**High frequency : high resolution, but low penetration**
✓**Low frequency : low resolution, but high penetration**

General Purpose of Seismic Exploration



Seismic Exploration

(Martin, 2004)

Airgun Seismic Source

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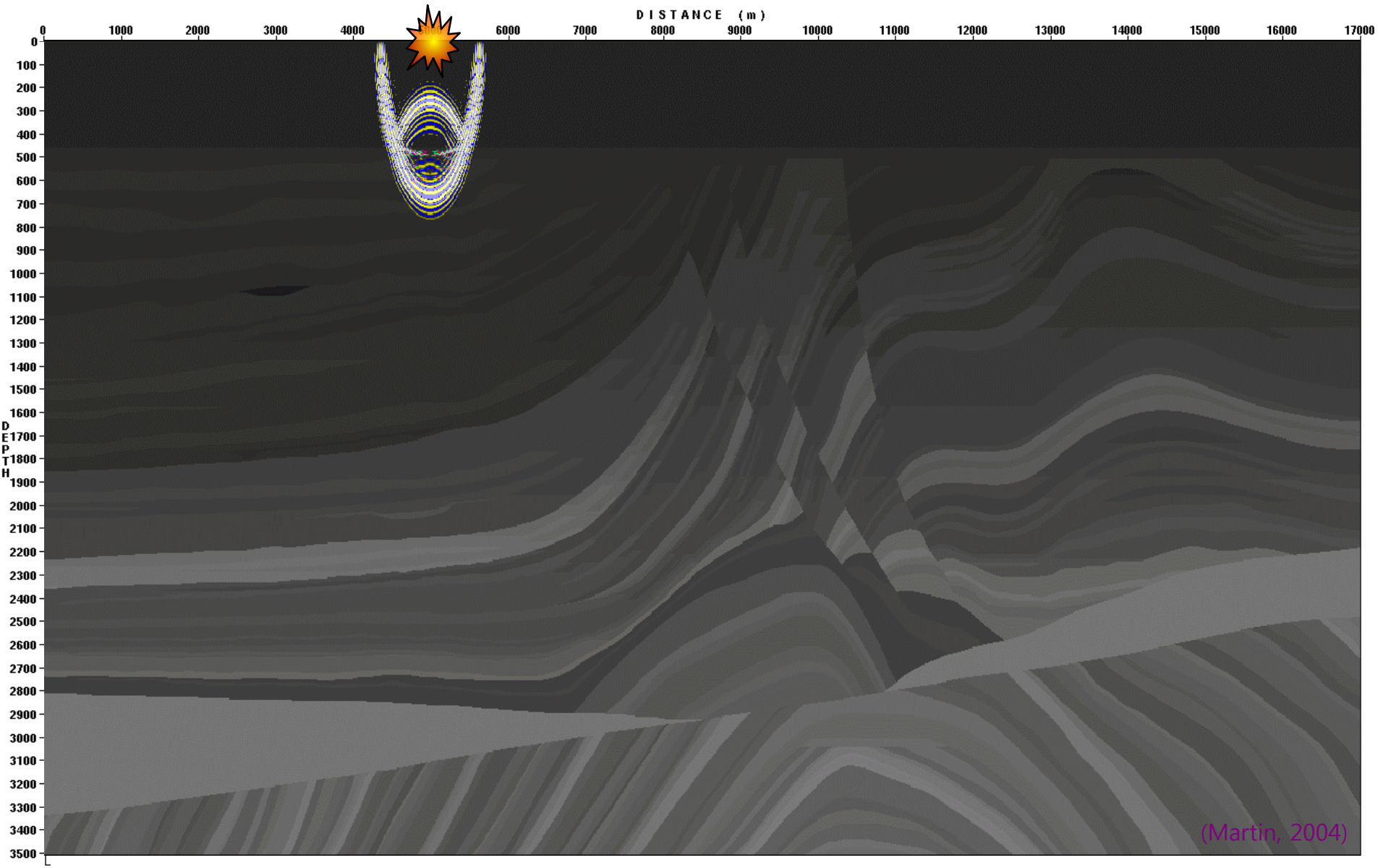
Snapshot: t=0.5 s



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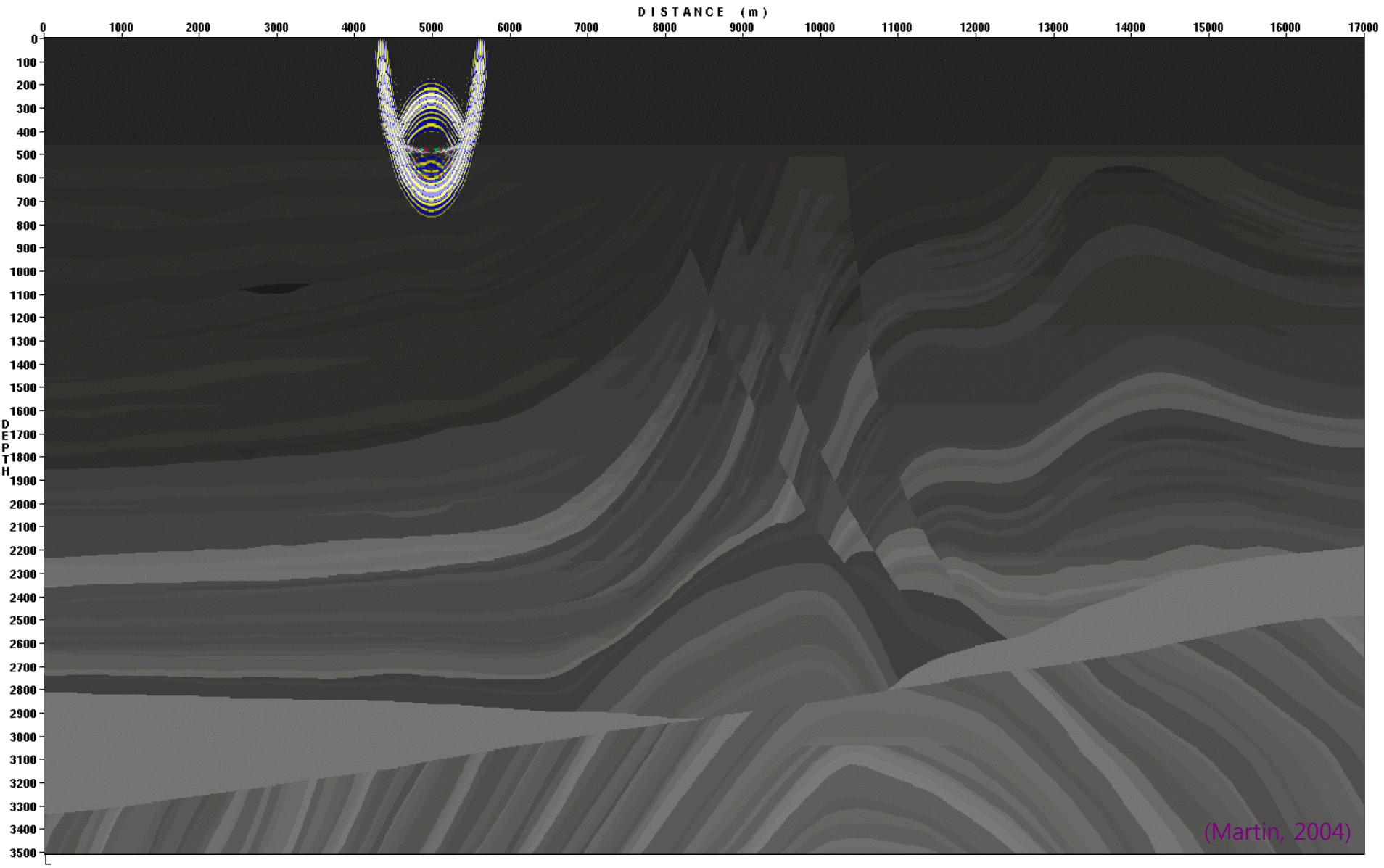

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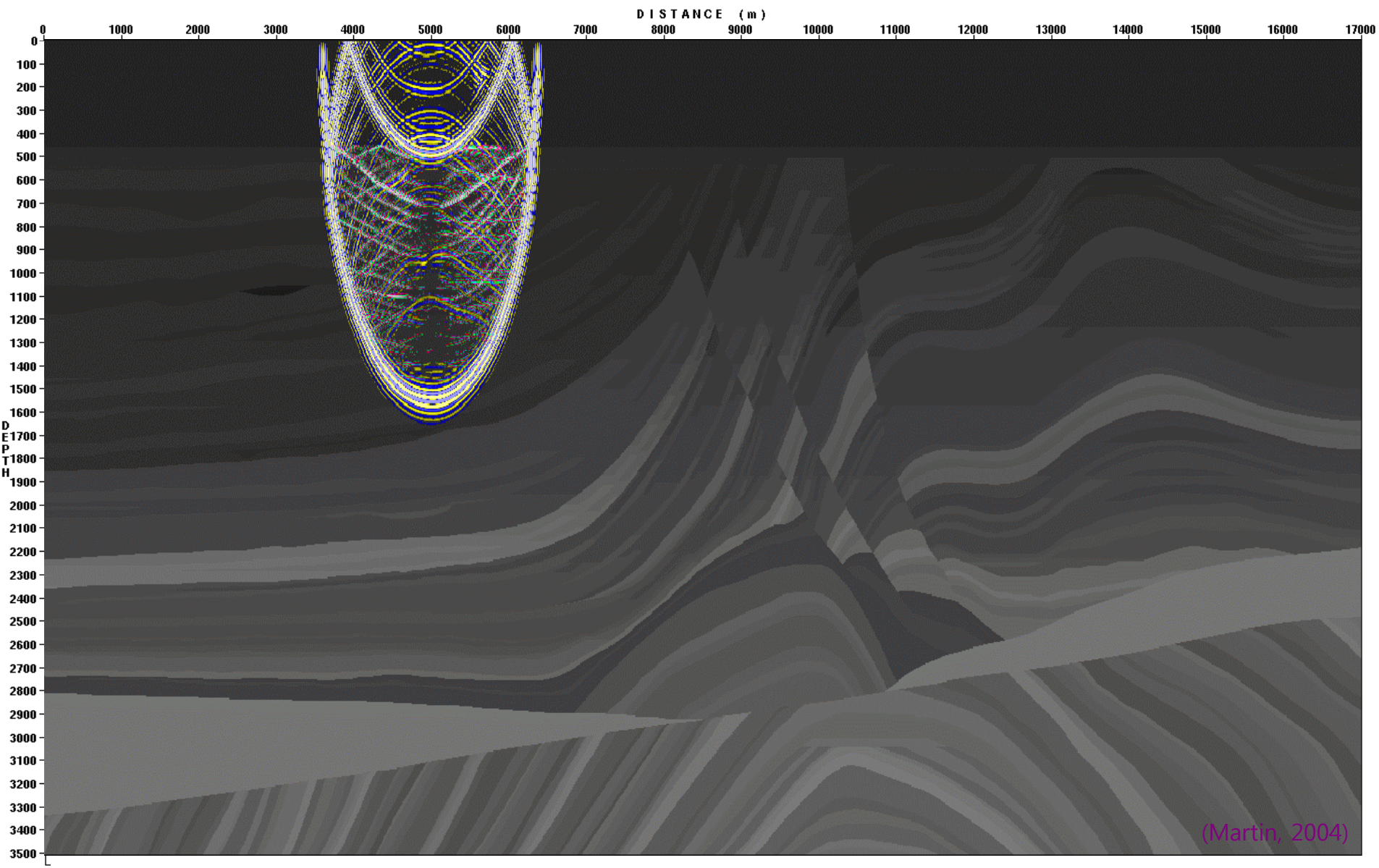

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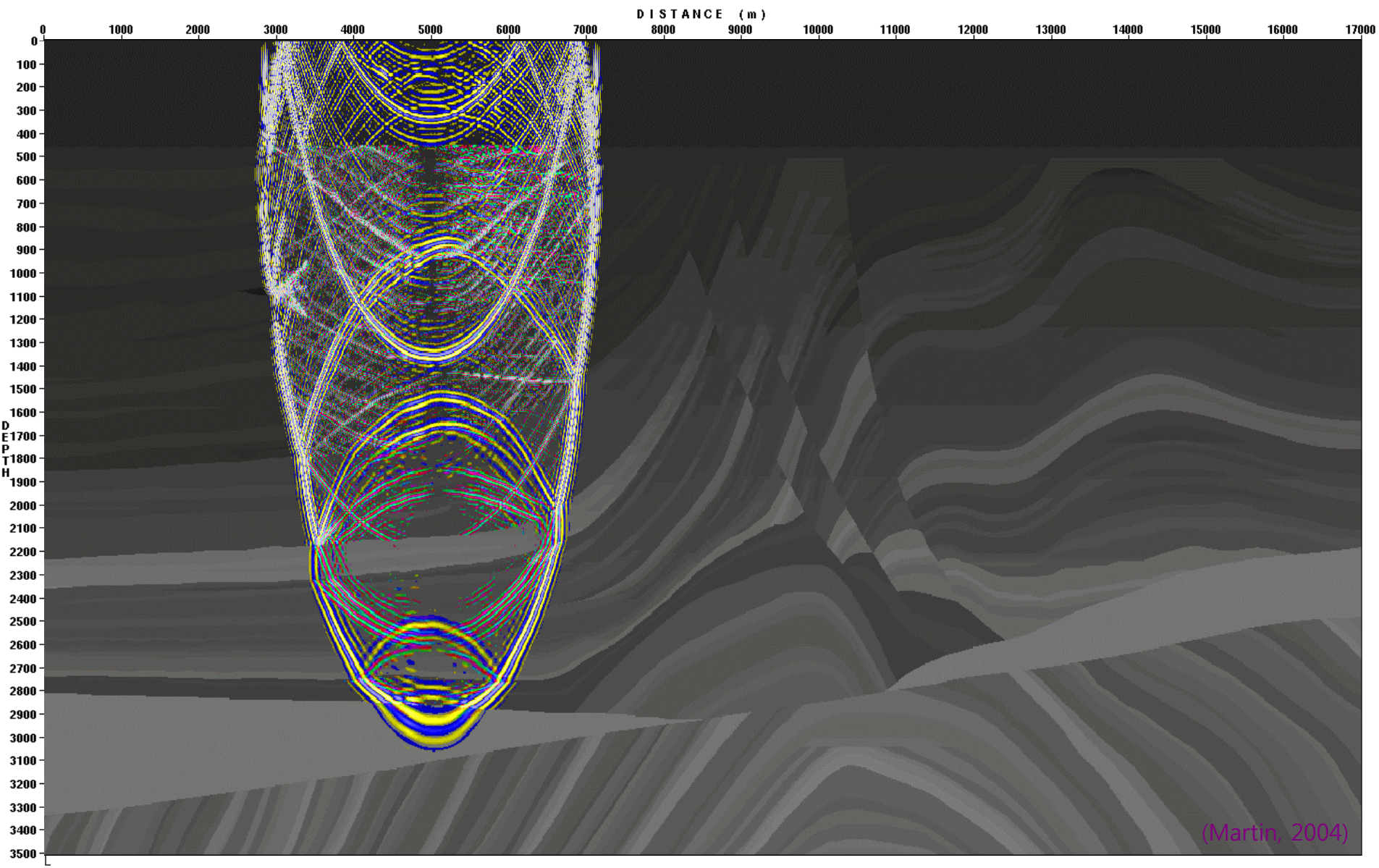
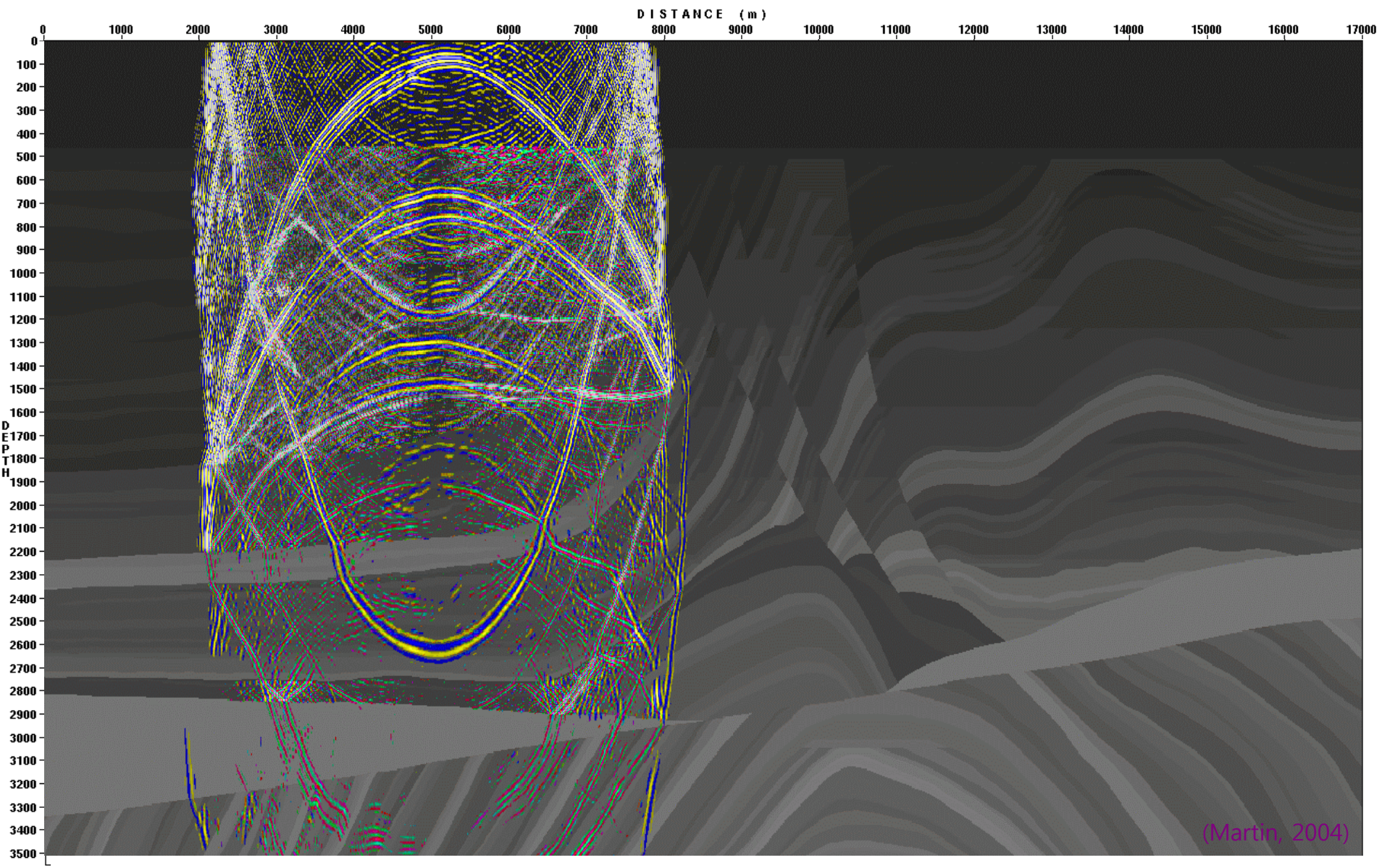
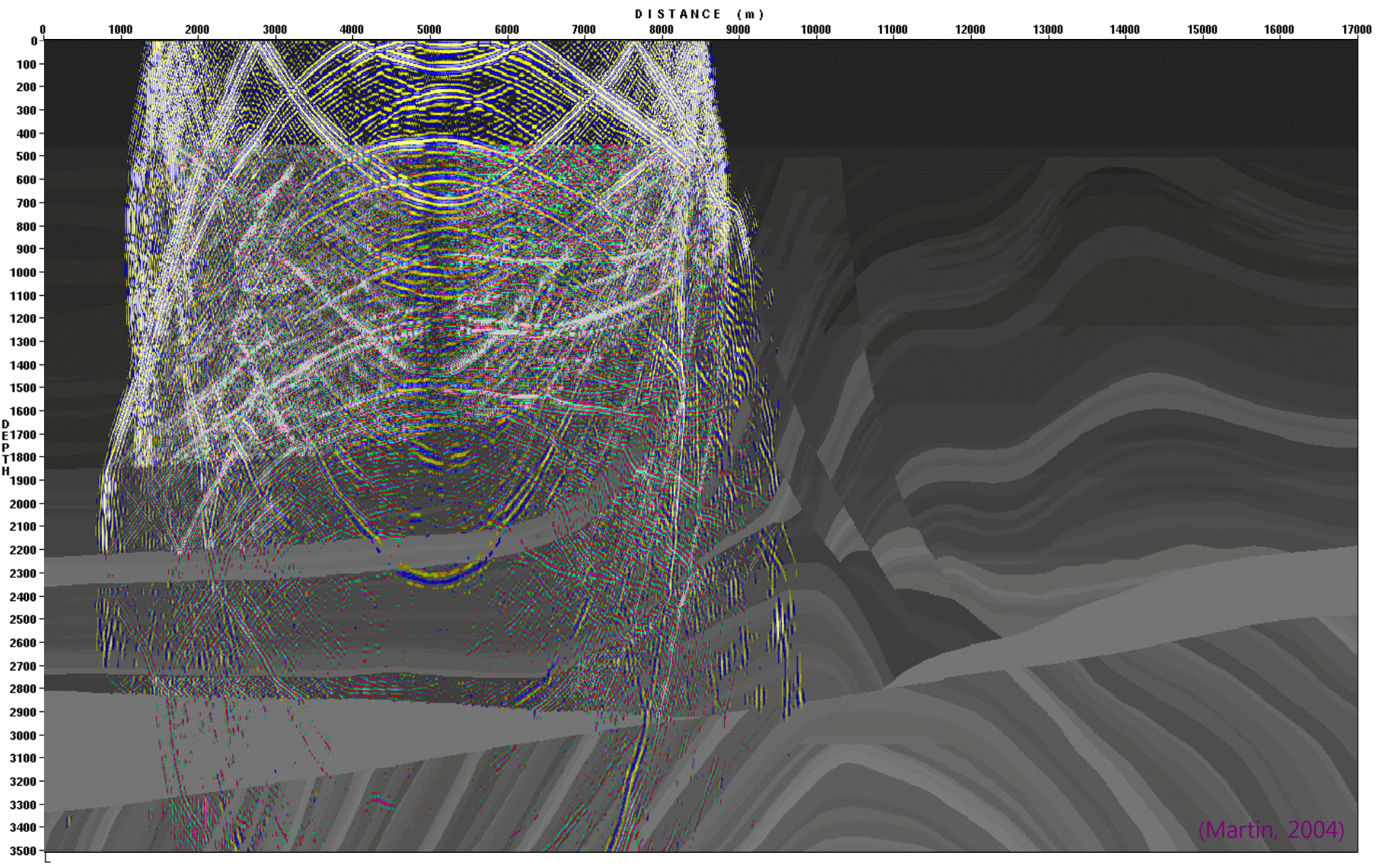


Snapshot: t=2.0 s

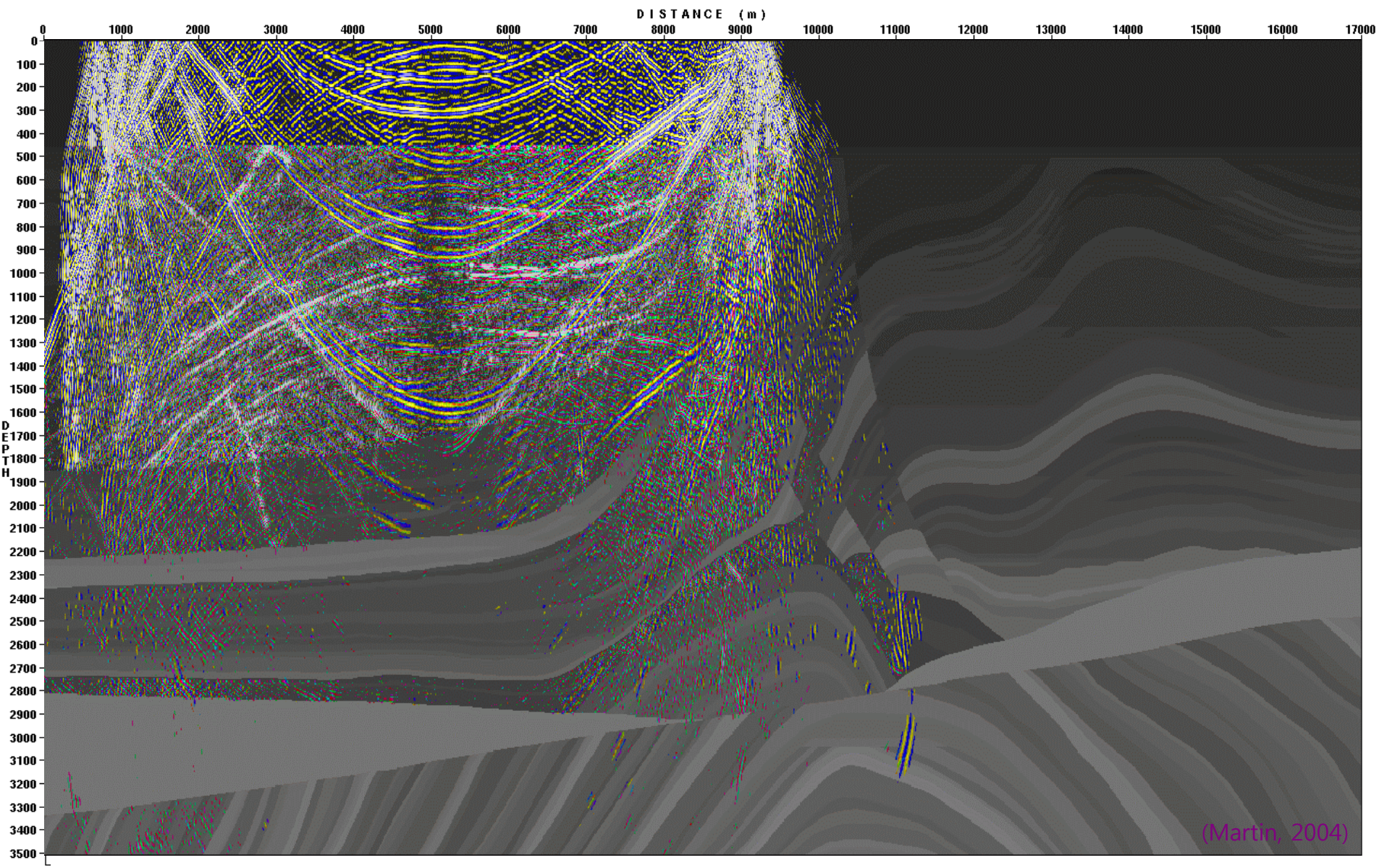


(Martin, 2004)

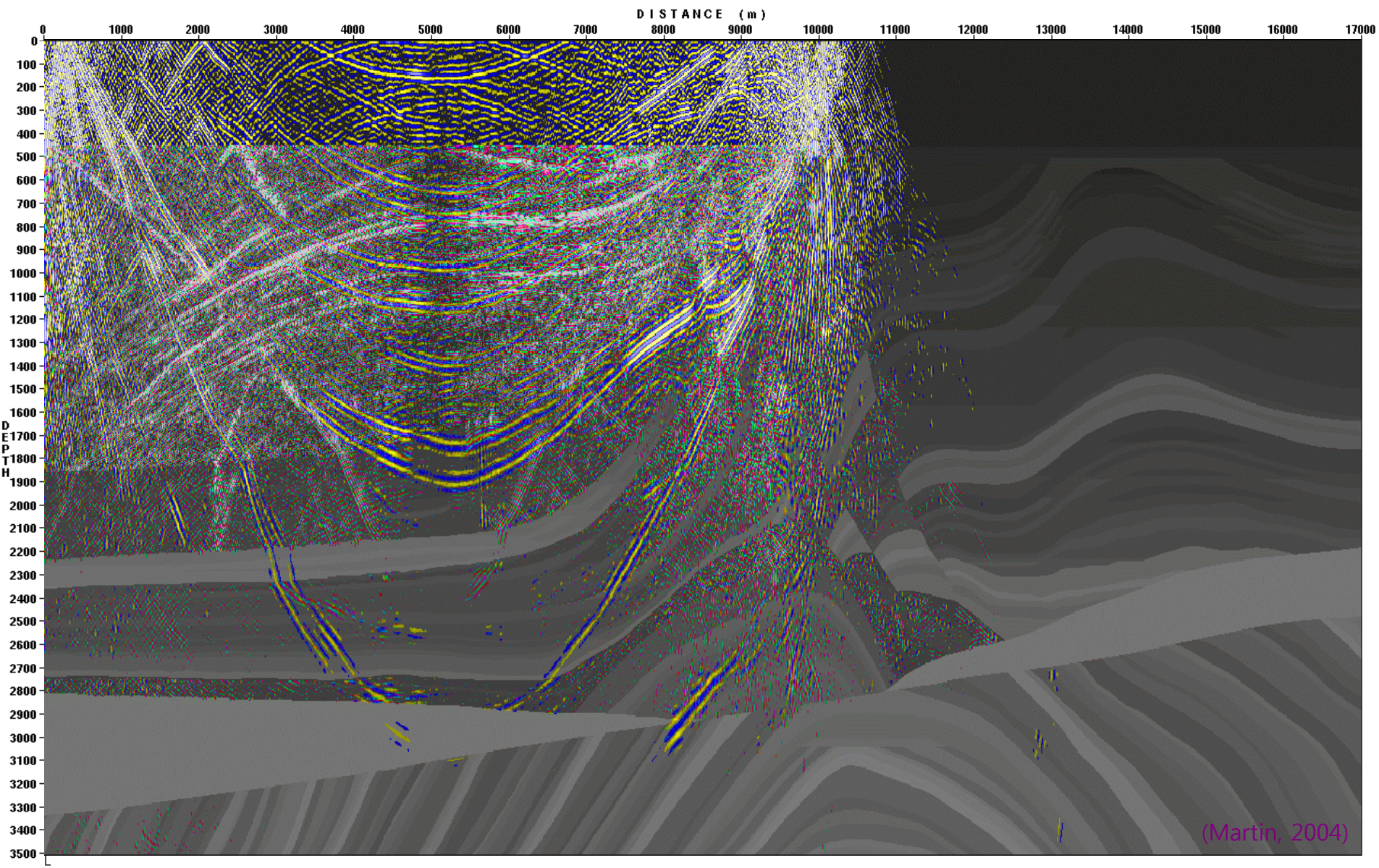
Snapshot: t=2.5 s



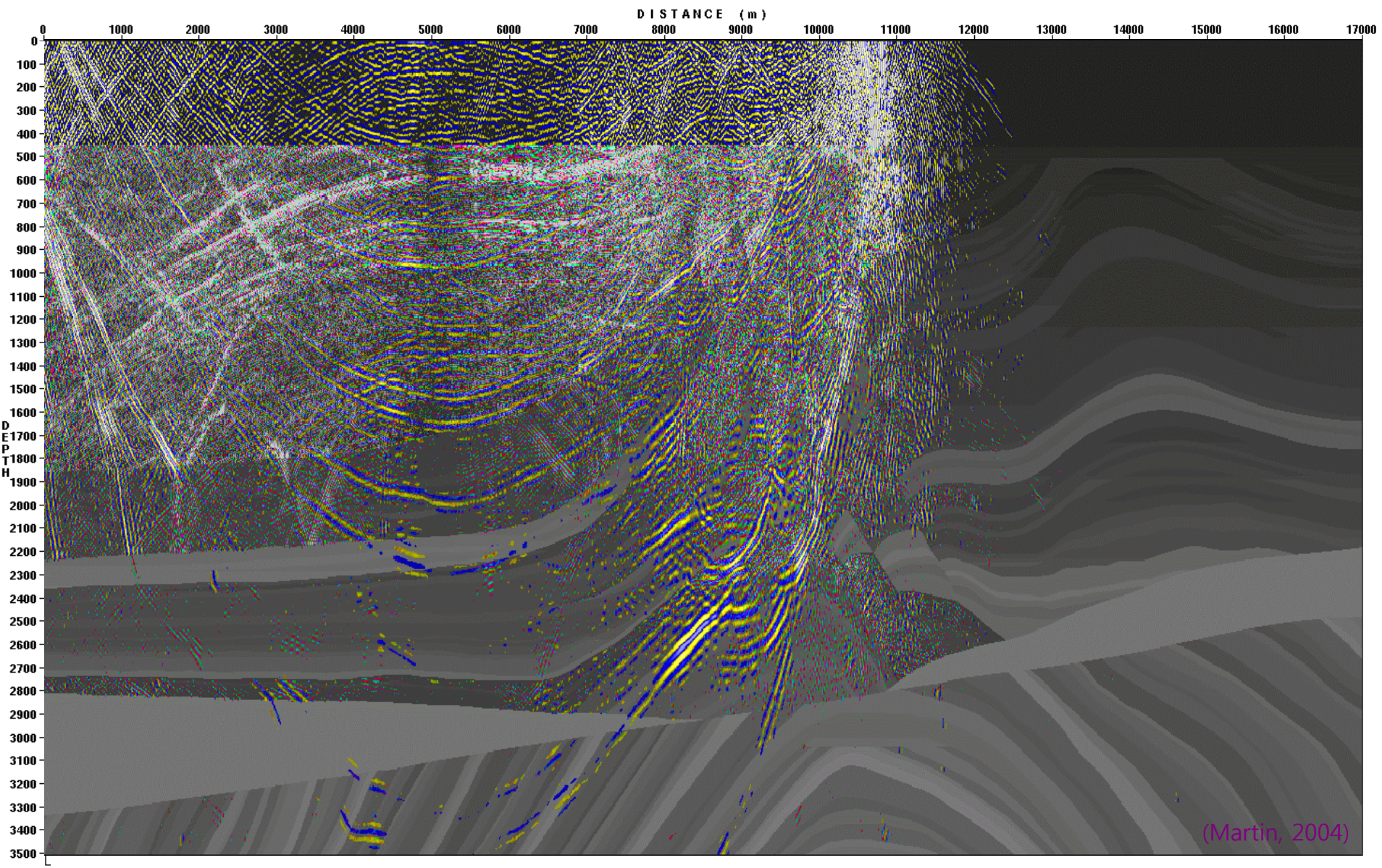
Snapshot: t=3.0 s



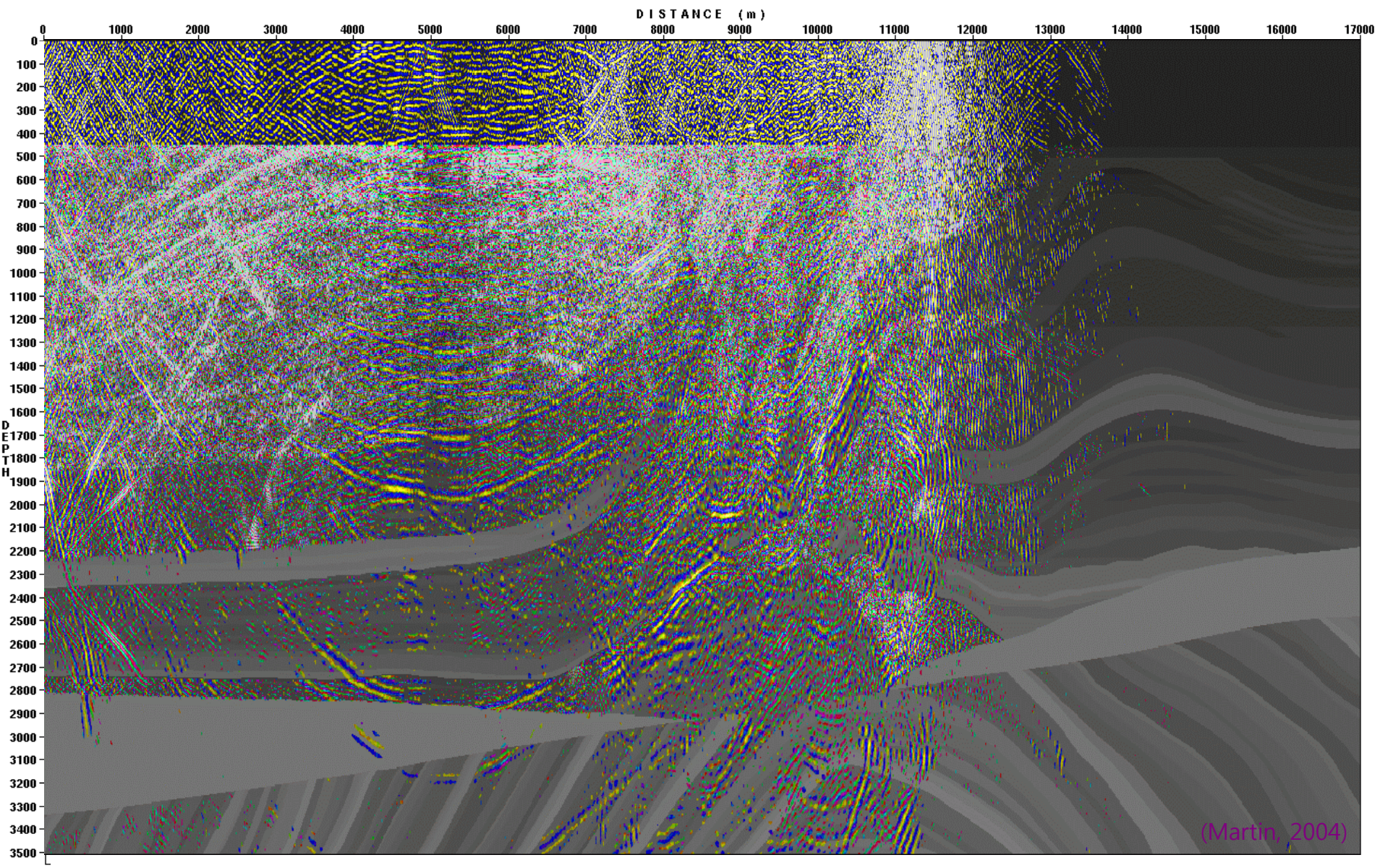
Snapshot: t=3.5 s



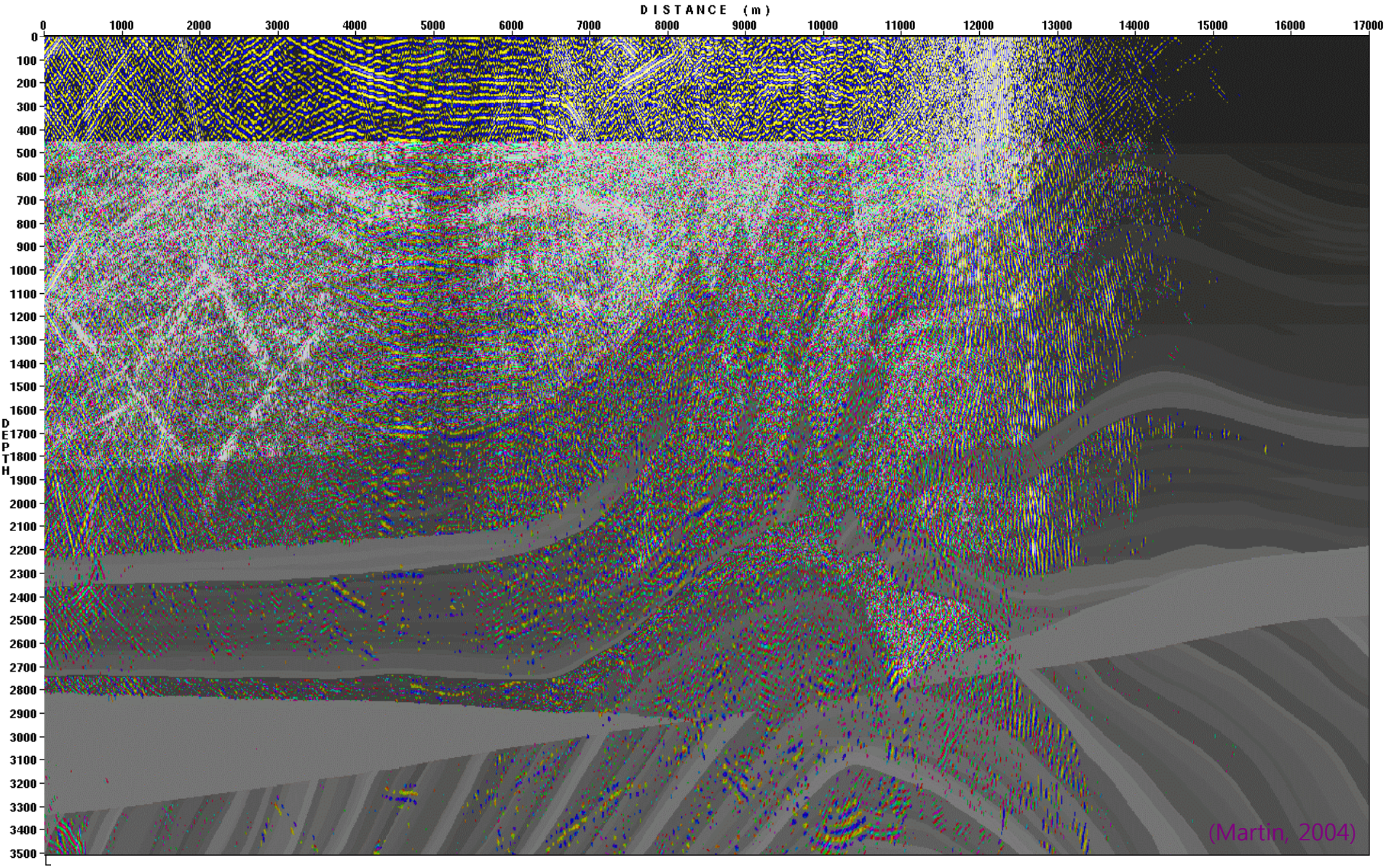
Snapshot: t=4.0 s



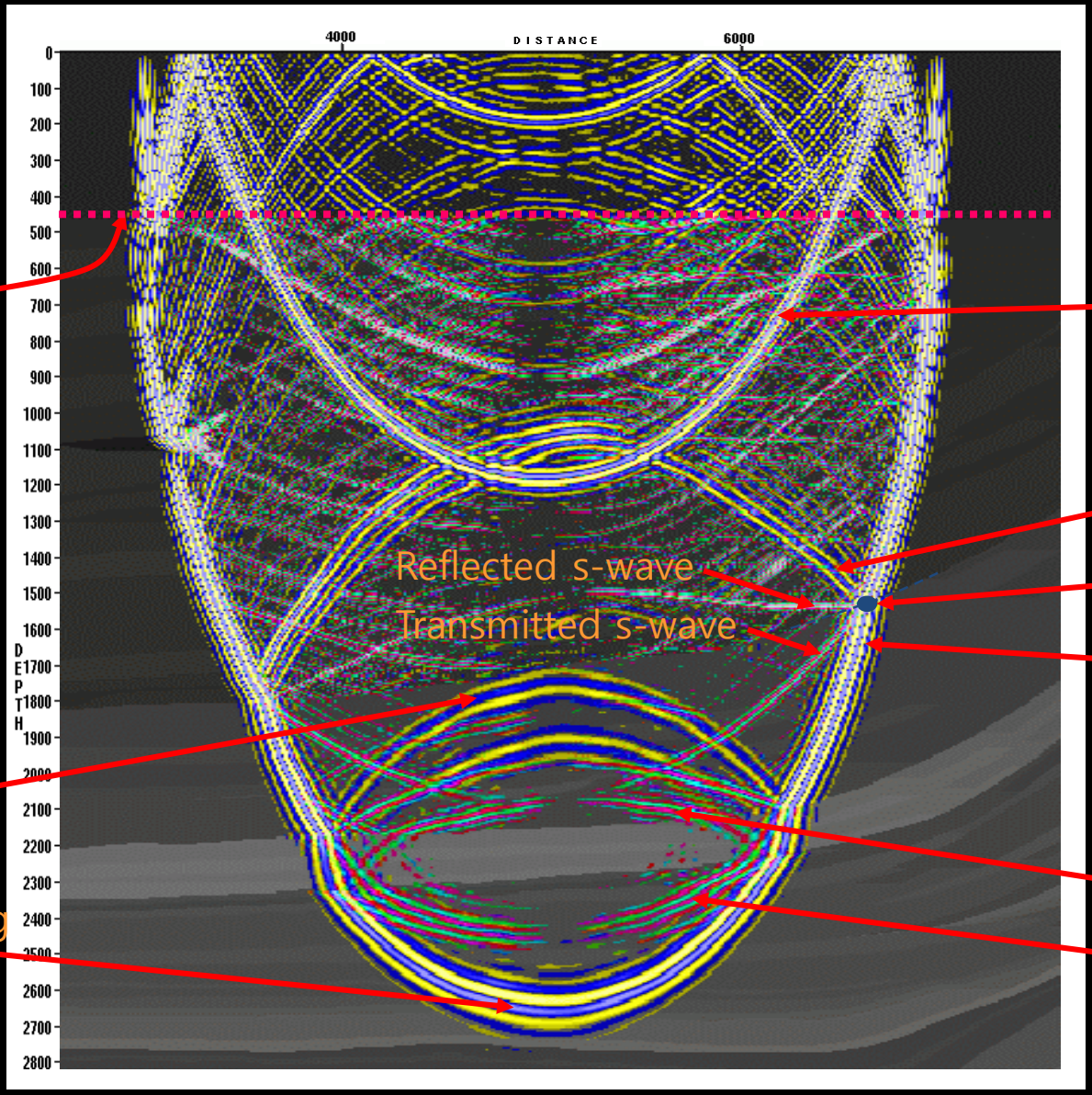
Snapshot: t=4.5 s



Snapshot: t=5.0 s

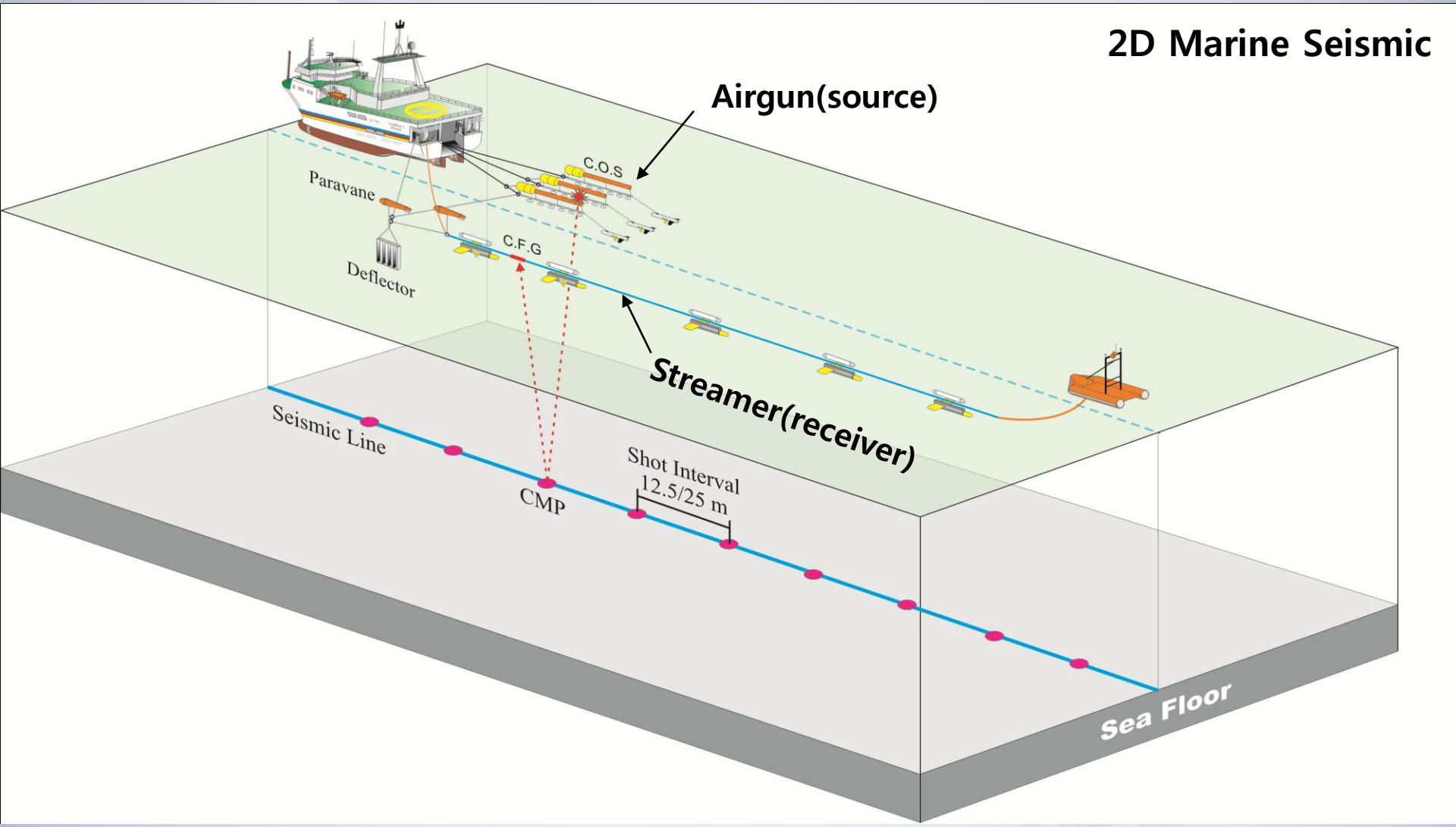


Seismic Wave Propagation through the earth

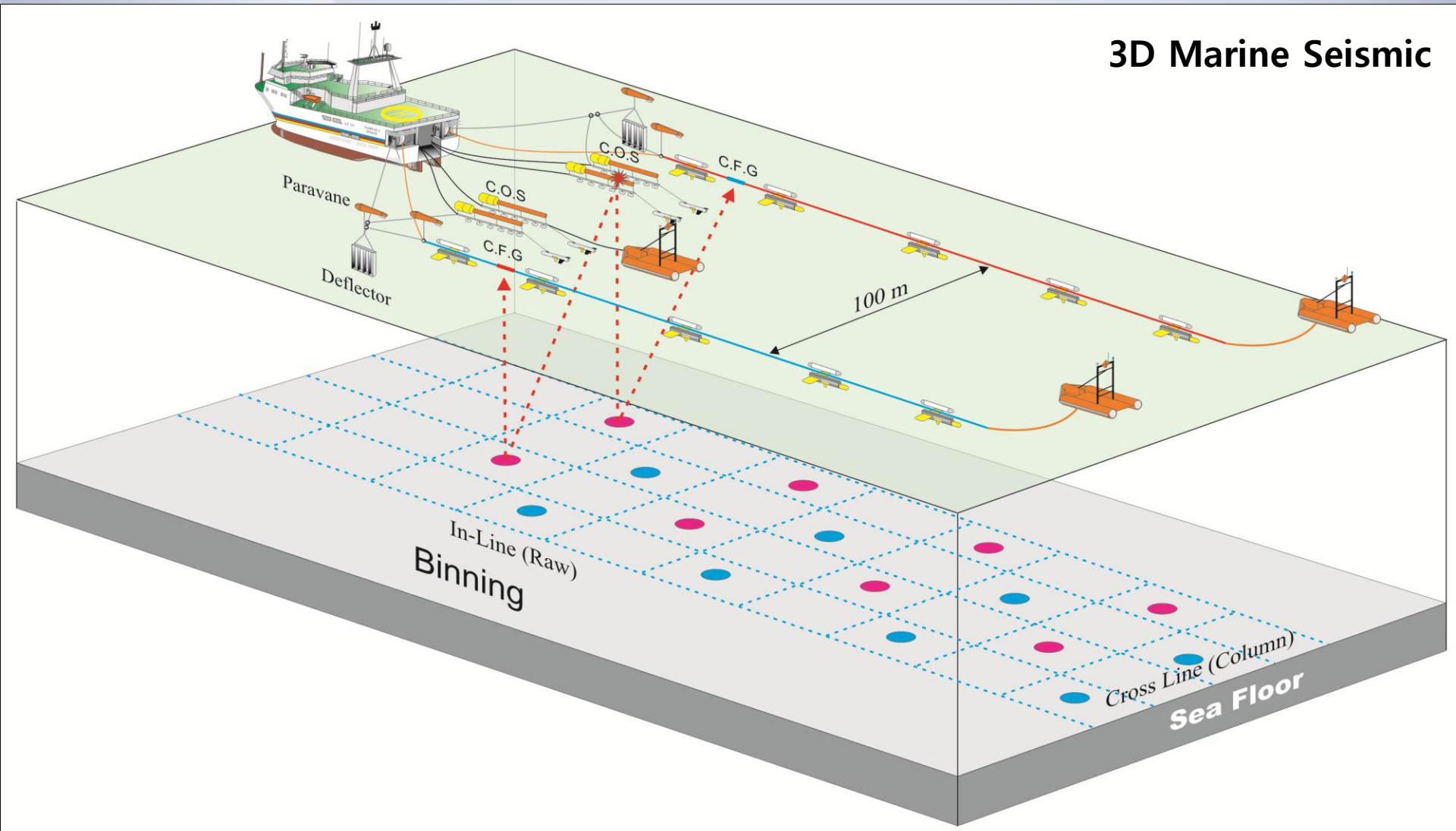


(Martin, 2004)

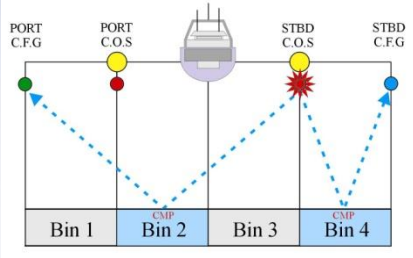
Marine 2D Seismic Exploration

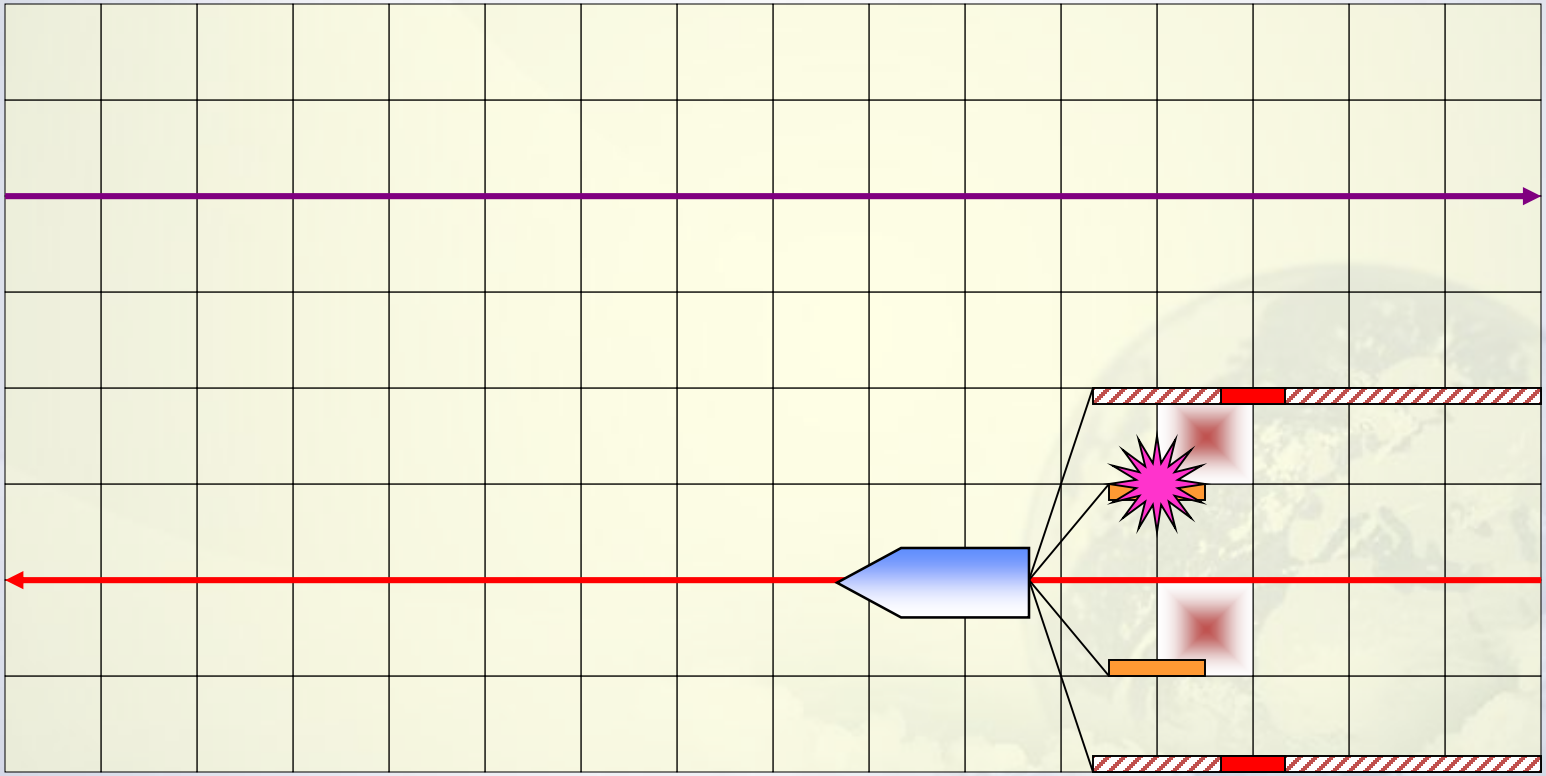


Marine 3D Seismic Exploration



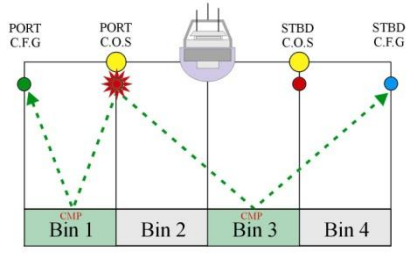
3D Binning

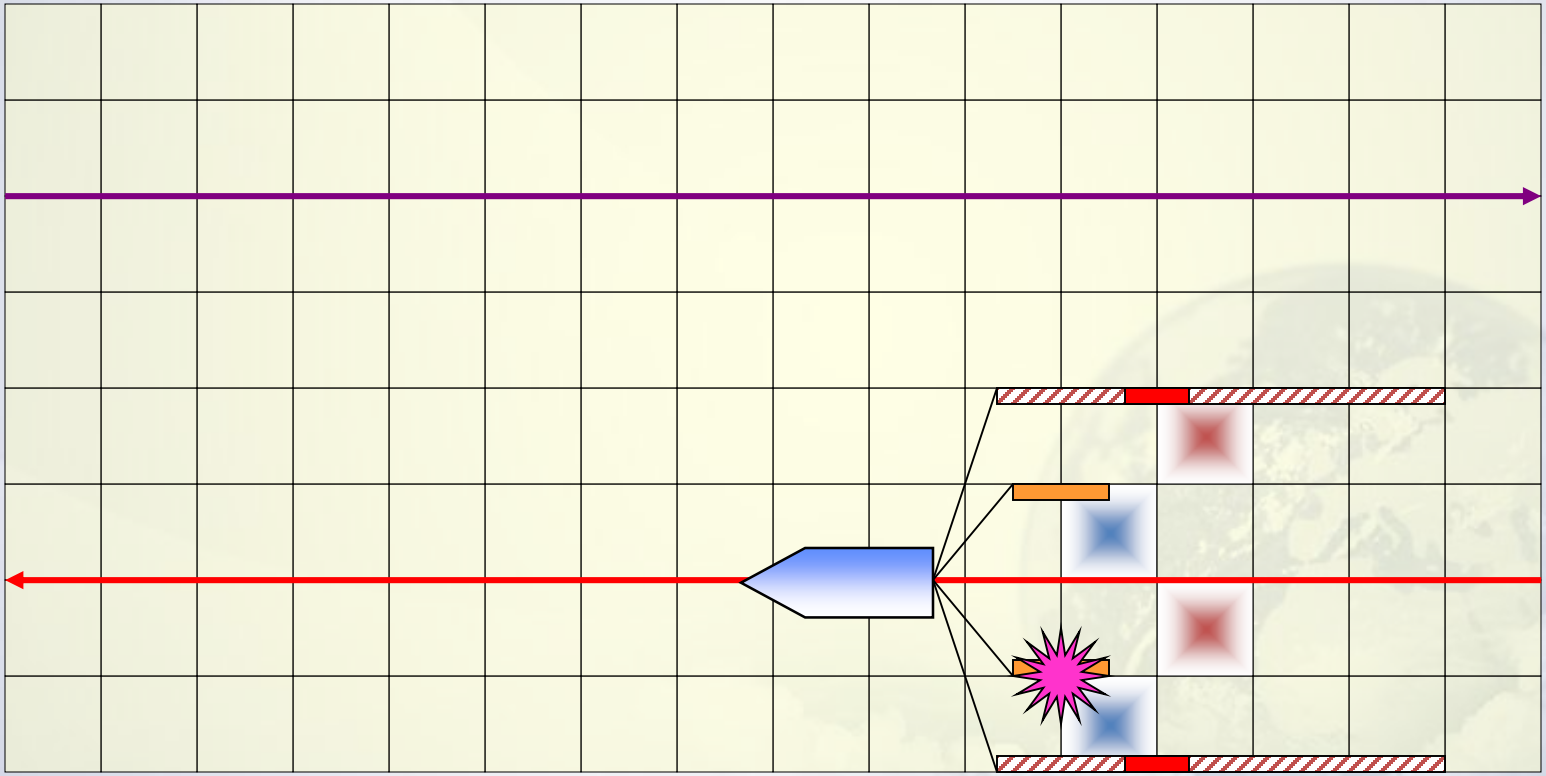




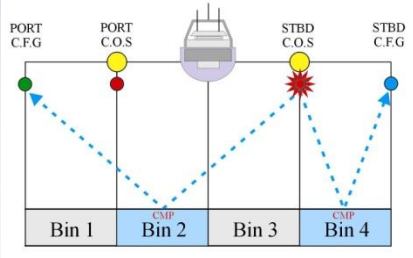
SP 101
SOL

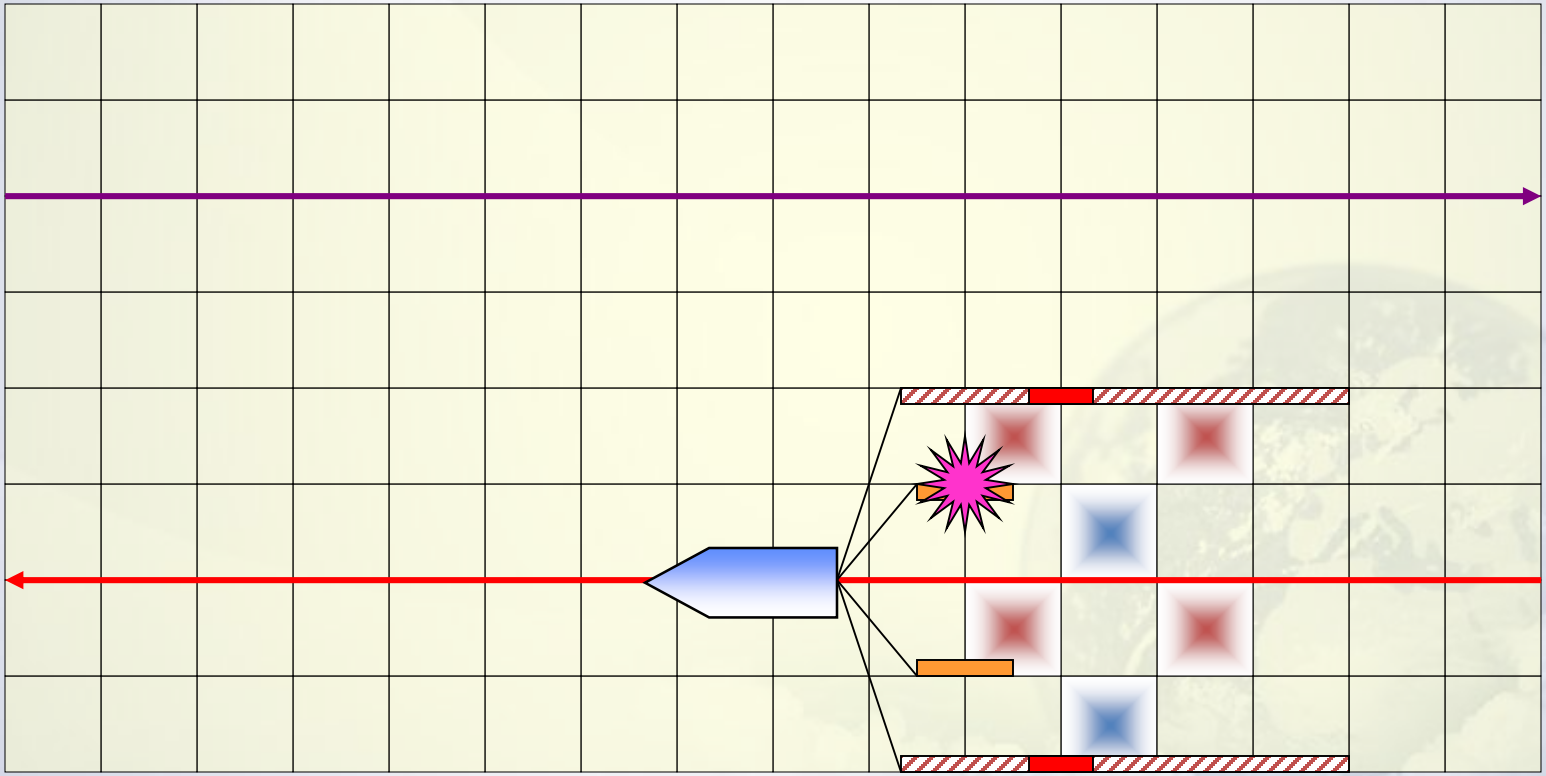
3D Binning


PORT C.F.G
PORT C.O.S
STBD C.O.S
STBD C.F.G
CMP
Bin 1
Bin 2
CMP
Bin 3
Bin 4


SP 102
SP 101
SOL

3D Binning


PORT
C.F.G
PORT
C.O.S
STBD
C.O.S
STBD
C.F.G
CMP
CMP
Bin 1
Bin 2
Bin 3
Bin 4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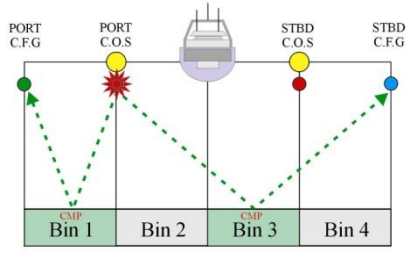
SP 102
SP 101
SOL

3D Binning


PORT C.F.G
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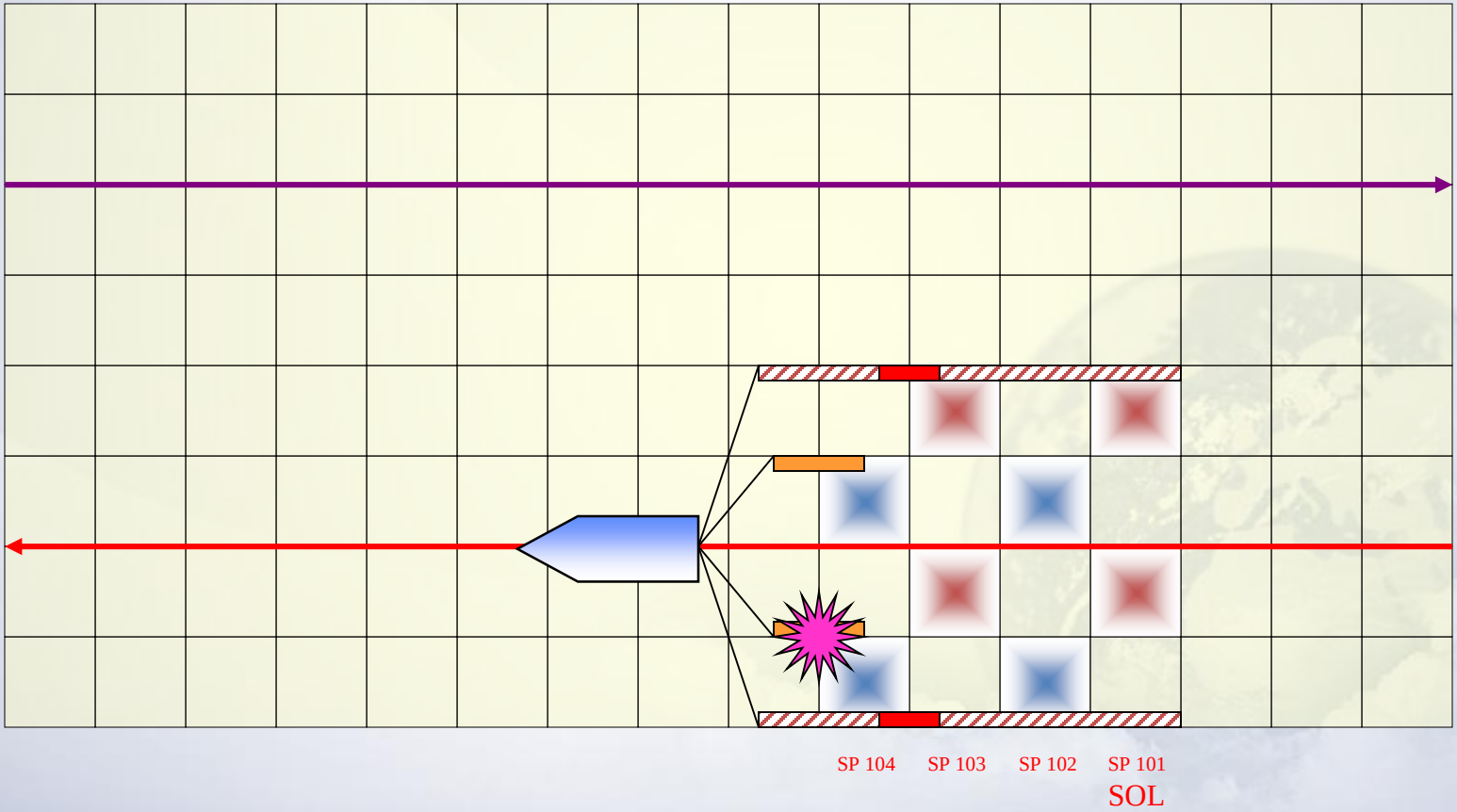
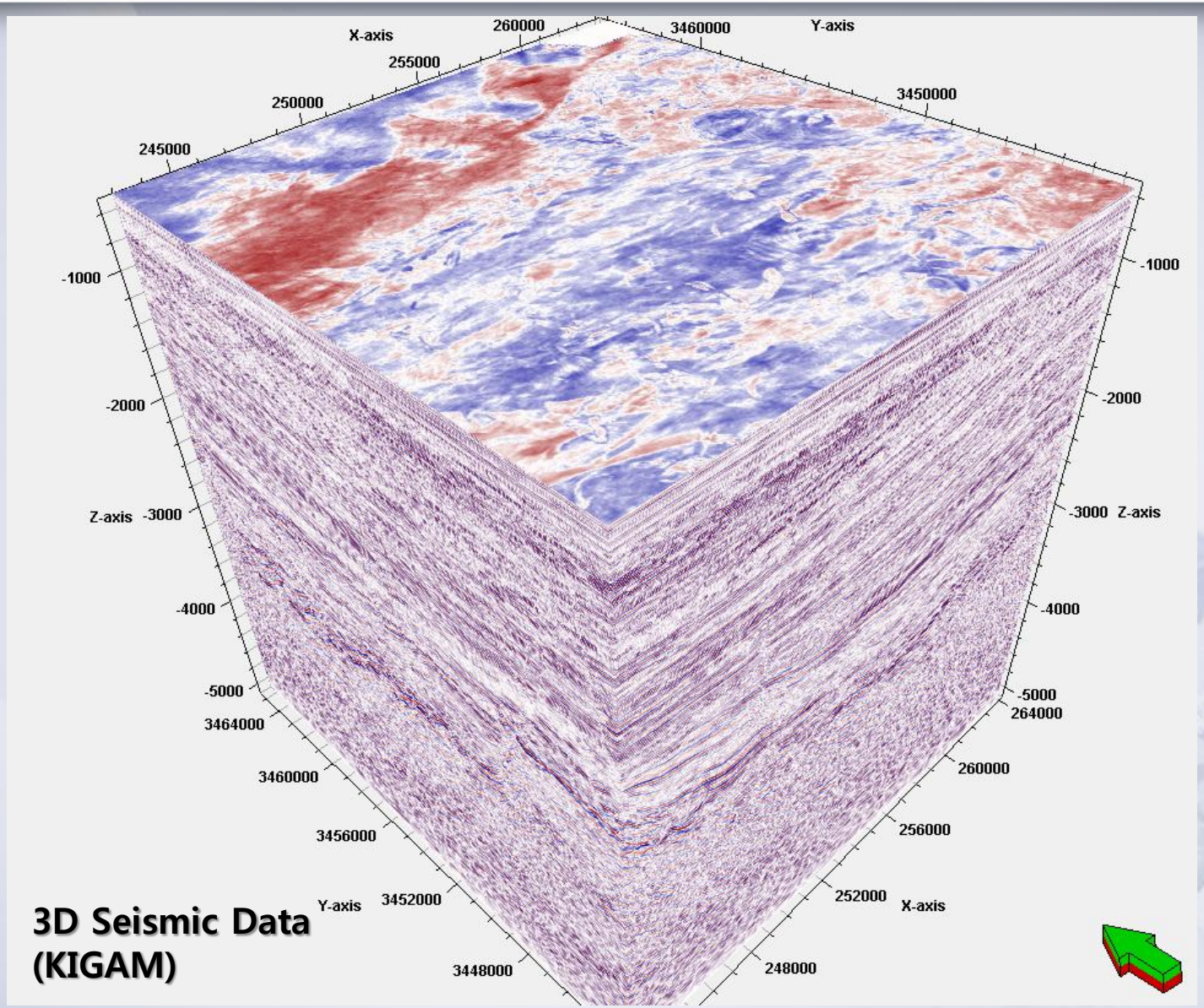

SP 104
SP 103
SP 102
SP 101
SOL

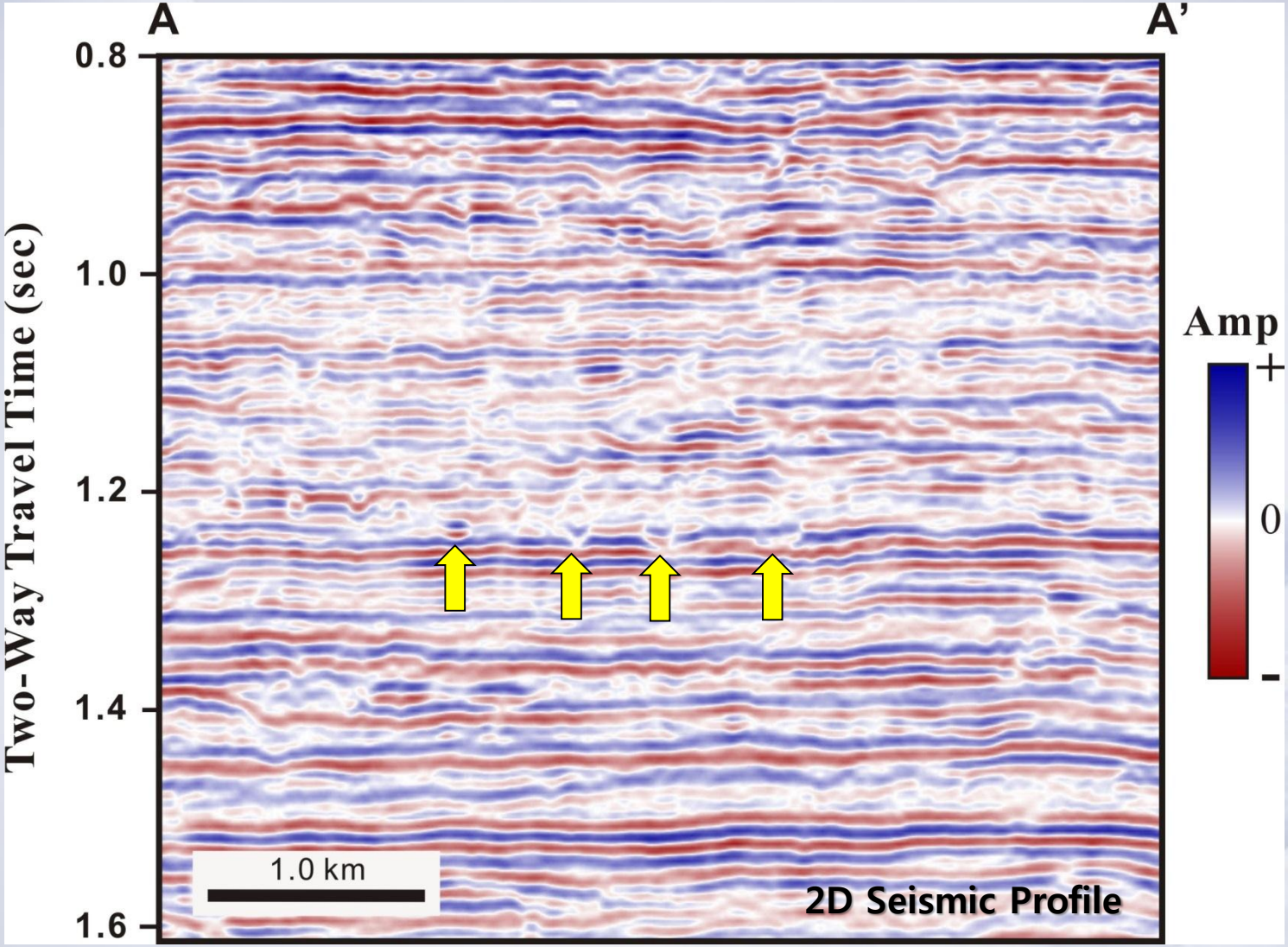
3D Seismic Survey using R/V TAMHAE II, KIGAM

3D vs 2D Seismic Exploration

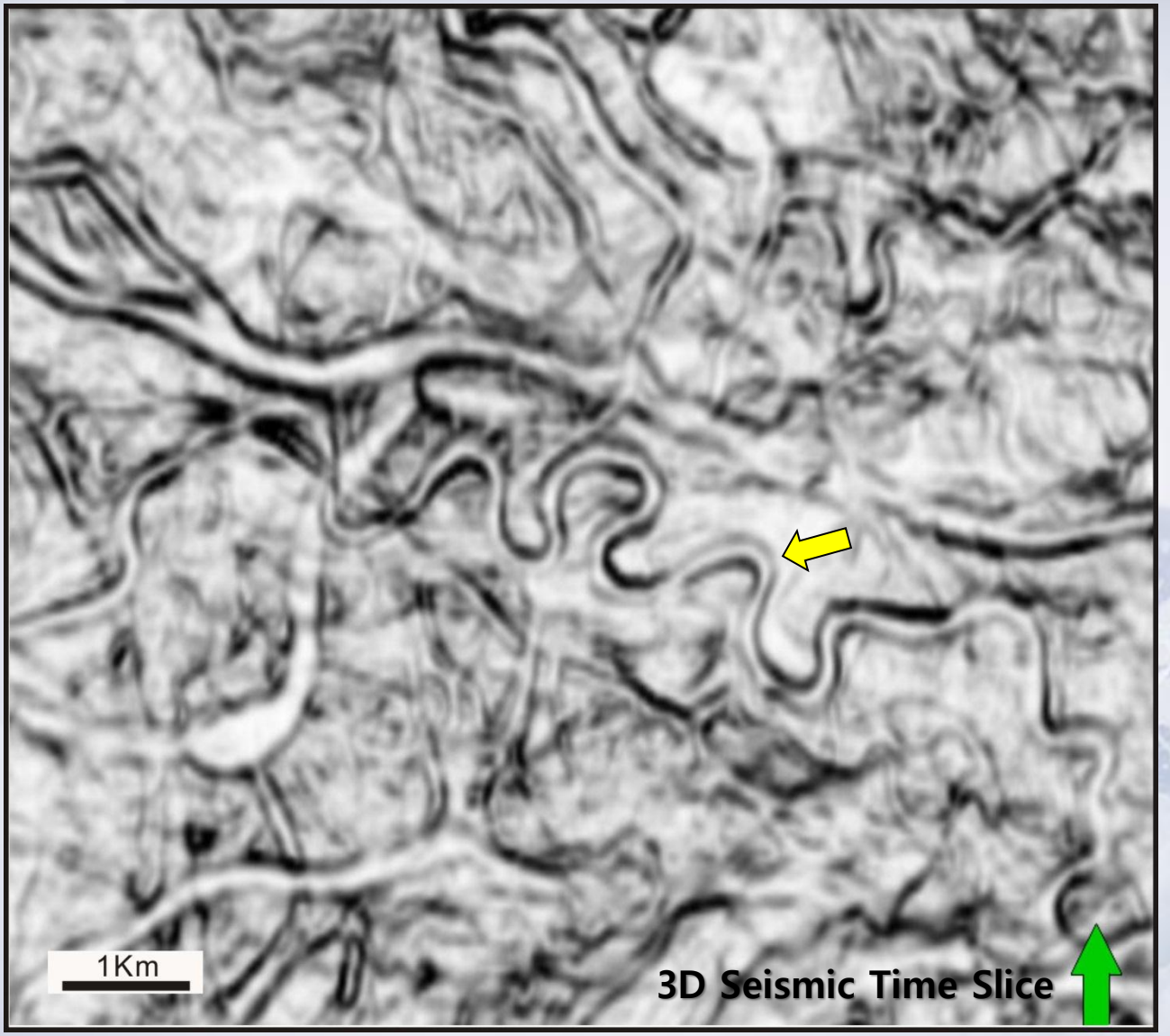


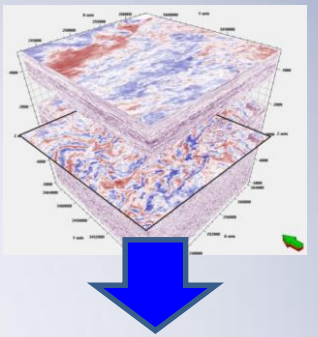
3D Seismic Data (KIGAM)

3D vs 2D Seismic Exploration



3D vs 2D Seismic Exploration

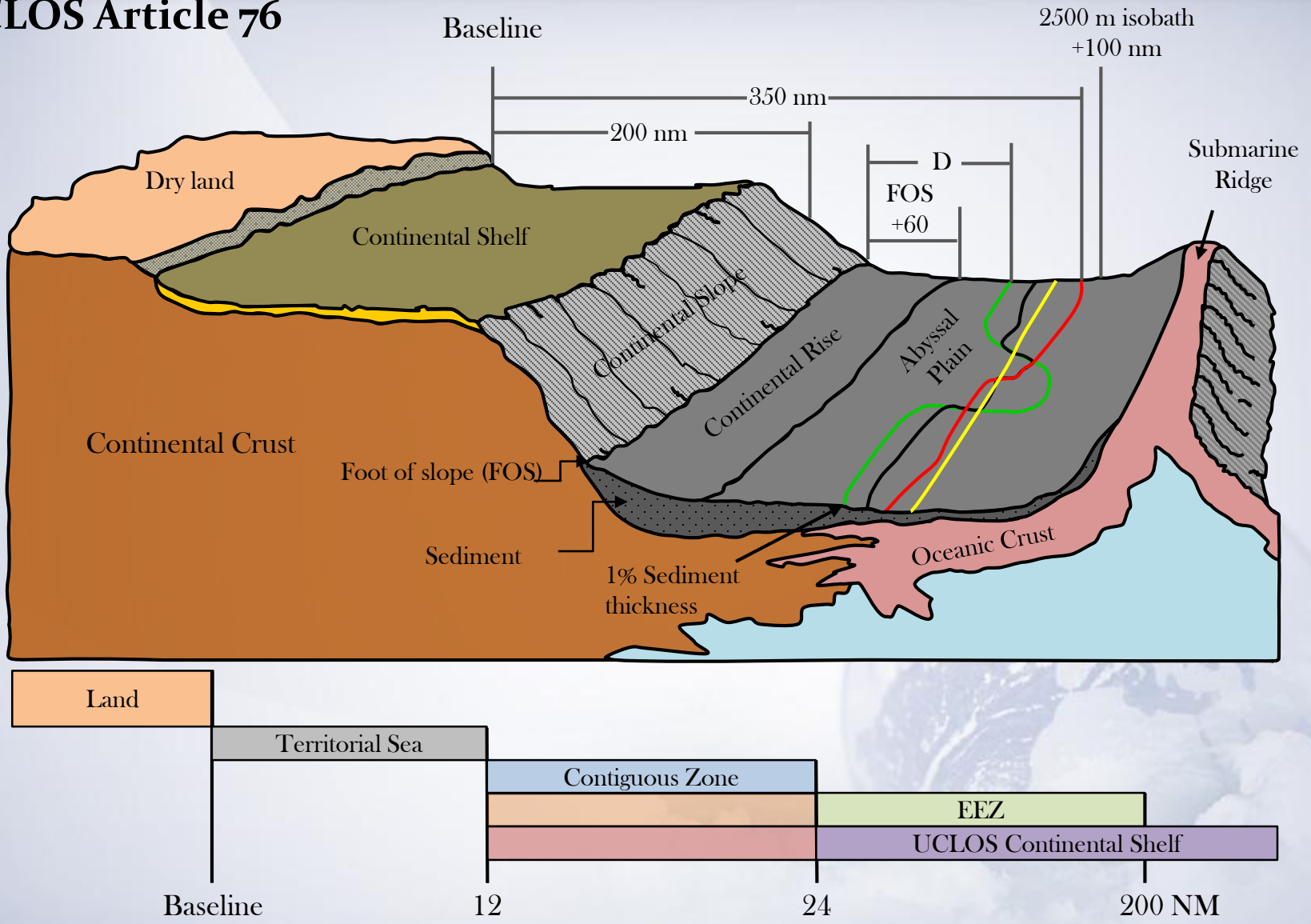




UNCLOS Outer limits of Continental Shelf

KIGAM

UNCLOS Article 76



UNCLOS Outer limits of Continental Shelf

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Article 76.4 Formula Lines

(i) a line delineated in accordance with paragraph 7 by reference to the outermost fixed points at each of which the thickness of sedimentary rocks is at least 1 per cent of the shortest distance from such point to the foot of the continental slope (Irish Formula, based on seismic data)

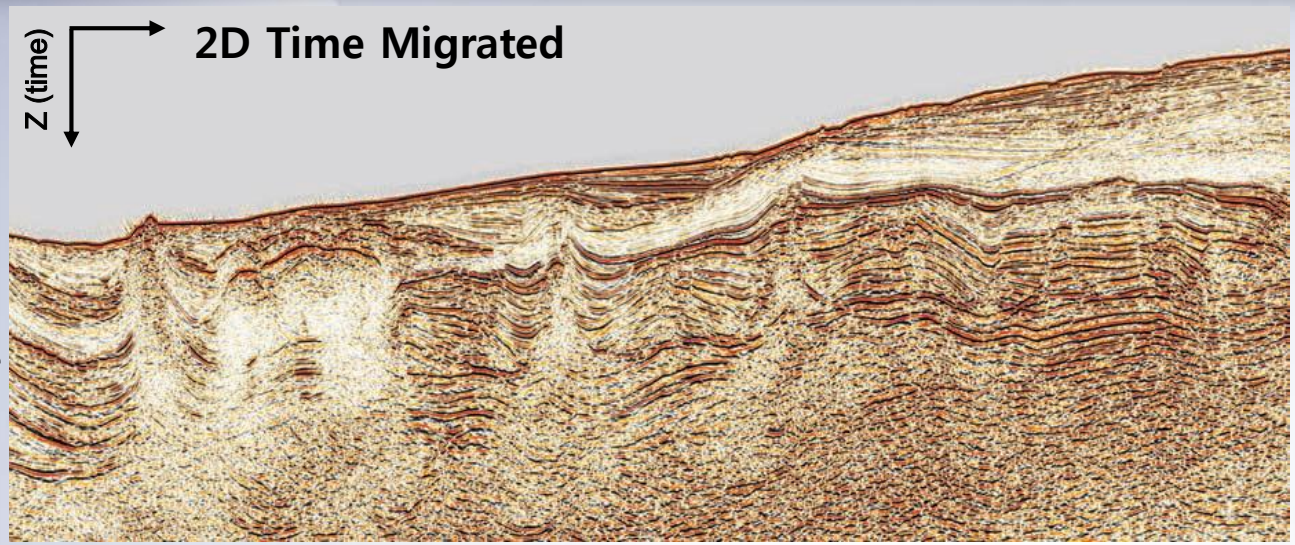
*(ii) a line delineated in accordance with paragraph 7 by reference to fixed points not more than **60 nautical** miles from the foot of the continental slope.* (**Hedberg Line**)

Article 76.5 Constraint Line

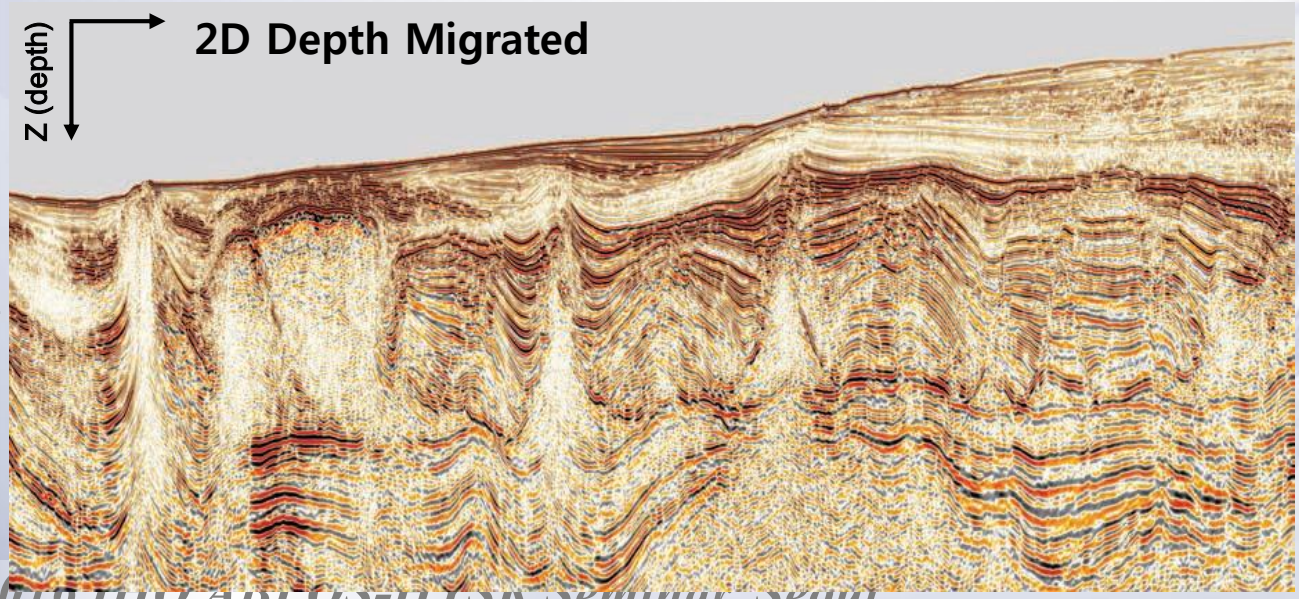
*The fixed points comprising the line of the outer limits of the continental shelf on the seabed, drawn in accordance with paragraph 4 (a)(i) and (ii), either shall not exceed **350 nautical miles** from the baselines from which the breath of the territorial sea is measured or shall not exceed **100 nautical miles** from the **2,500 meter isobath**, which is a line connecting the depth of 2,500 meters.*

Outer Limit of Continental Shelf Fixed Points

UNCLOS Outer limits of Continental Shelf



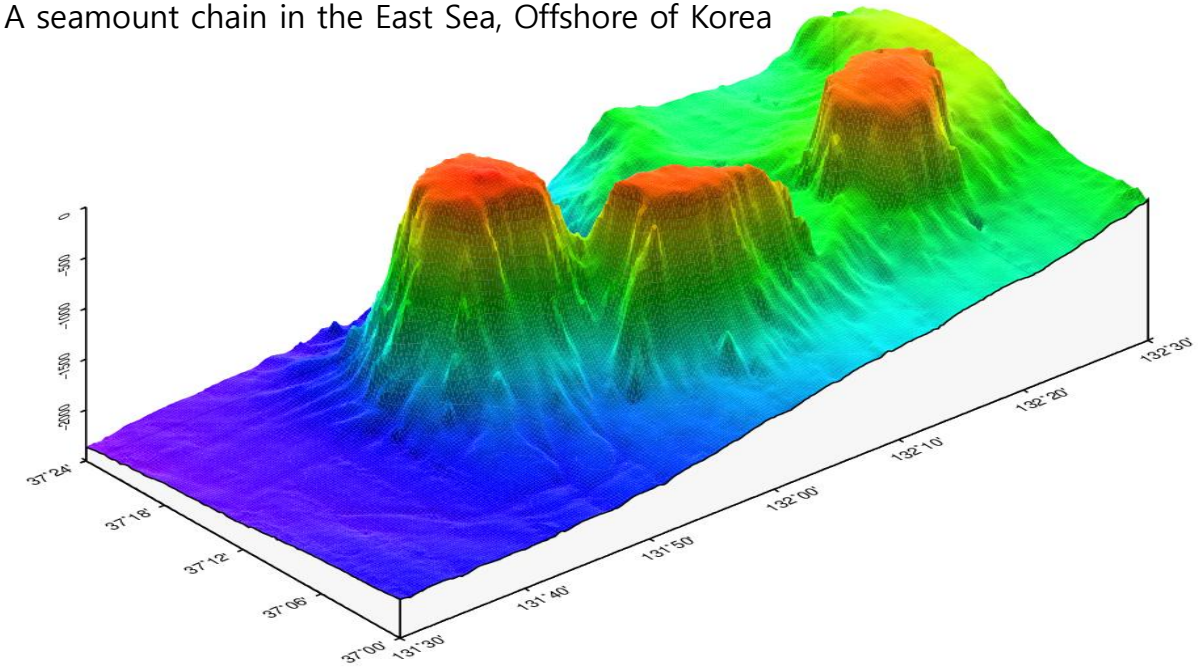
(WesternGeco ad, AAPG Explorer, November 2008)



Domain conversion (time to depth) is essential !

Naming of Undersea Features

A seamount chain in the East Sea, Offshore of Korea

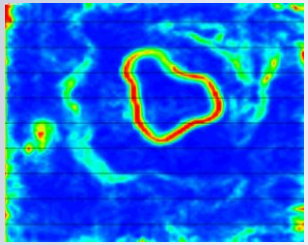


What are the origin of seamounts?

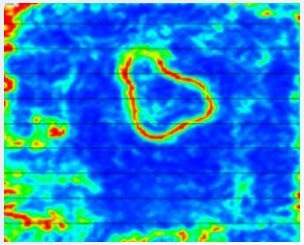
- Volcanic eruption
- Atoll (reef complex)
- Continental fragment

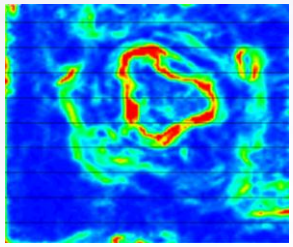
Naming of Undersea Features

Seismic data are useful to figure out the origin of undersea features

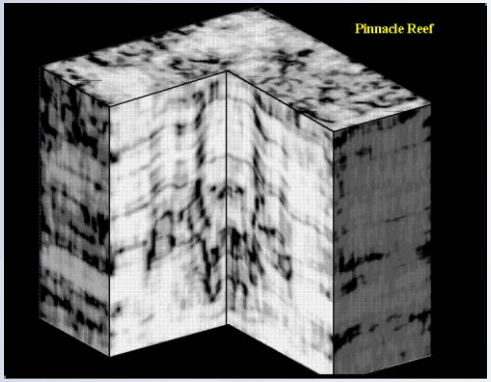


Pinnacle Reef, Canada

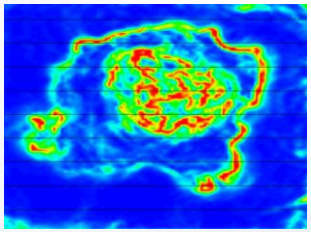


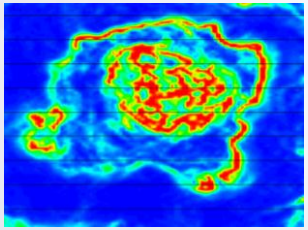


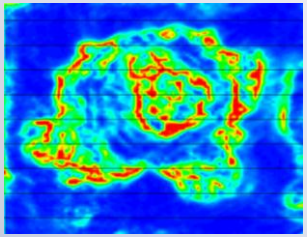
1 km



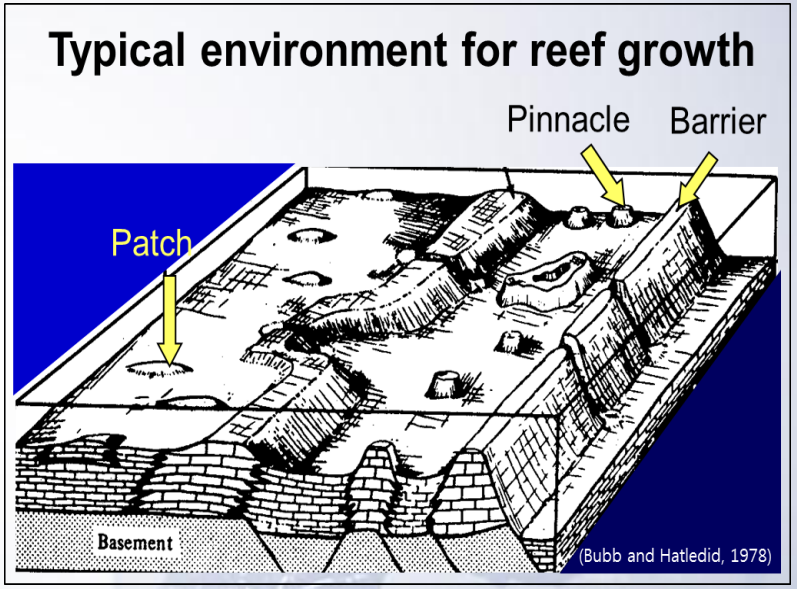
(Chopra and Marfurt, 2007)





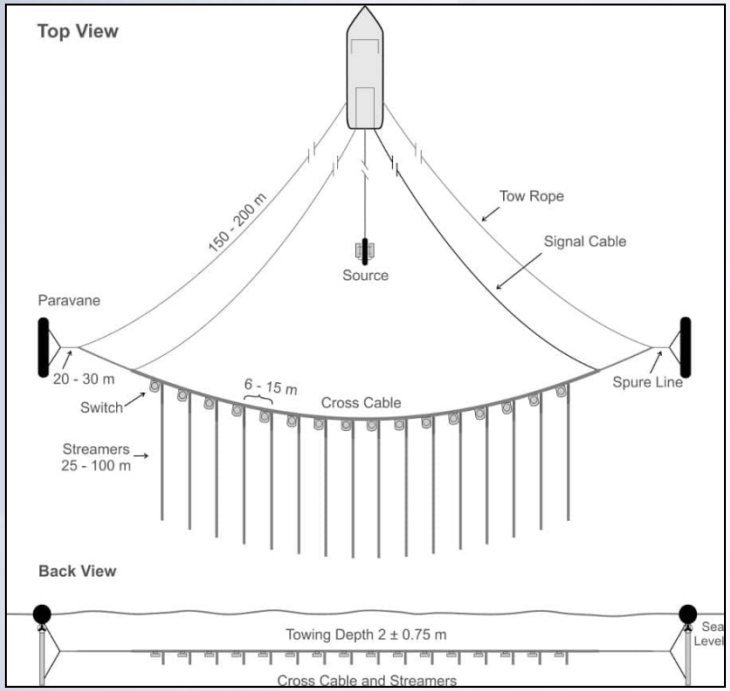


Coherence slices at 20 ms increments

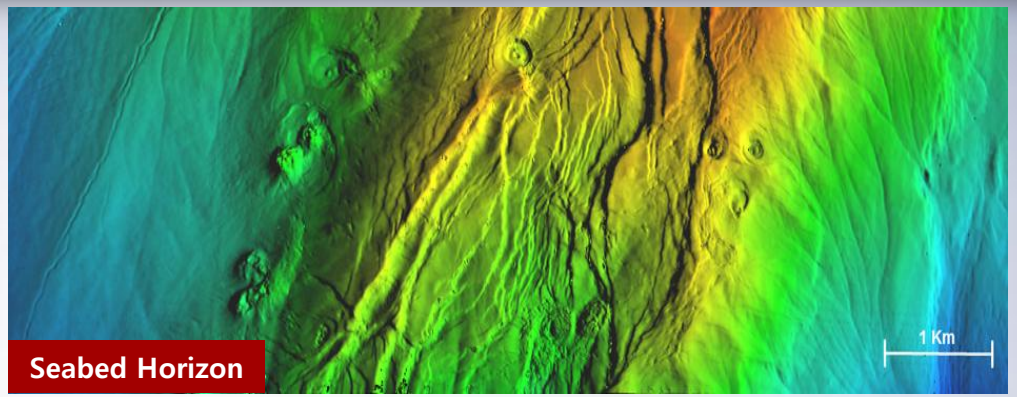


Ultra High Resolution 3D Seismic

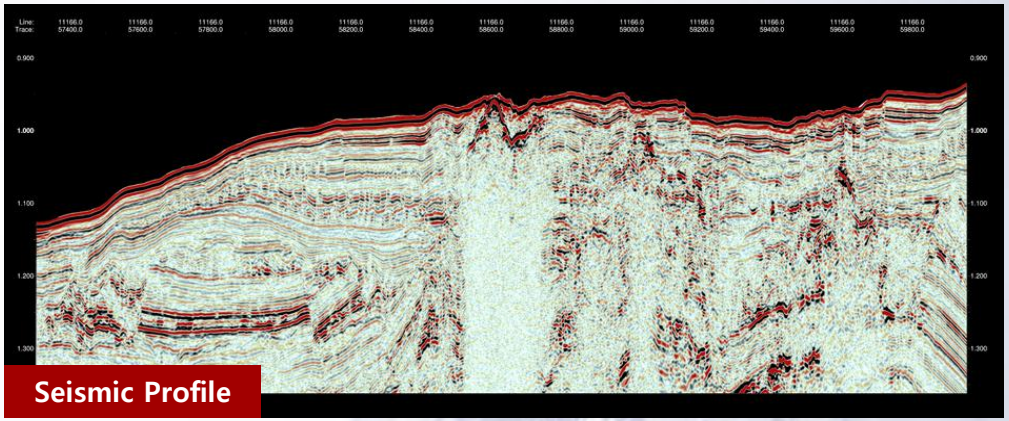
P-Cable 3D Seismic



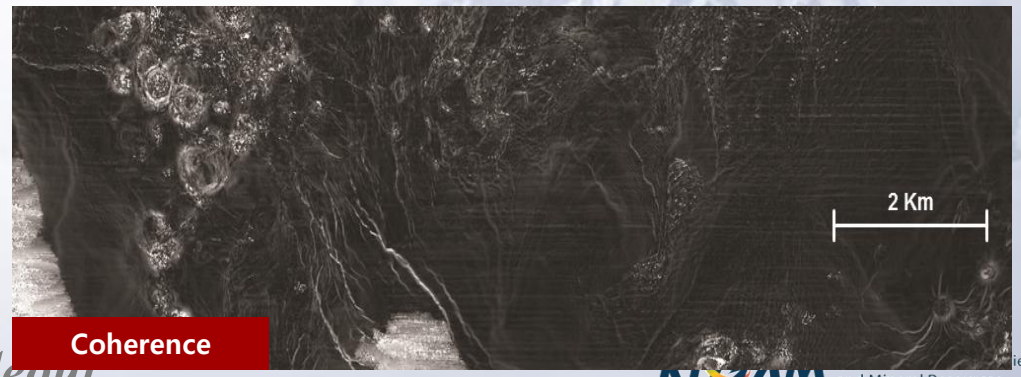
(P-Cable 3D Seismic AS)



Seabed Horizon



Seismic Profile



Coherence

(www.geometricspcale.com)

Summary

- Marine seismic survey is the most useful method to explore the structure of the earth (from shallow to deep subsurface structure).
- Seismic exploration is divided to several categories by frequency band.
- Marine seismic exploration data are used to generate Irish formula line of UNCLOS Outer limits of Continental Shelf (UNCLOS Article 76.4).
- Domain conversion of seismic data (from time to depth) is essential for UNCLOS outer limits of continental shelf.
- Seismic reflection data are useful to constraint the origin of undersea features.

Thank You !

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KIGAM