



Prestack Seismic for QC and Inspection of Amplitudes

for
high-grading prospects and reservoir
characterisation

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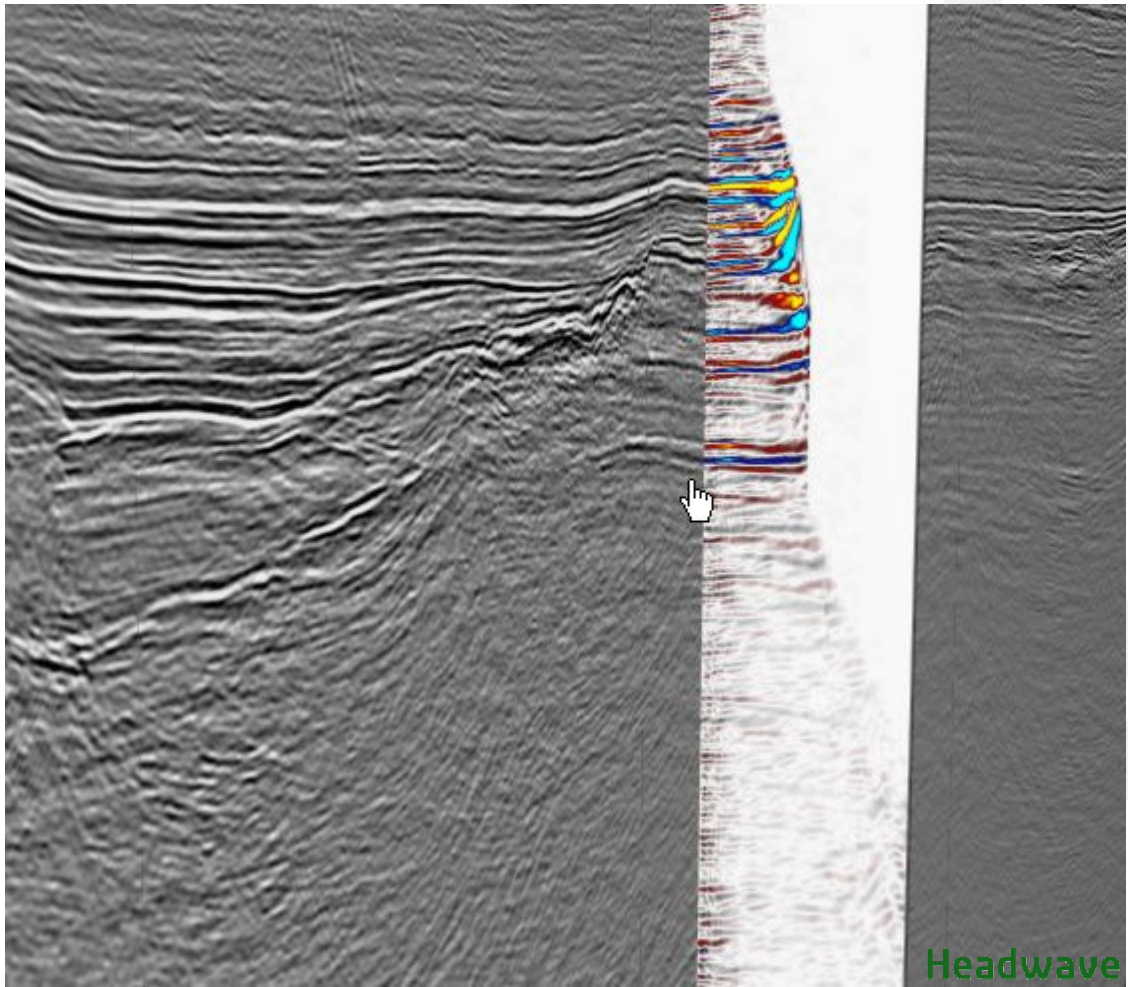


Vision

- The use of prestack seismic in QC, analysis and interpretation adds a new dimension
 - It will
 - improve the quality of the classic techniques
 - speed-up and refine E&P in the North Sea



Let's go Prestack



Headwave

Long offset NSR data, courtesy Fugro-TGS



Prestack Seismic for QC and Inspection of Amplitudes

Introduction

- Introduction
 - Partners in this presentation
 - Existing techniques (stacks and substacks)
 - New techniques (additional)



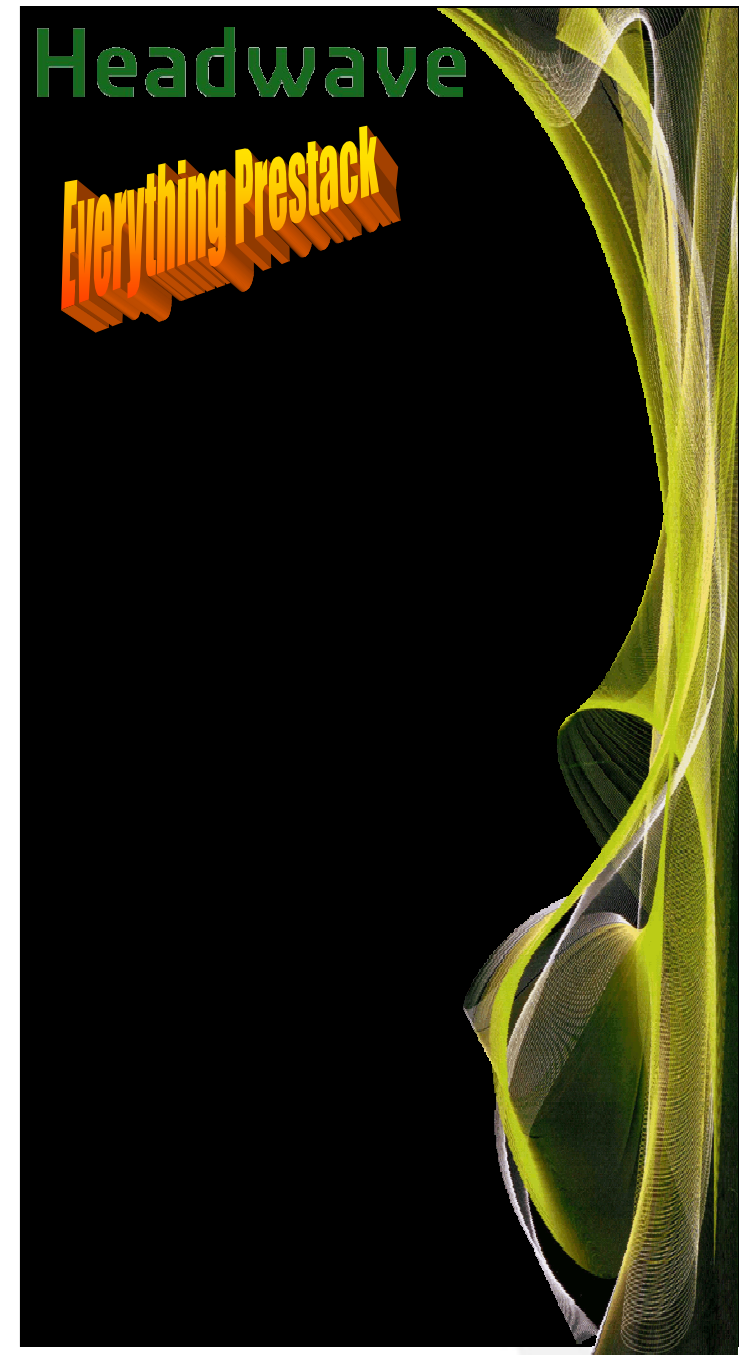
Introduction

Partners in this presentation

3D data

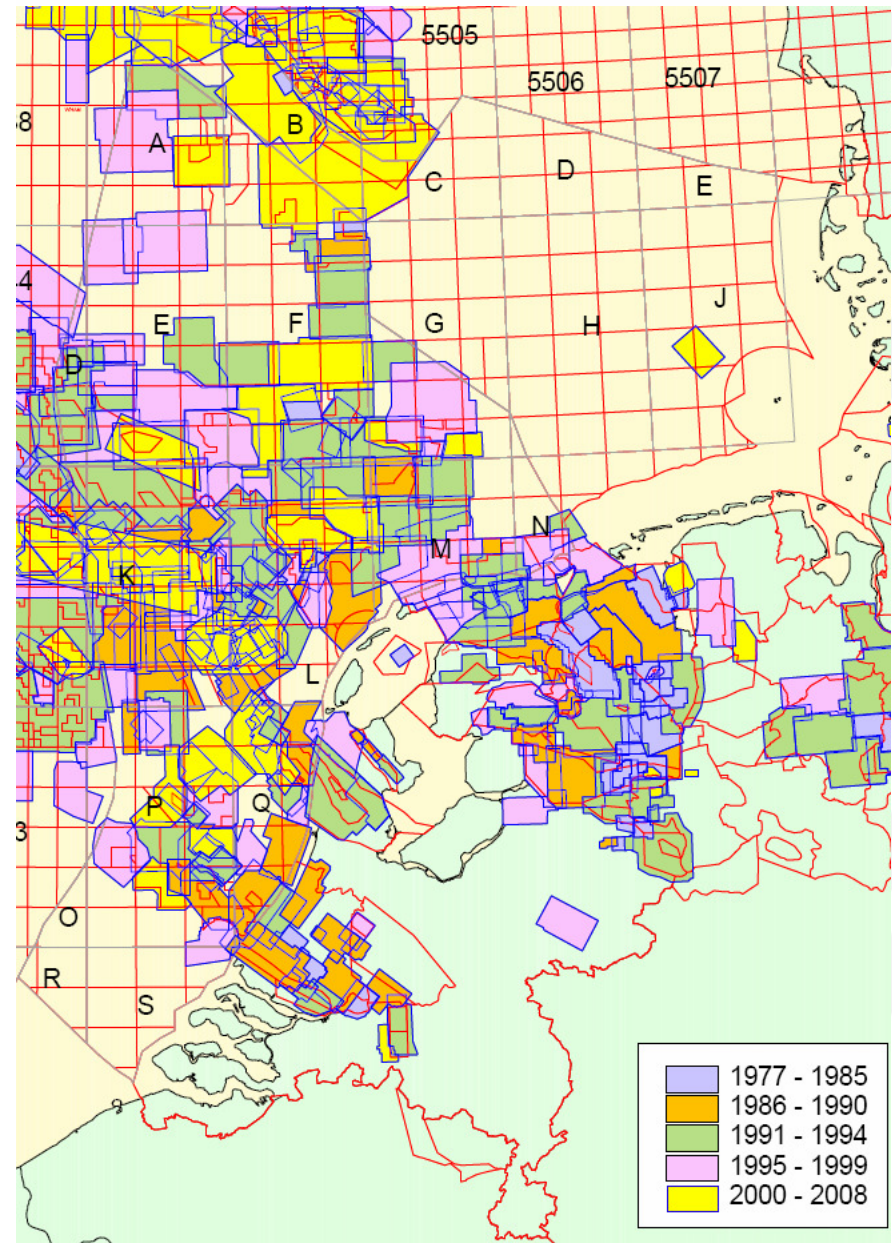


2D data



3D seismic surveys

- Over 2/3 *offshore* covered by 3D
- 1/3 *onshore* covered by 3D





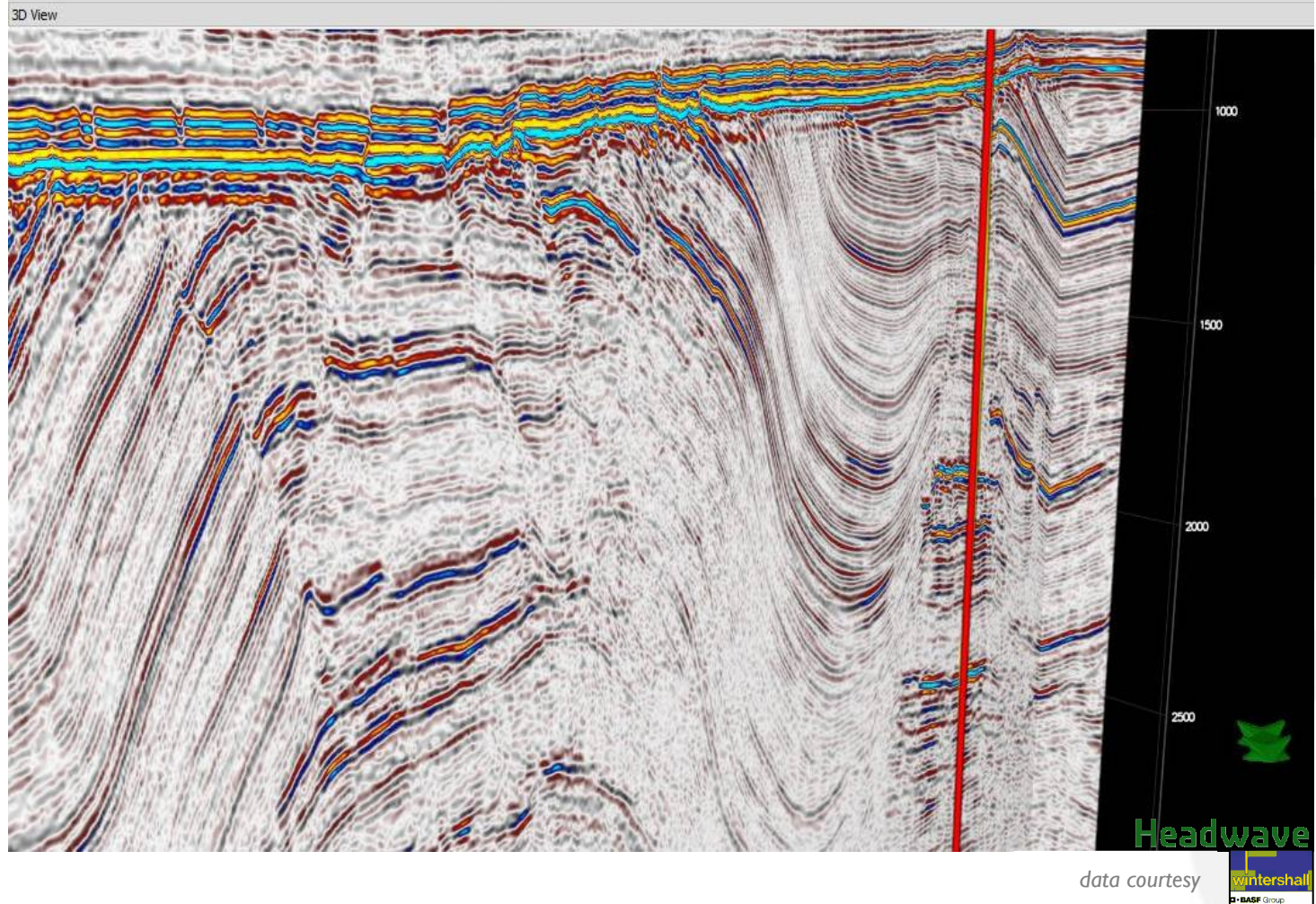
QC tools

Prestack inspection

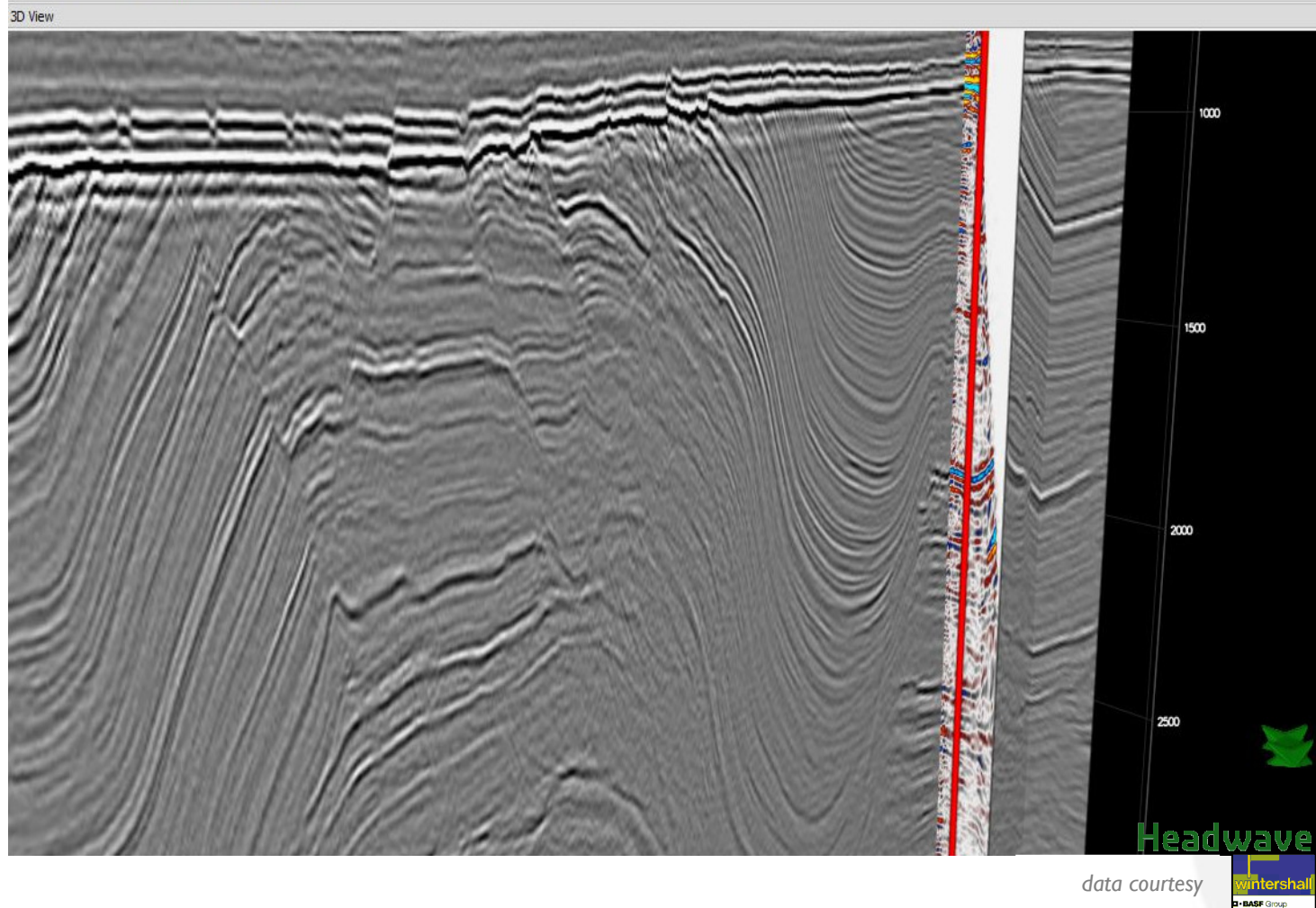
- Gathers and offset slices
- Browse all offsets posted on horizon:
 - Prestack extraction:
 - Amplitude at T_0
 - Prestack tracking
 - Amplitude following loop
 - Δt for RMO
 - Max offset for tracking
 - Time span of Δt
 - Locator on horizon or well
 - Random Prestack inspection at POI

Let's go Prestack

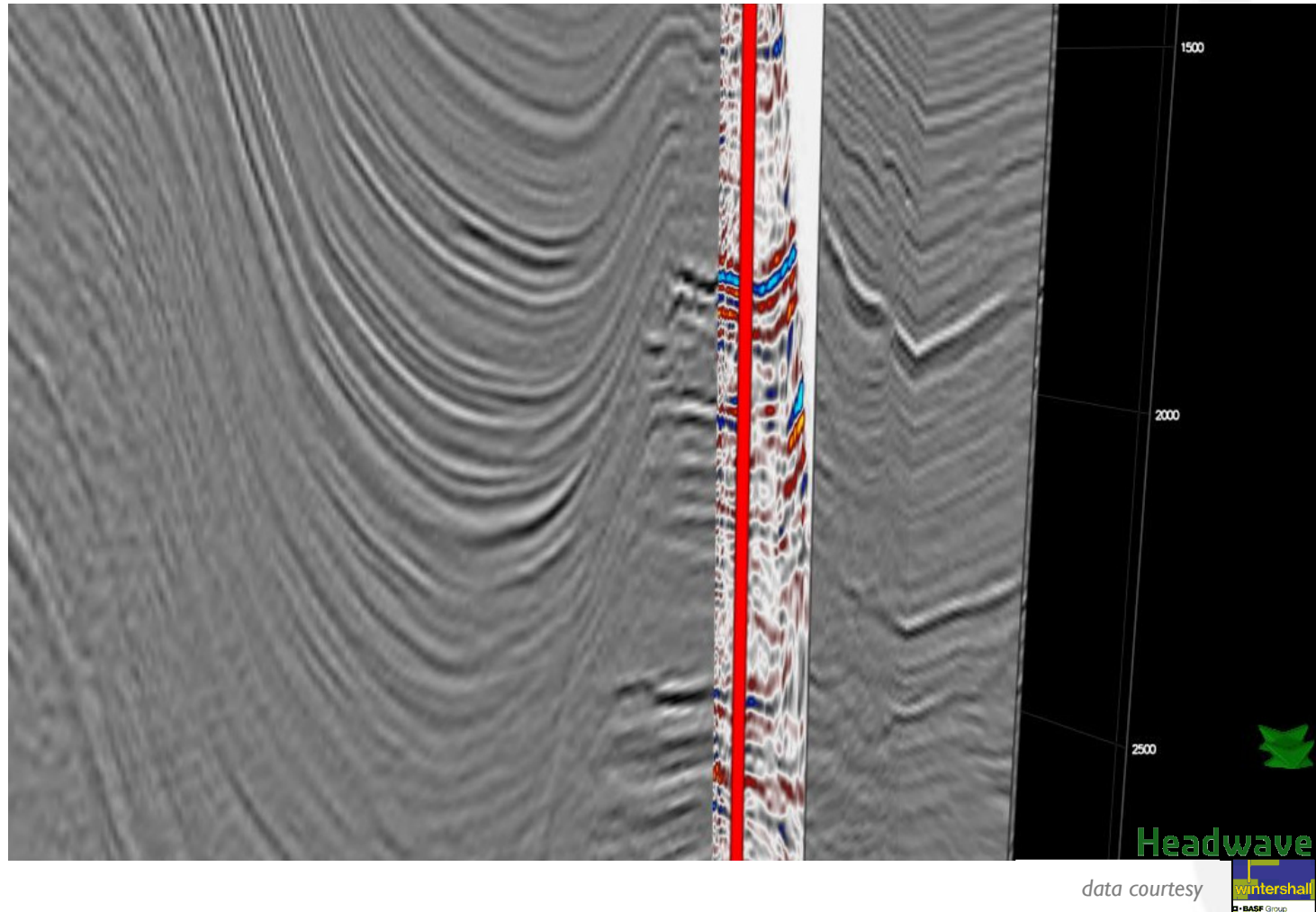
Demo data Poststack only



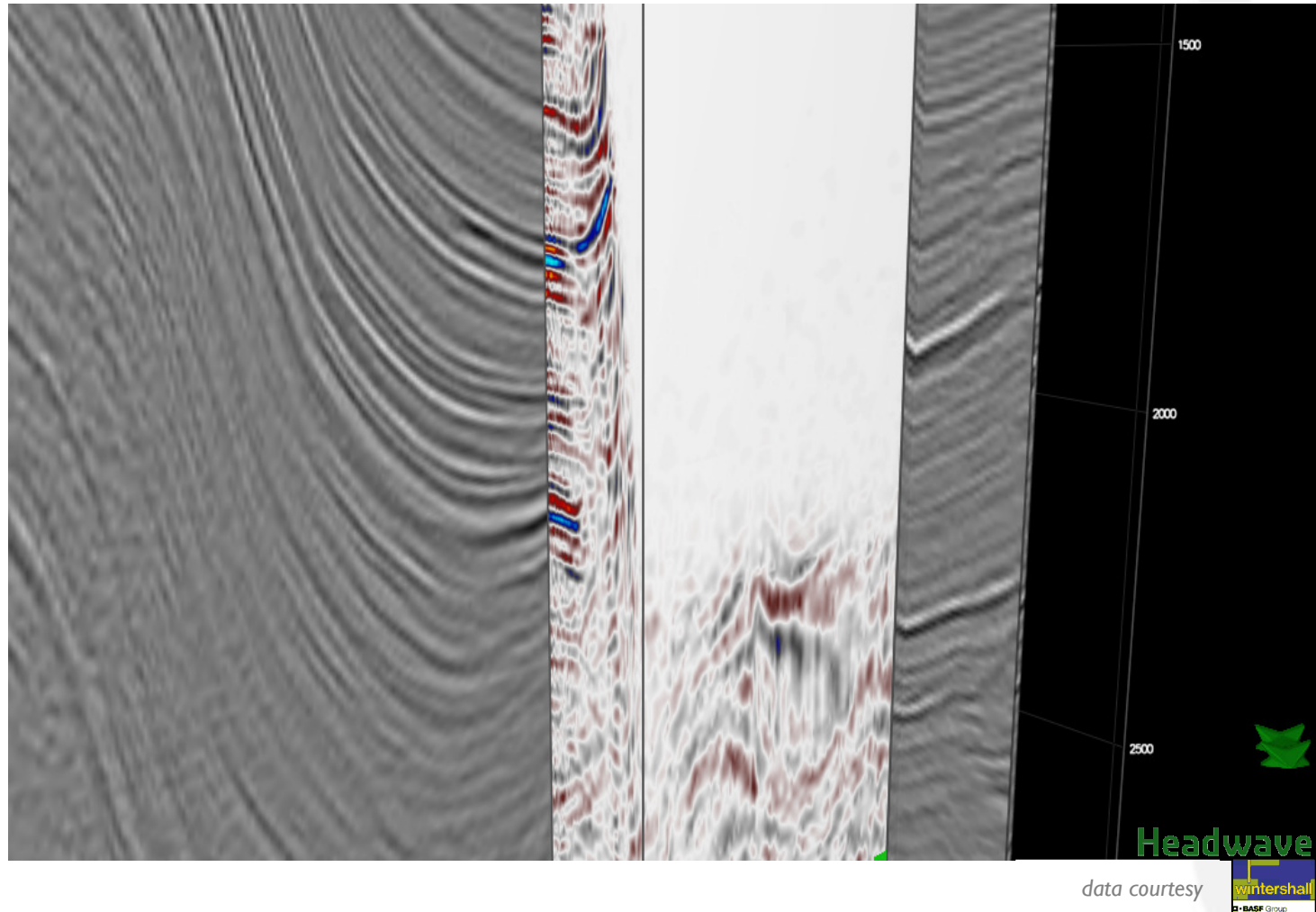
Demo data Prestack added



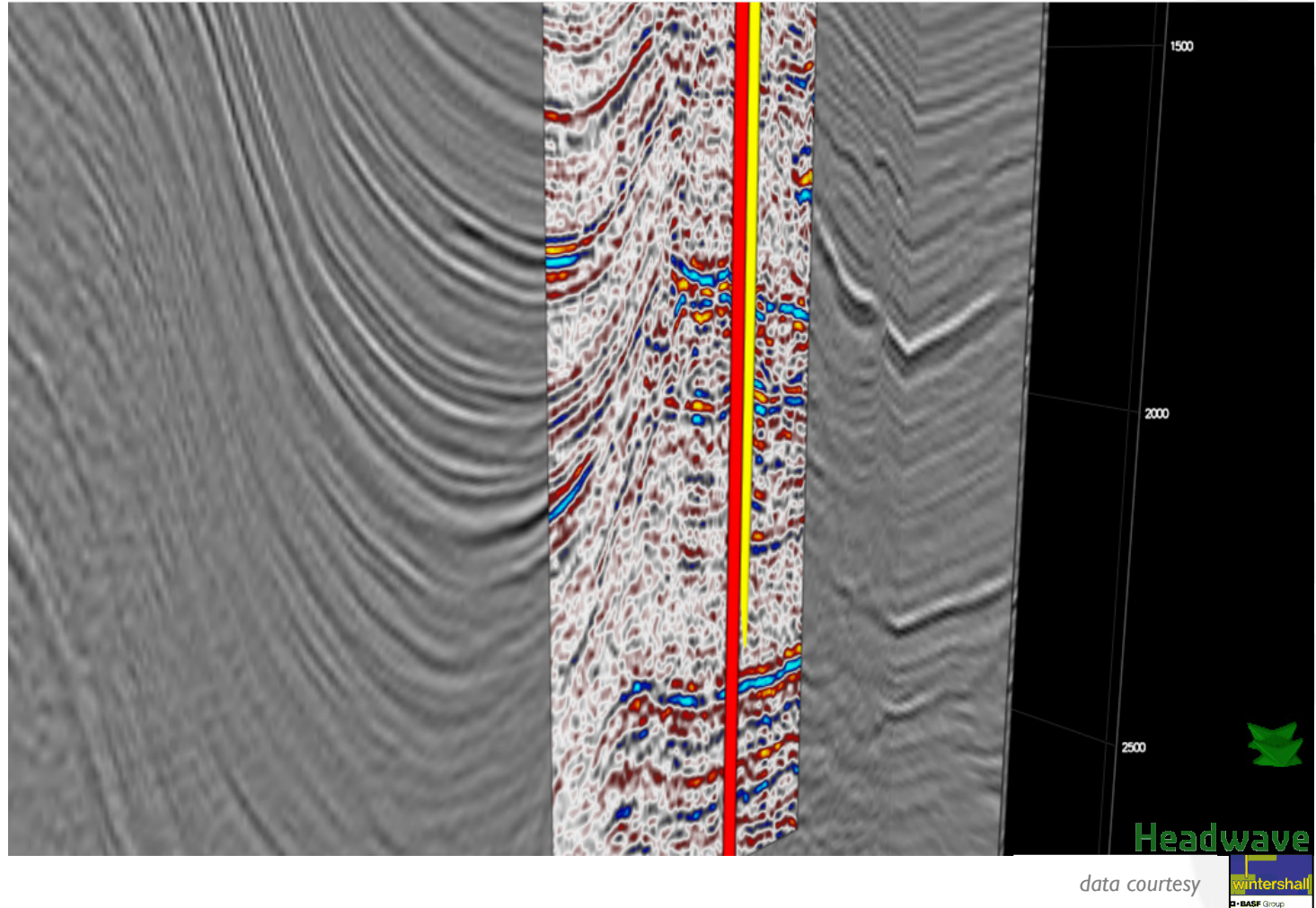
Demo data Prestack zoom



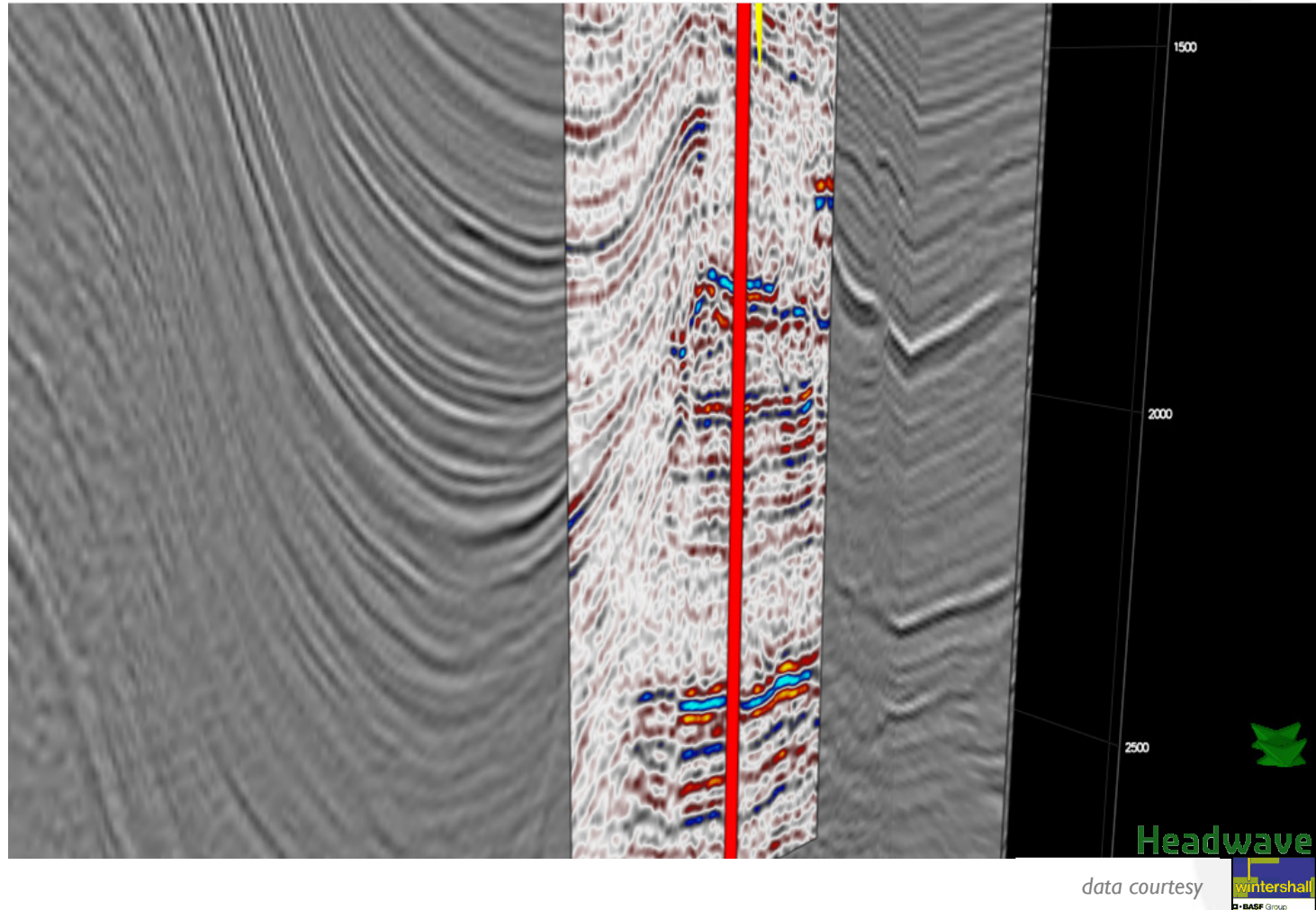
Demo data Prestack probe



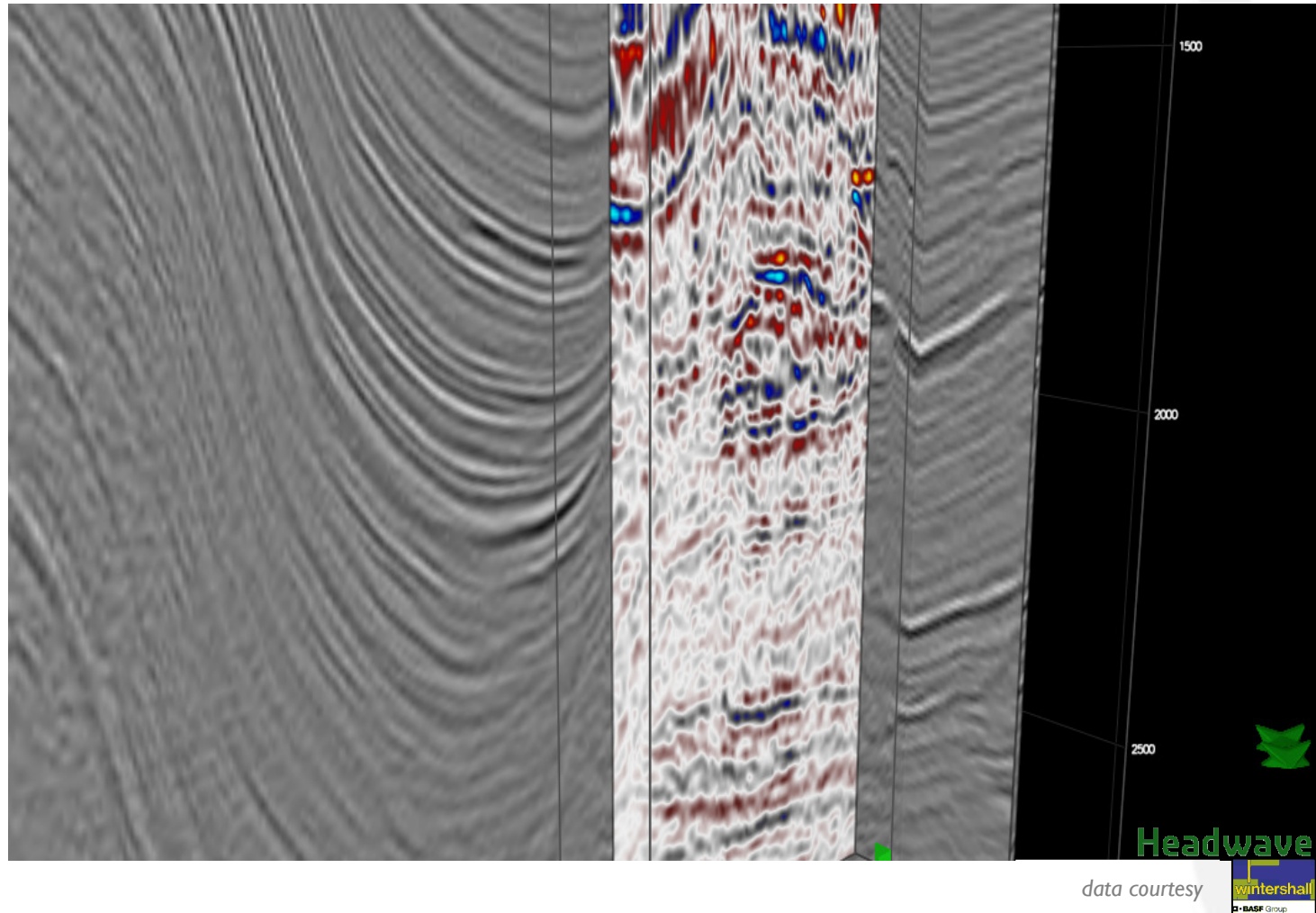
Demo data Prestack offset 7



Demo data Prestack offset 20



Demo data Prestack offset 40





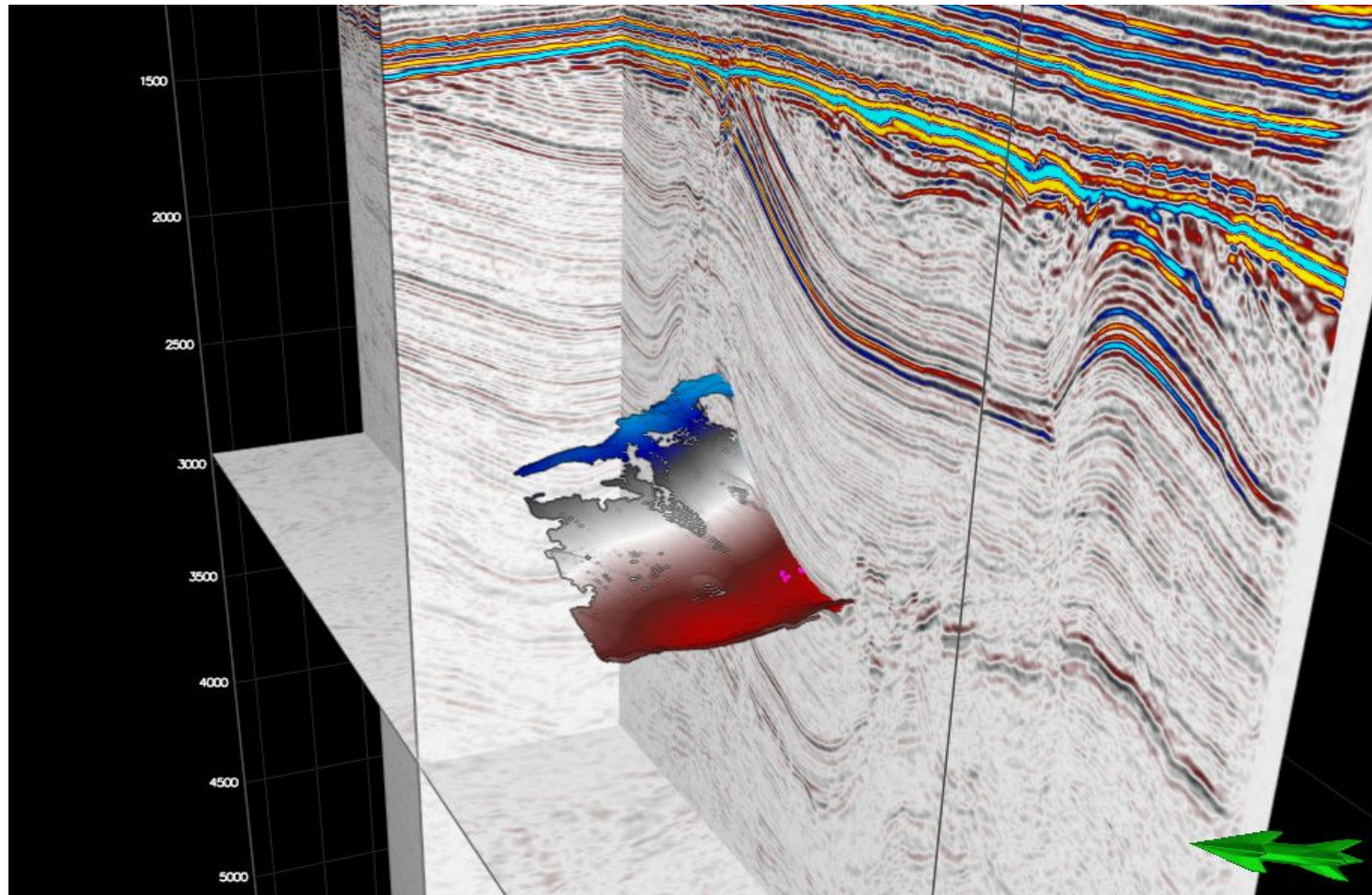
Examples

Prestack inspection

- Gathers, probes and offset slices
- Browse all offsets posted on horizon:
 - **Prestack extraction:**
 - Amplitude at T_0
 - **Prestack tracking**
 - Amplitude following loop
 - Δt for RMO
 - Max offset for tracking
 - Time smear
 - **Locator** on horizon or well
 - Random Prestack inspection at POI

Let's go Prestack

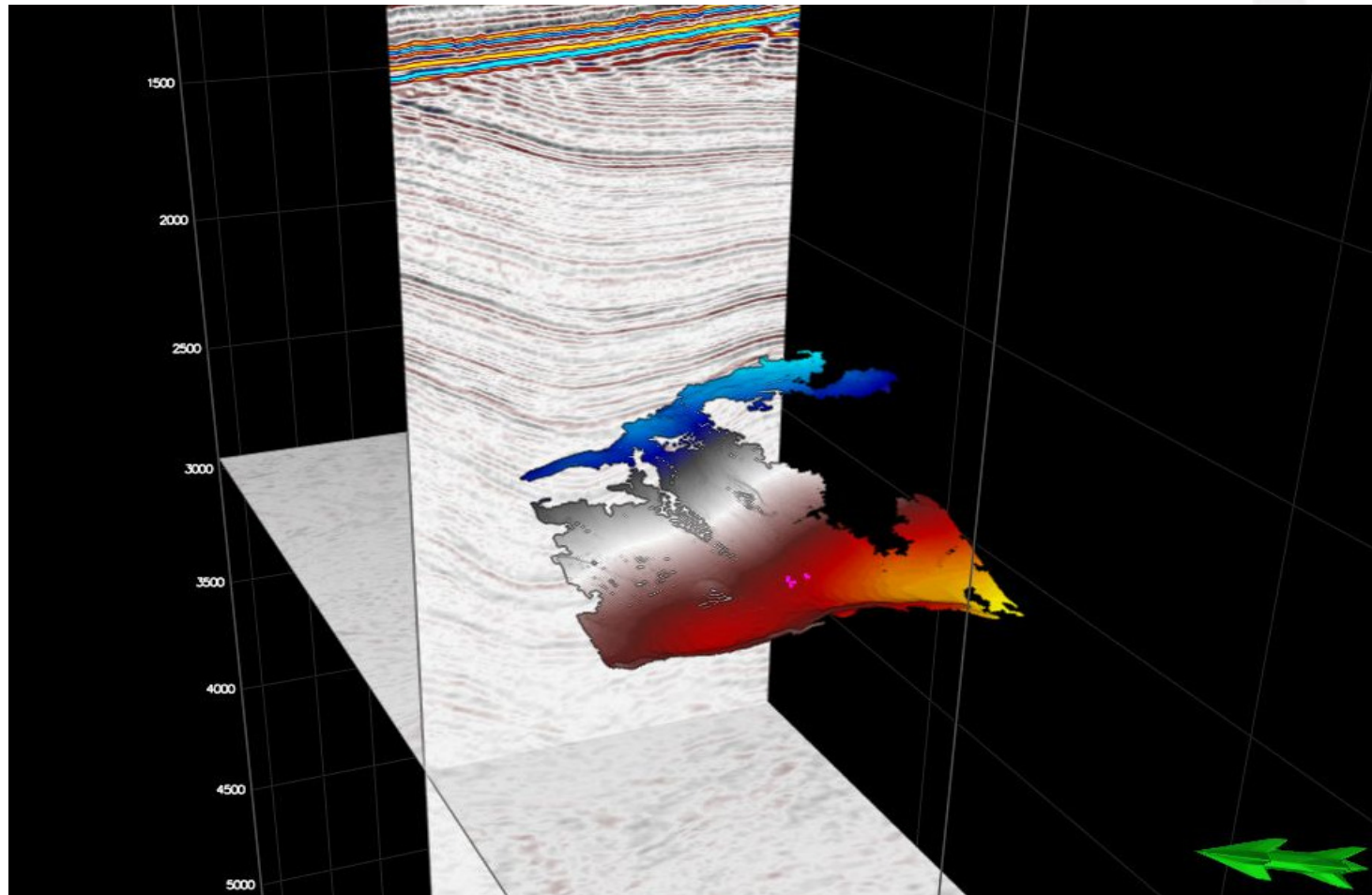
Prestack checking / tracking



data courtesy



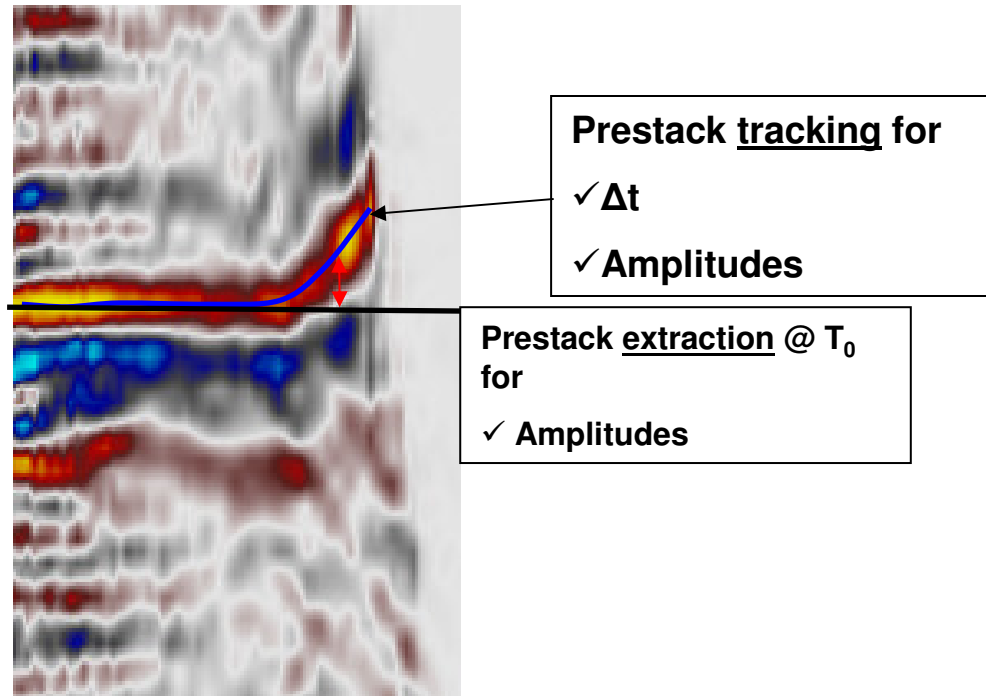
Prestack checking / tracking



data courtesy



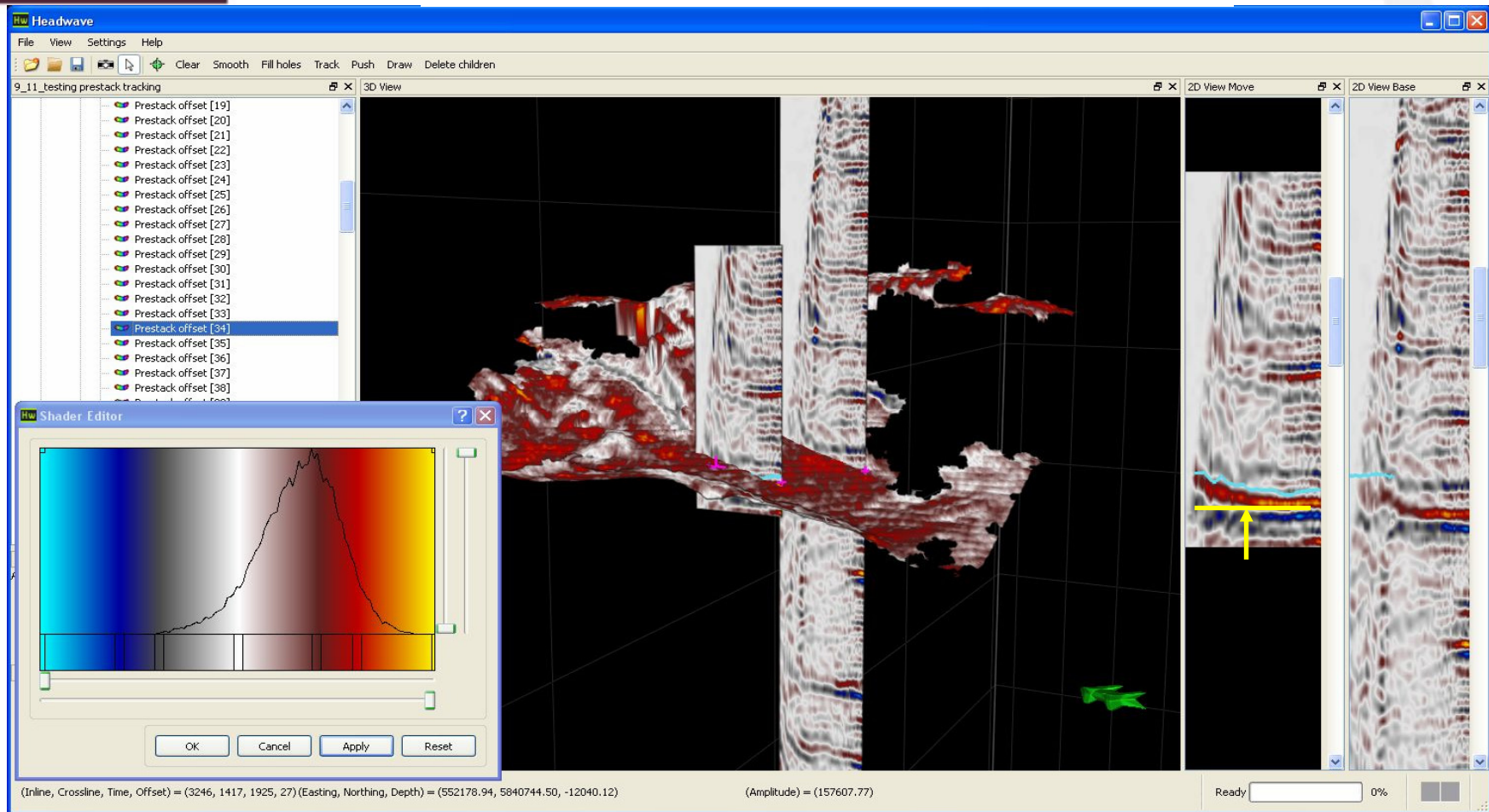
Prestack extraction / tracking





Prestack Extraction @ 34

2 Locators for inspection on horizon



data courtesy

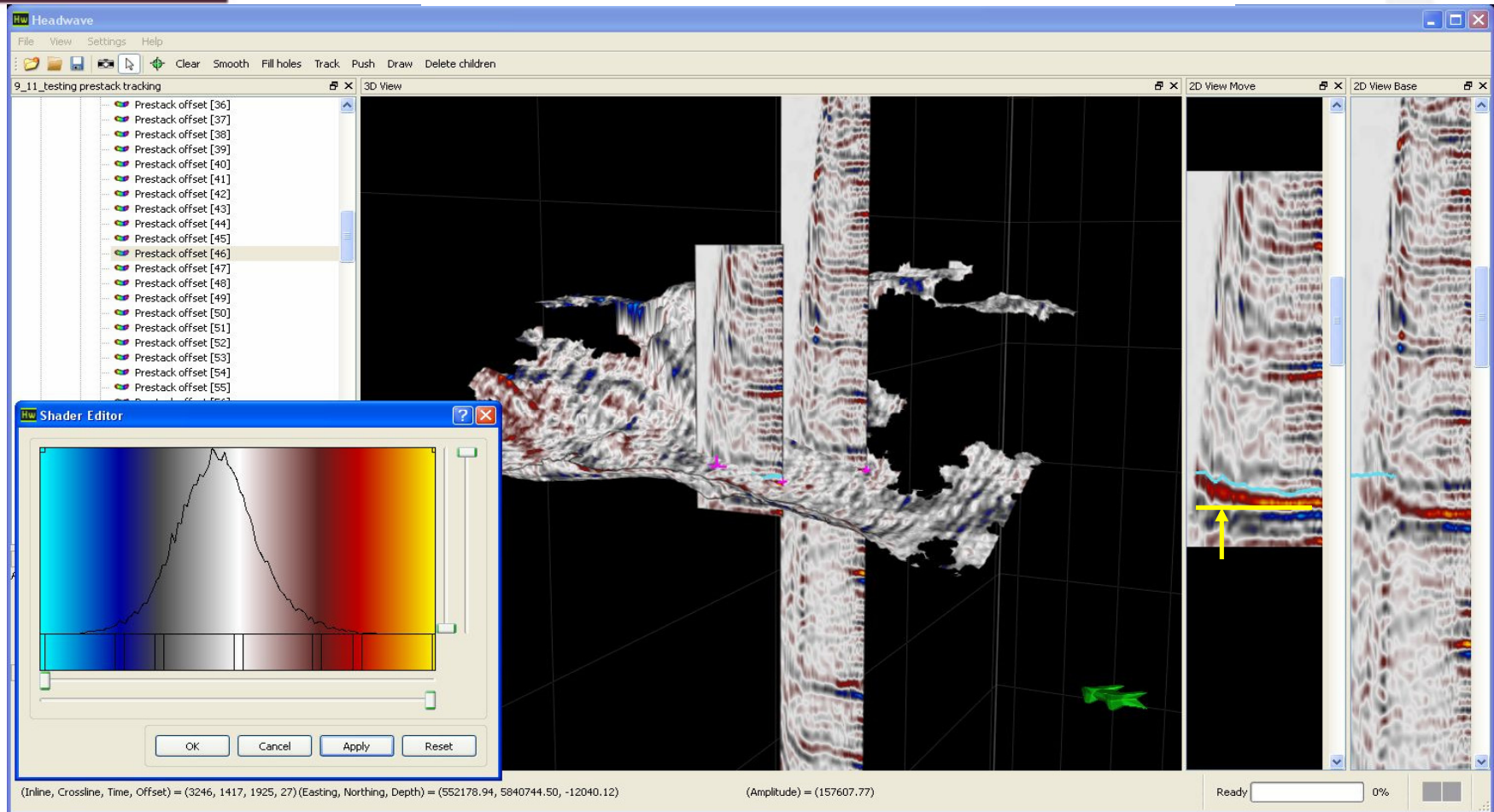


Prestack Seismic for QC and Inspection of Amplitudes



Prestack Extraction @ 46

2 Locators for inspection on horizon



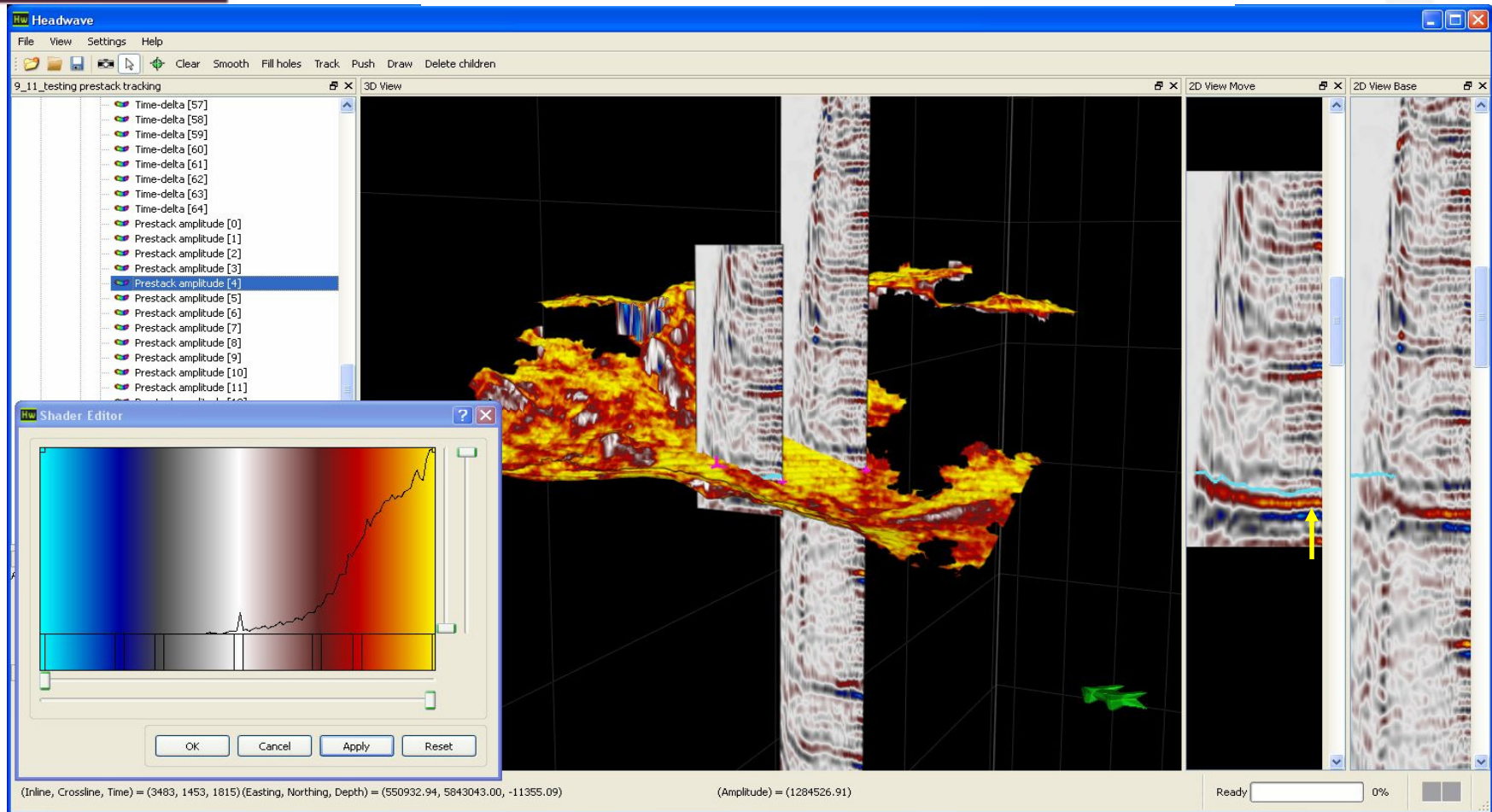
data courtesy



Prestack Seismic for QC and Inspection of Amplitudes

Prestack Amplitude @ 4

2 Locators for inspection on horizon

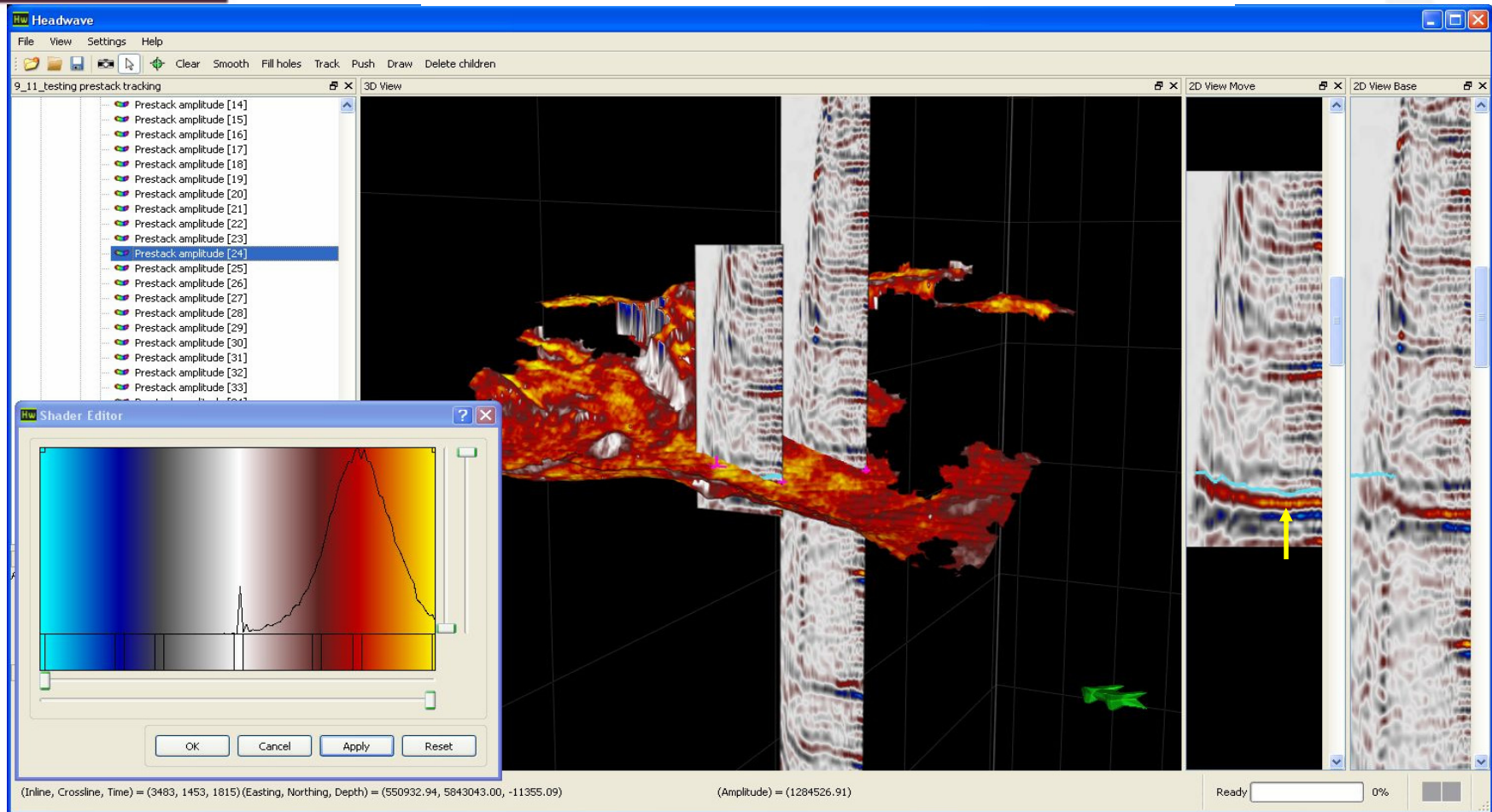


data courtesy



Prestack Amplitude @ 24

2 Locators for inspection on horizon

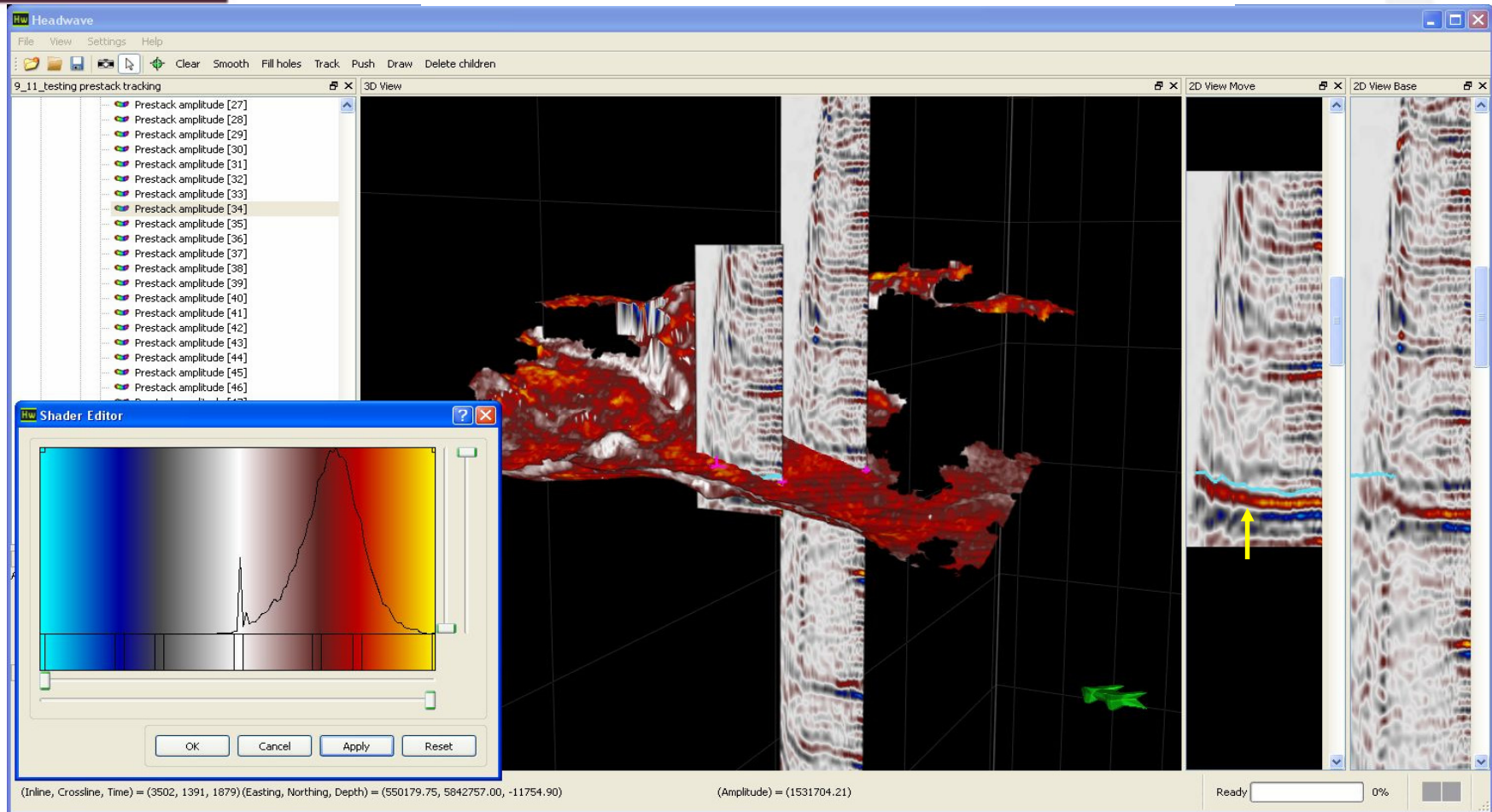


data courtesy



Prestack Amplitude @ 34

2 Locators for inspection on horizon

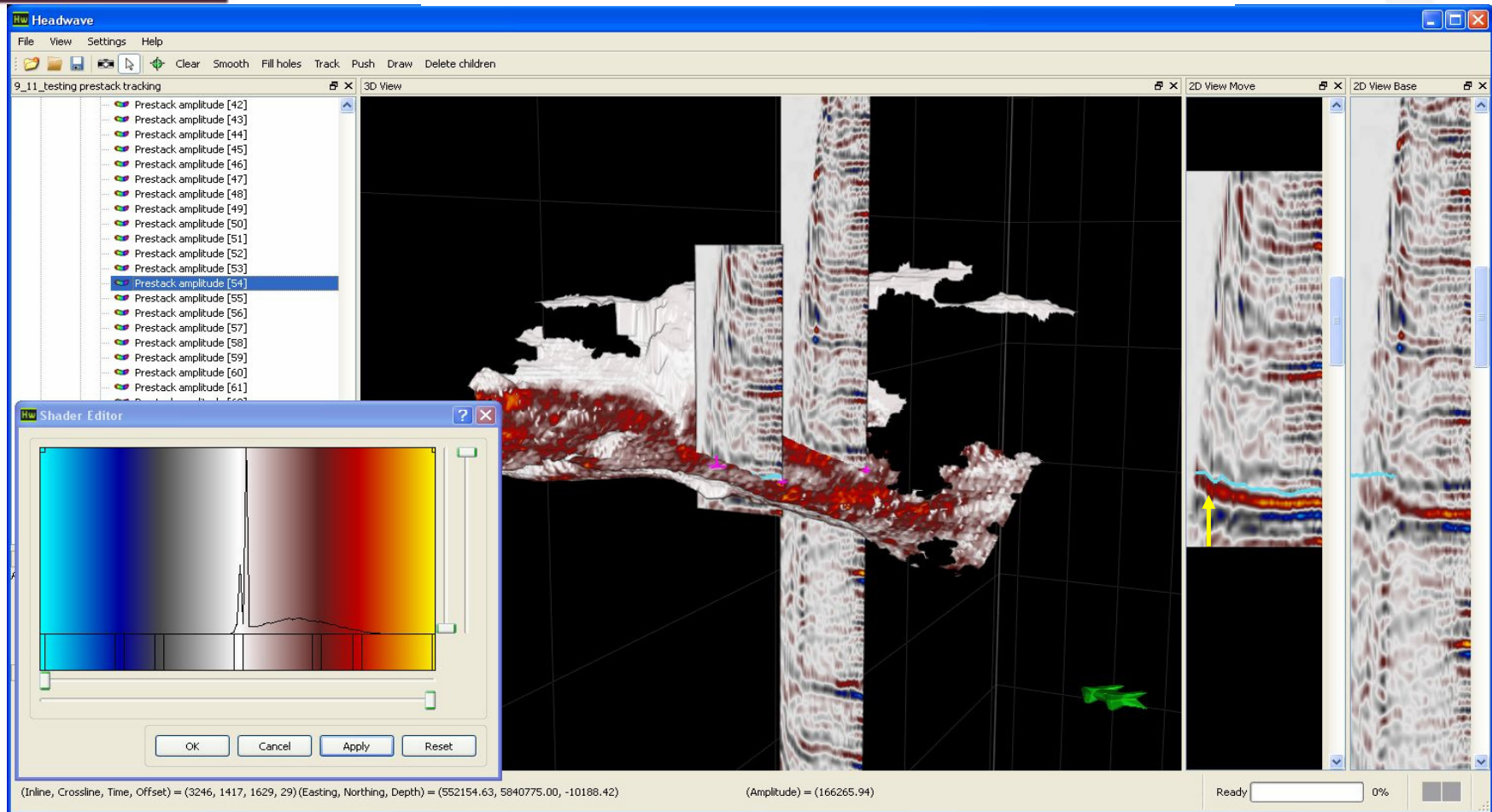


data courtesy



Prestack Amplitude @ 54

2 Locators for inspection on horizon

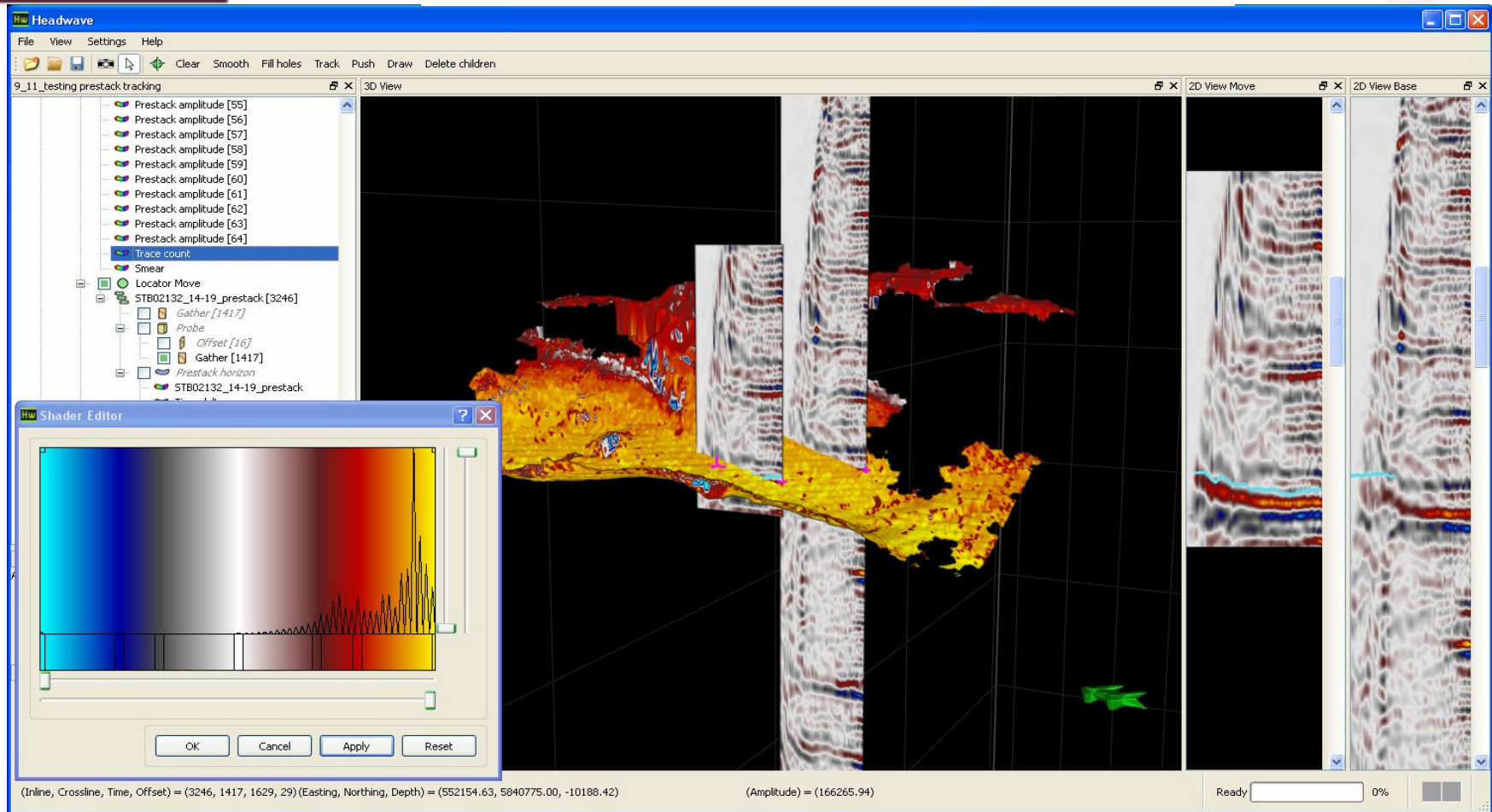


data courtesy



Prestack Trace count

2 Locators for inspection on horizon

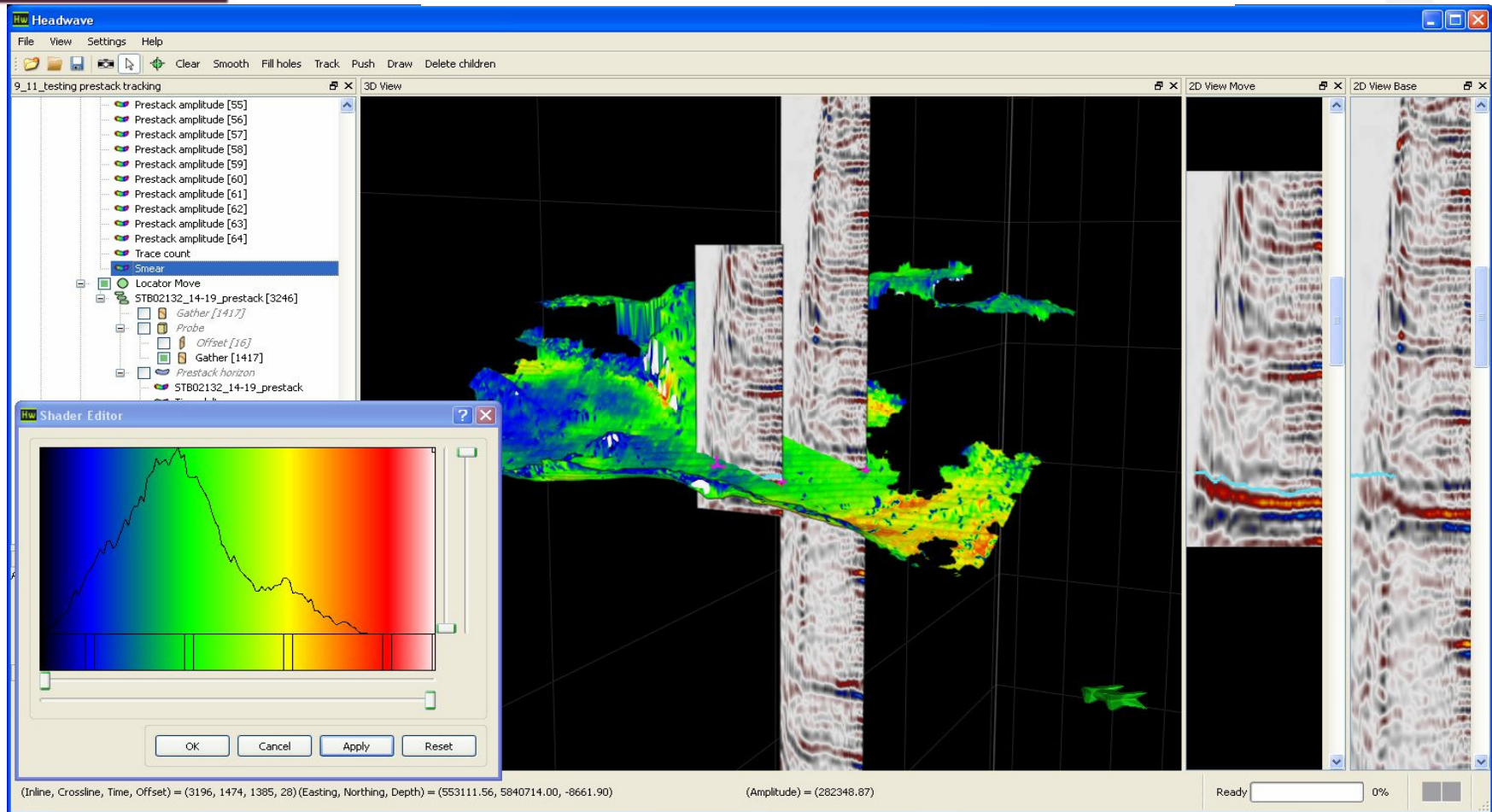


data courtesy



Prestack ΔT smear

2 Locators for inspection on horizon

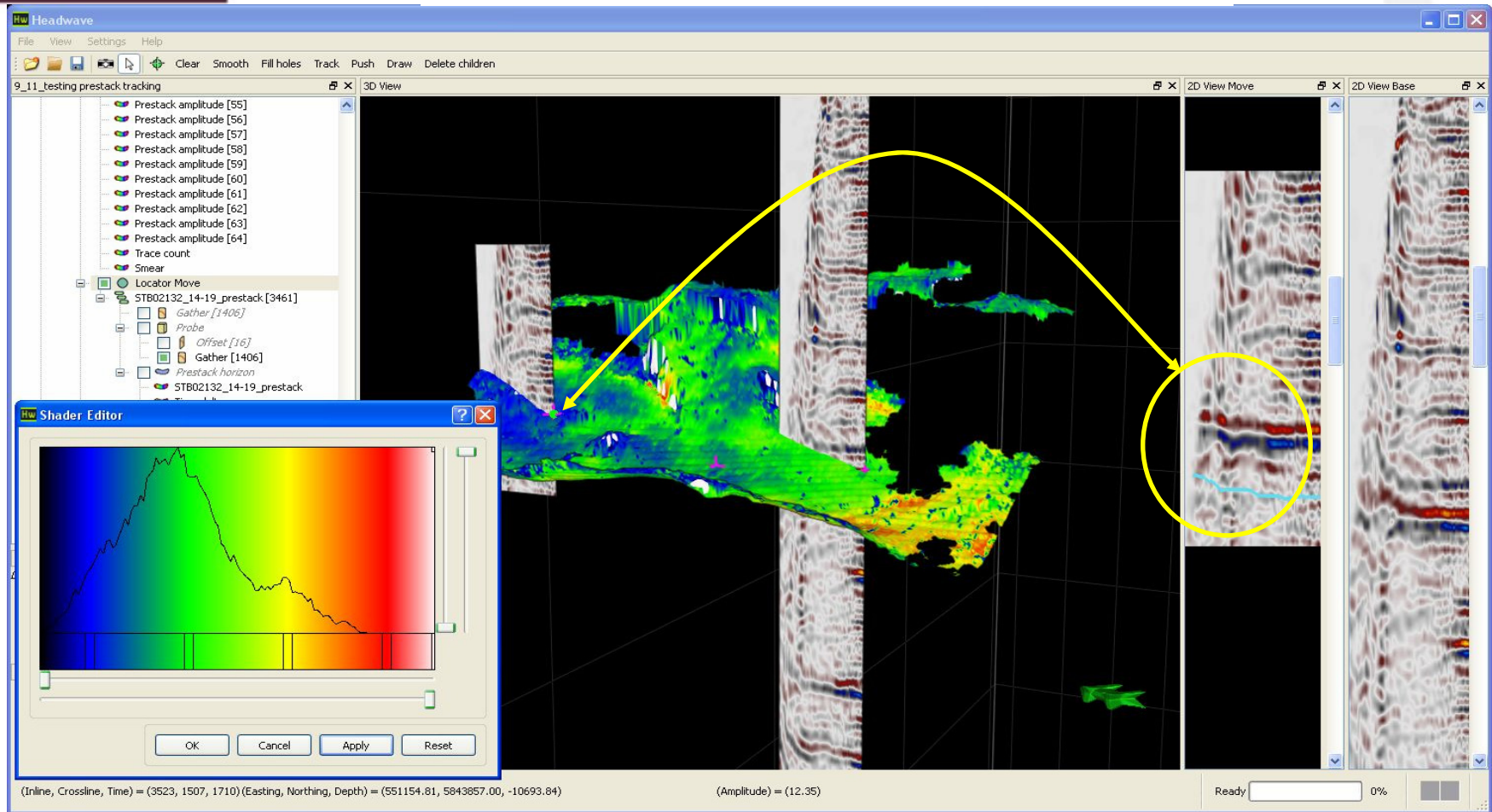


data courtesy



Prestack ΔT smear small

2 Locators for inspection on horizon



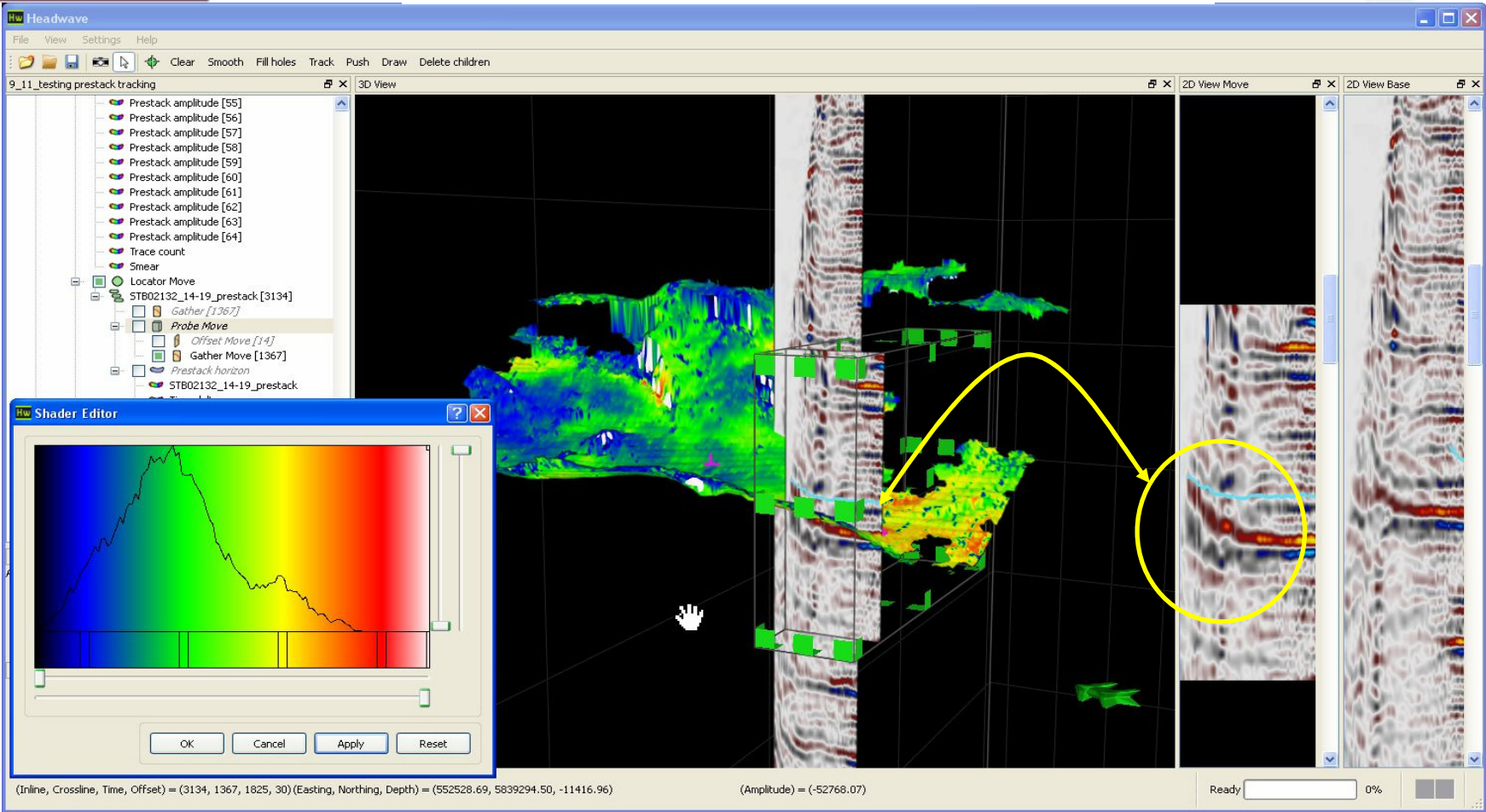
data courtesy





Prestack ΔT smear large

2 Locators for inspection on horizon

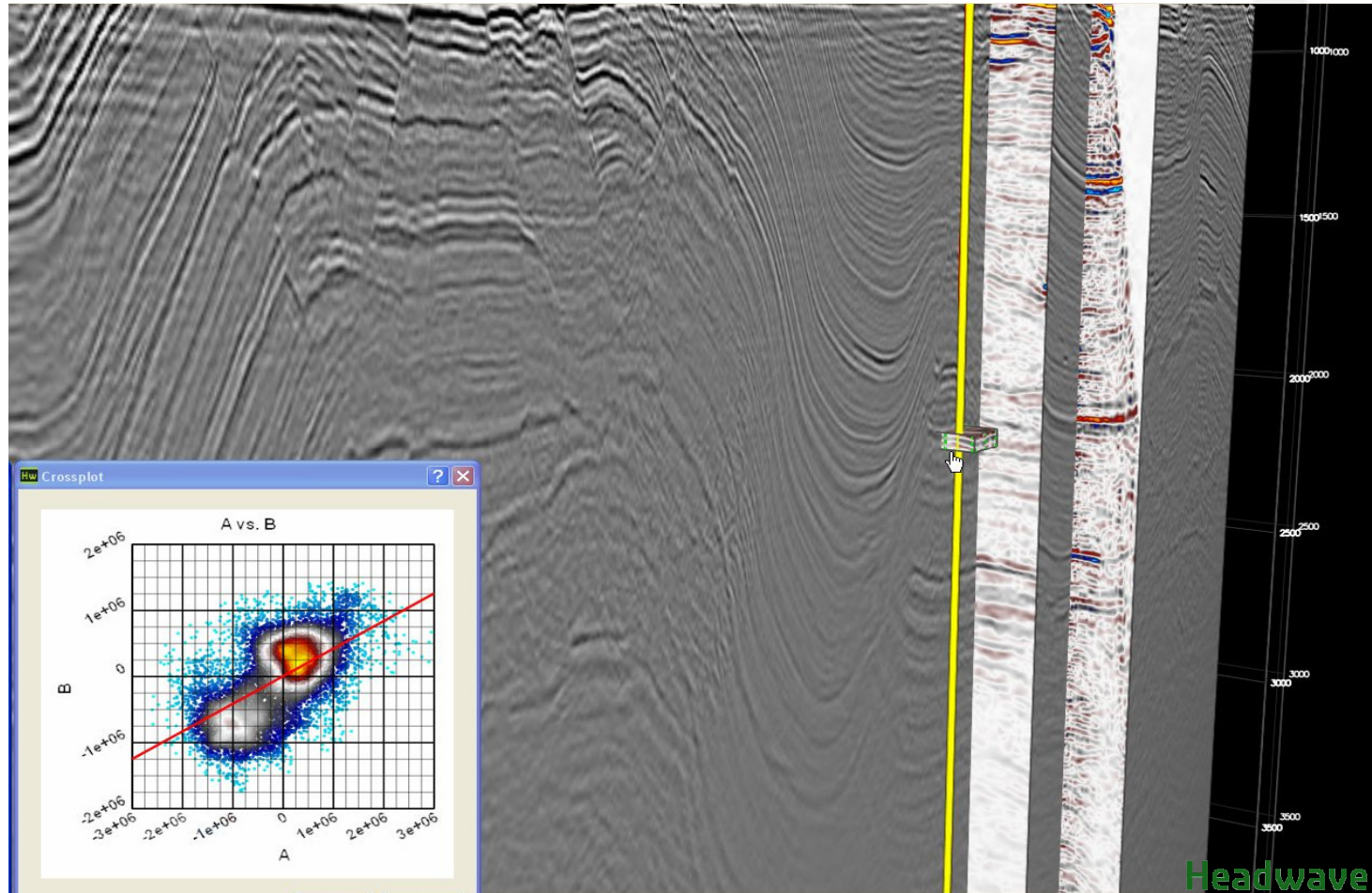


data courtesy



Prestack Seismic for QC and Inspection of Amplitudes

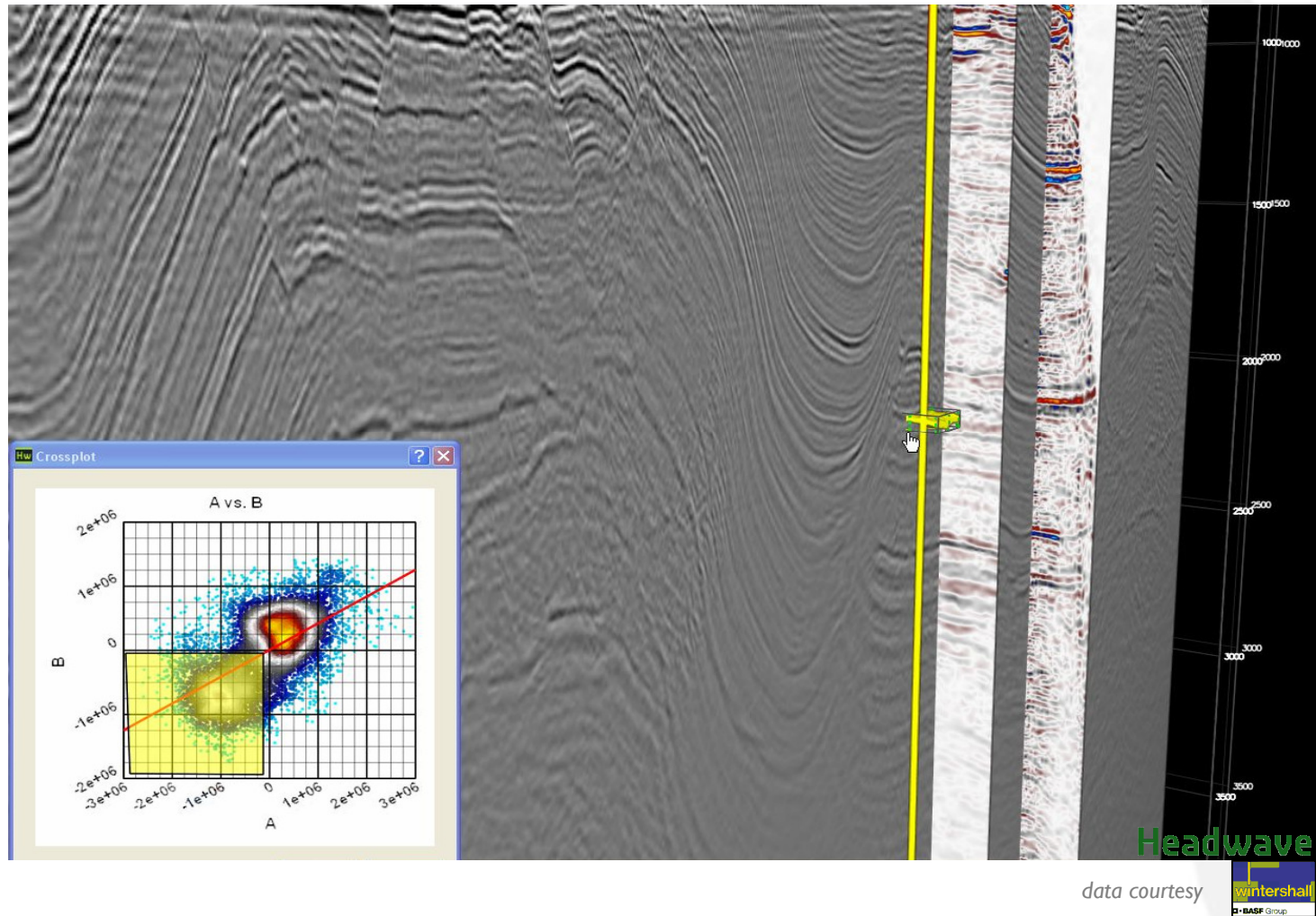
A & B crossplot



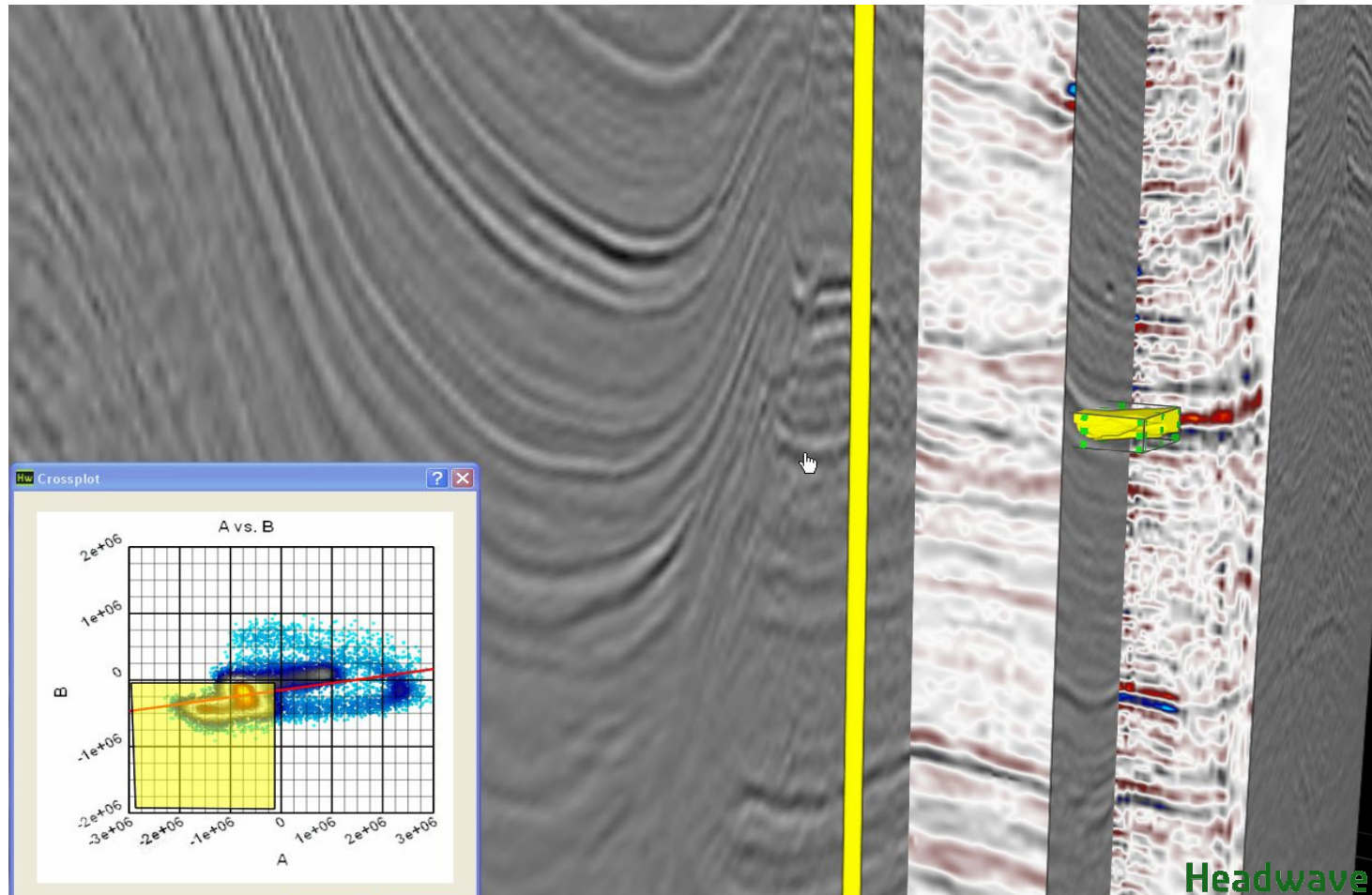
data courtesy



A & B crossplot



A & B crossplot

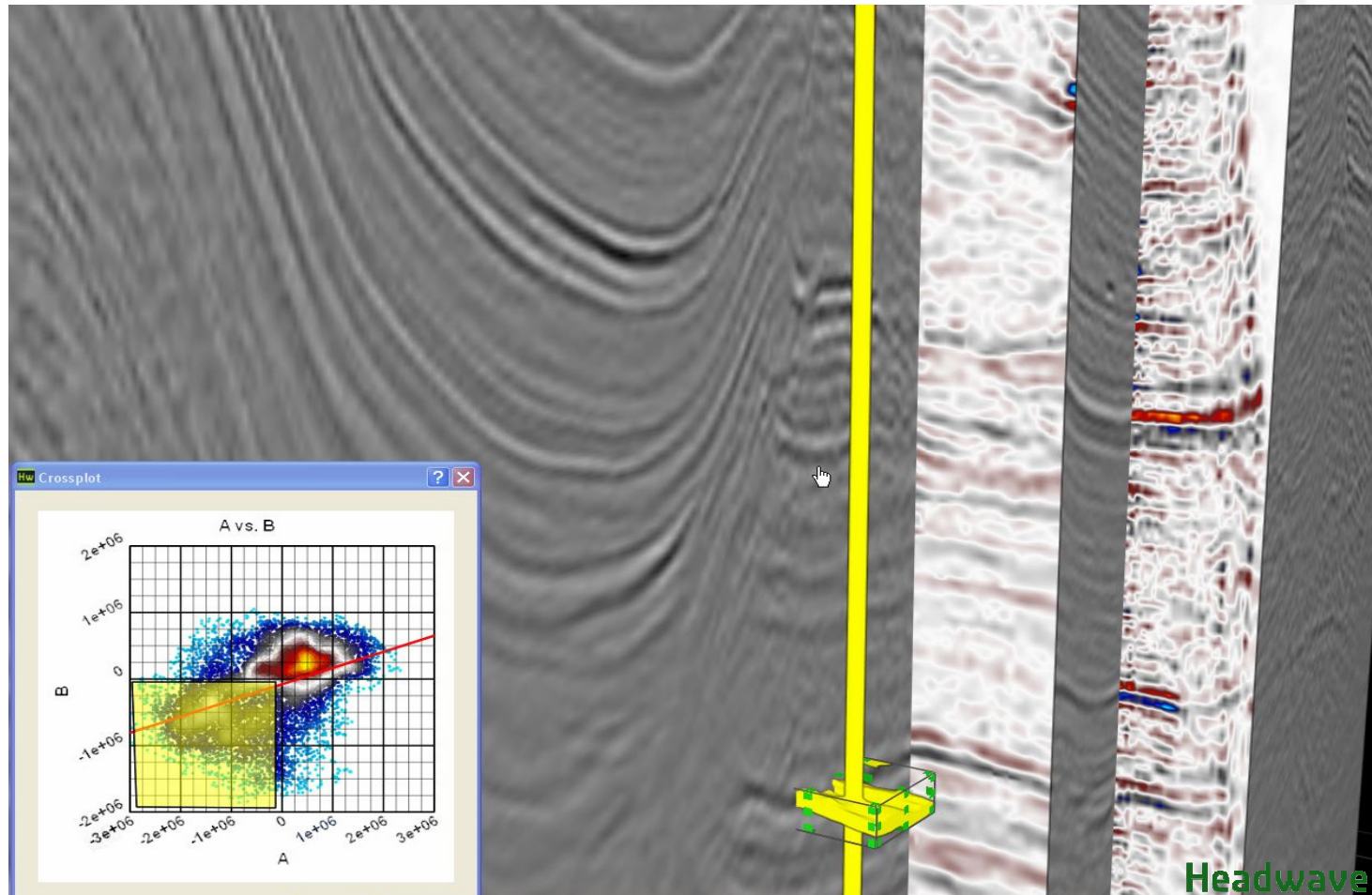


Headwave

data courtesy



A & B crossplot



Headwave

data courtesy





QC for 3D

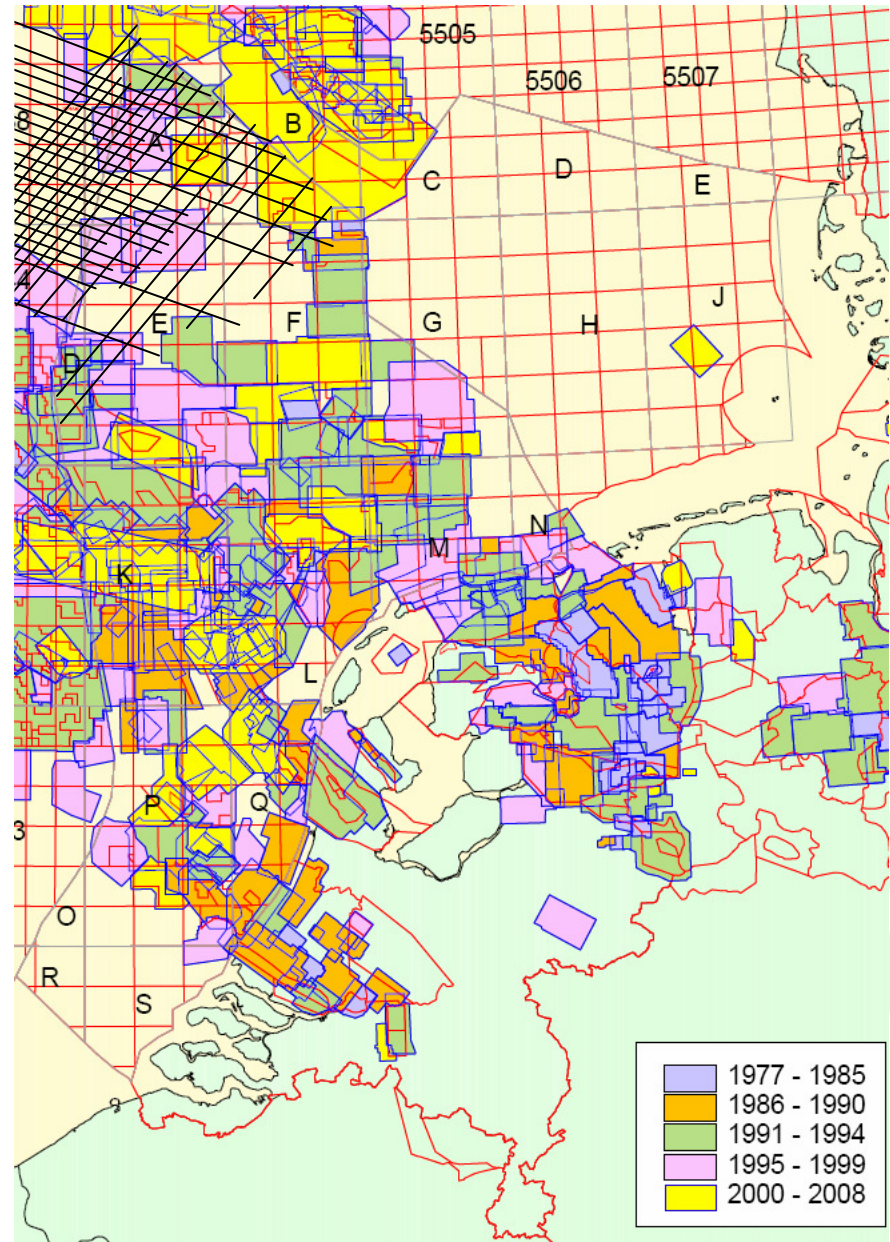
- Prestack inspection :
 - Is NMO / RMO properly applied
 - Is Offset coverage OK
 - Do we understand AvO relation in full
 - Check data around well targets

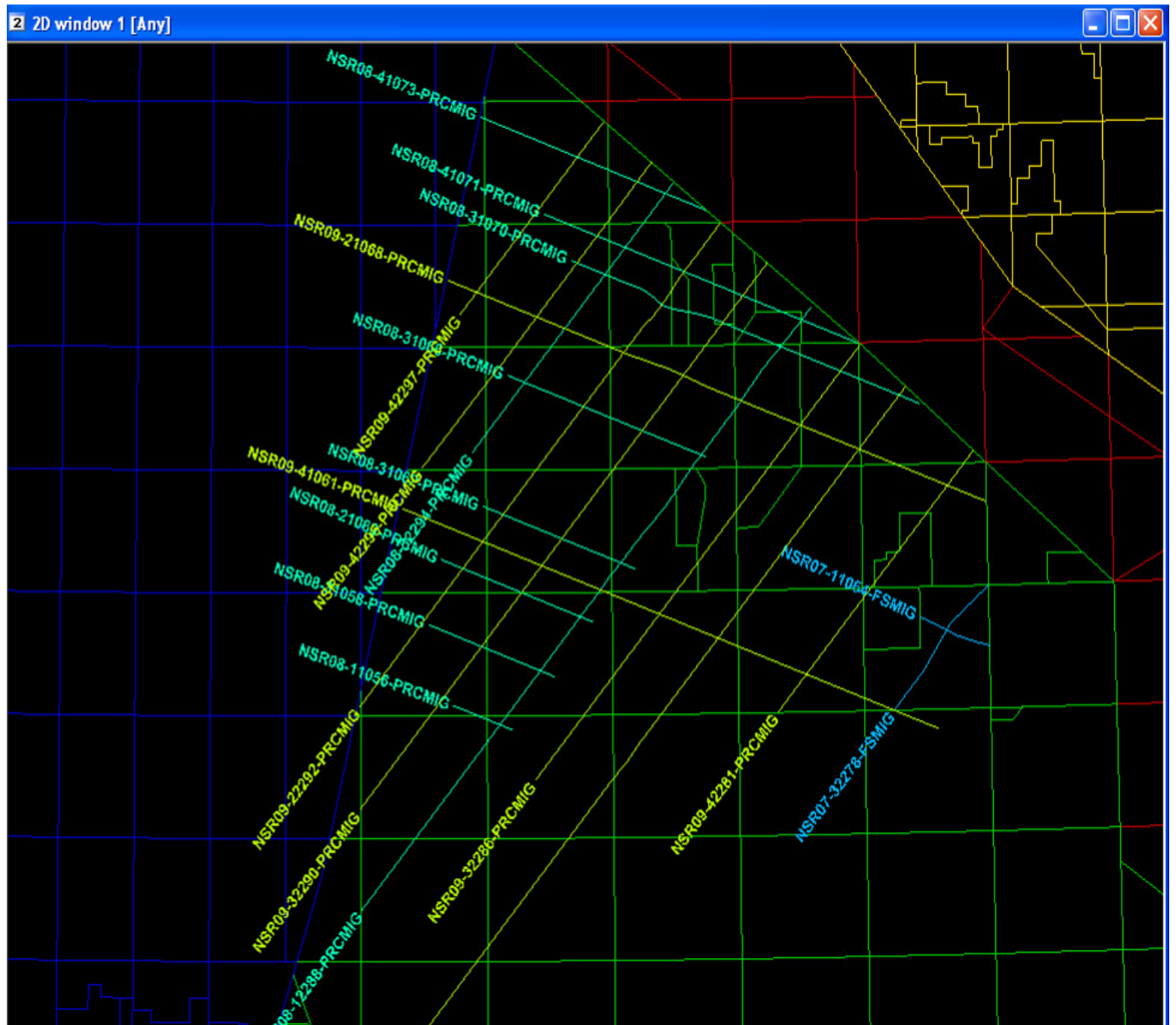
Let's go Prestack

3D seismic surveys

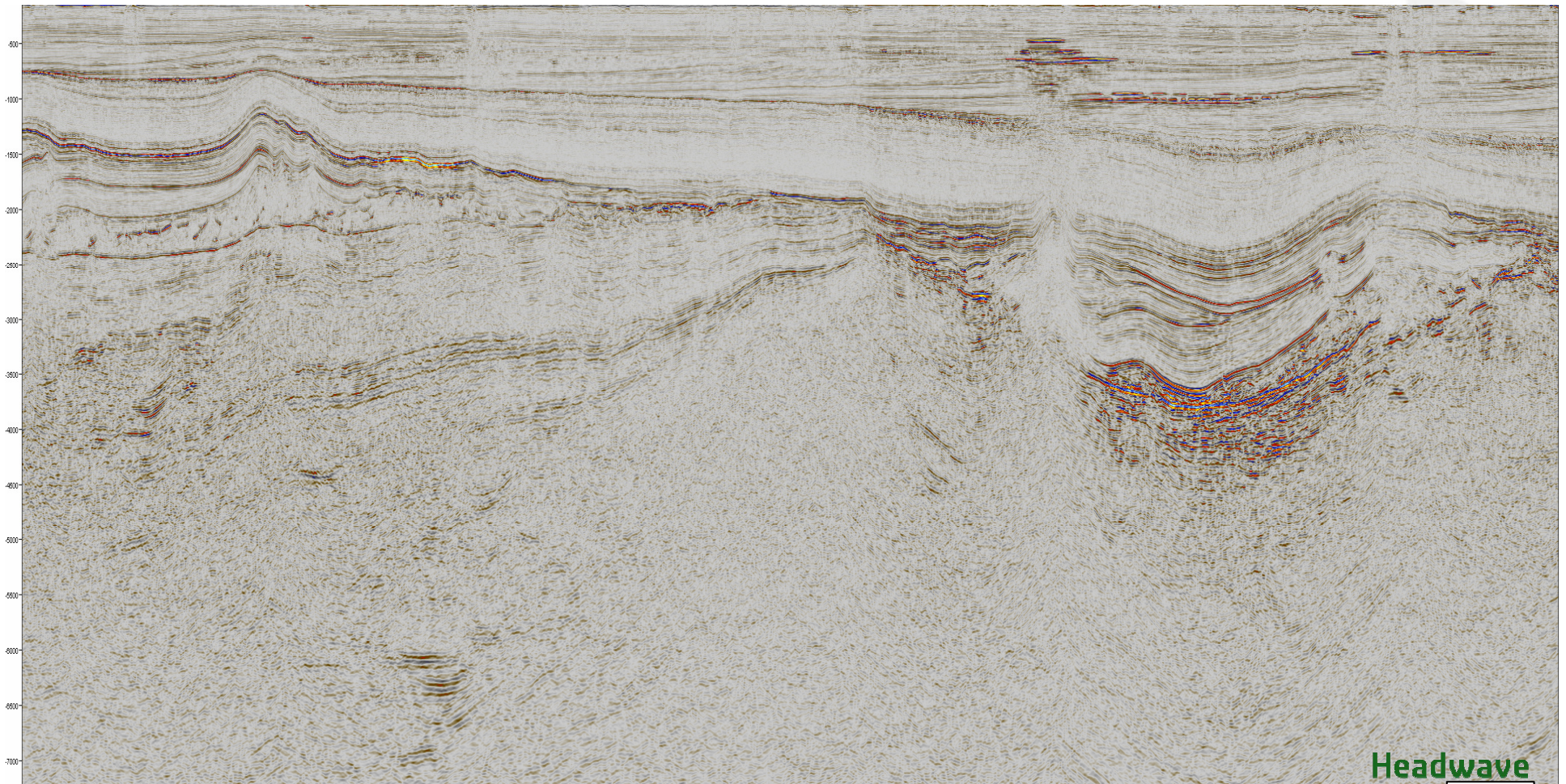
2D long offset spec
Fugro and TGS

- Over 2/3 *offshore* covered by 3D
- 1/3 *onshore* covered by 3D





2D SW-NE line in the northern Dutch offshore



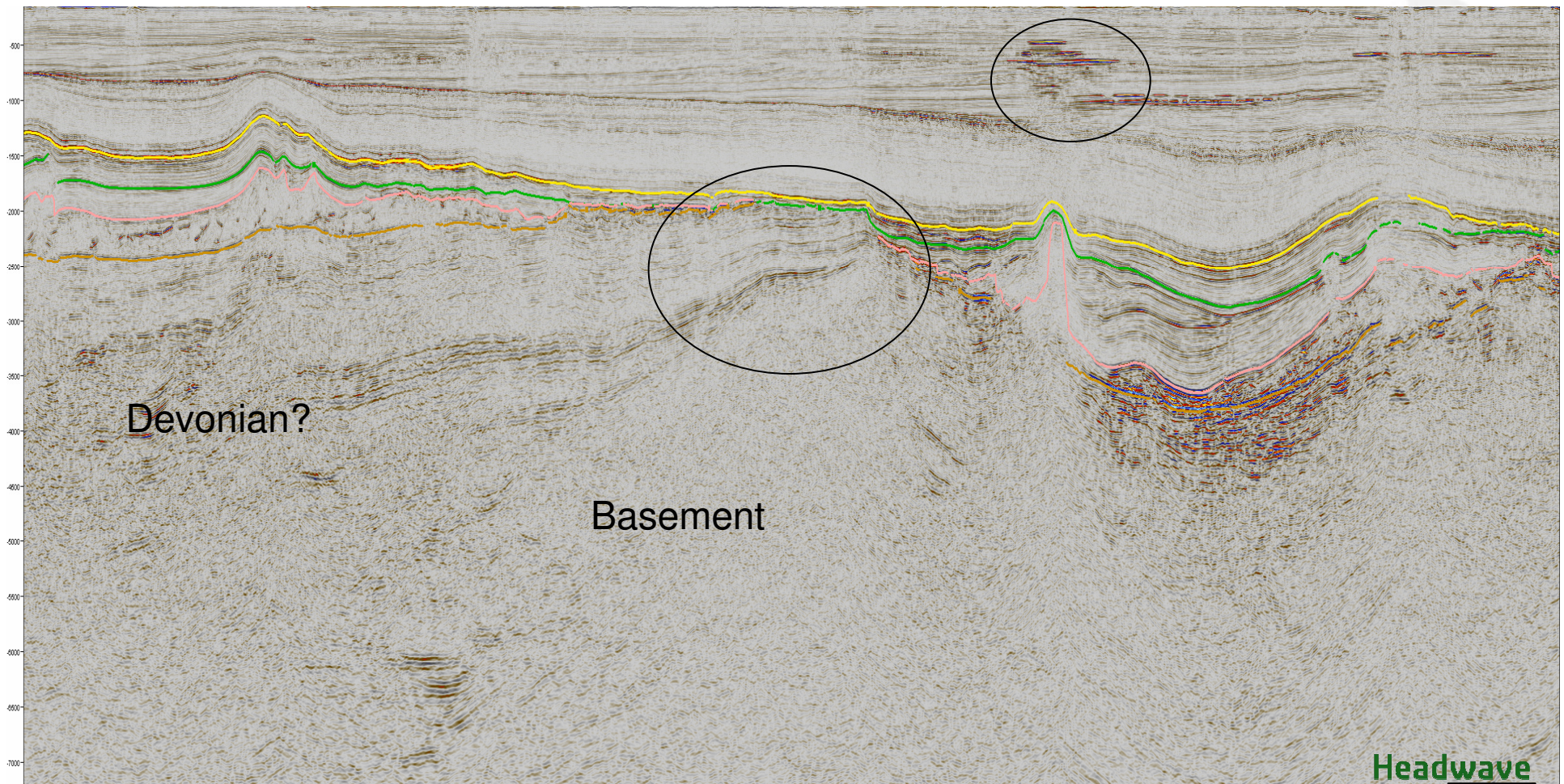


2D SW-NE line in the northern Dutch offshore

Cleaverbank "High"

Elbow Spit High

Step "Graben"

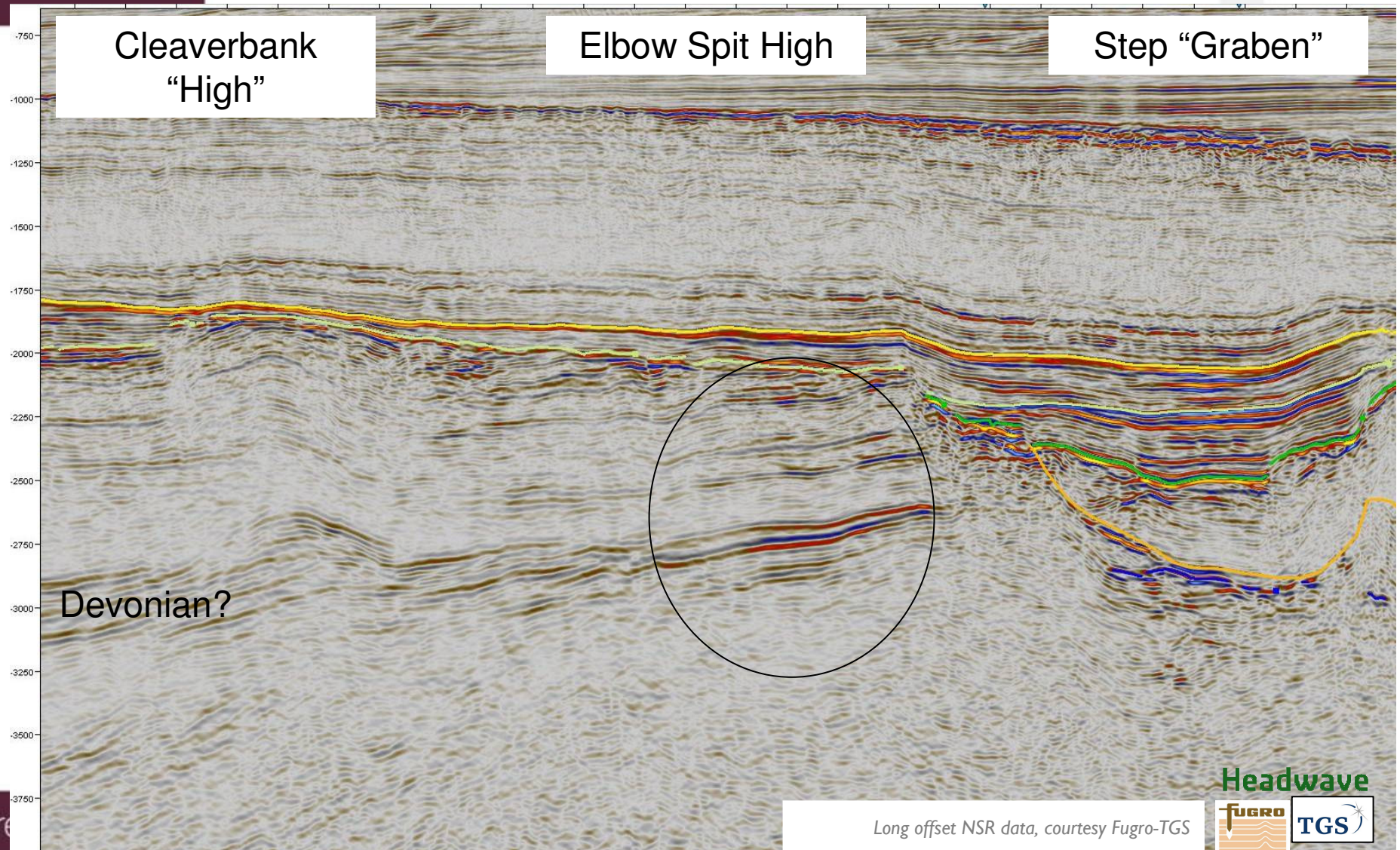


Prestack Seismic for QC and Inspection

Long offset NSR data, courtesy Fugro-TGS



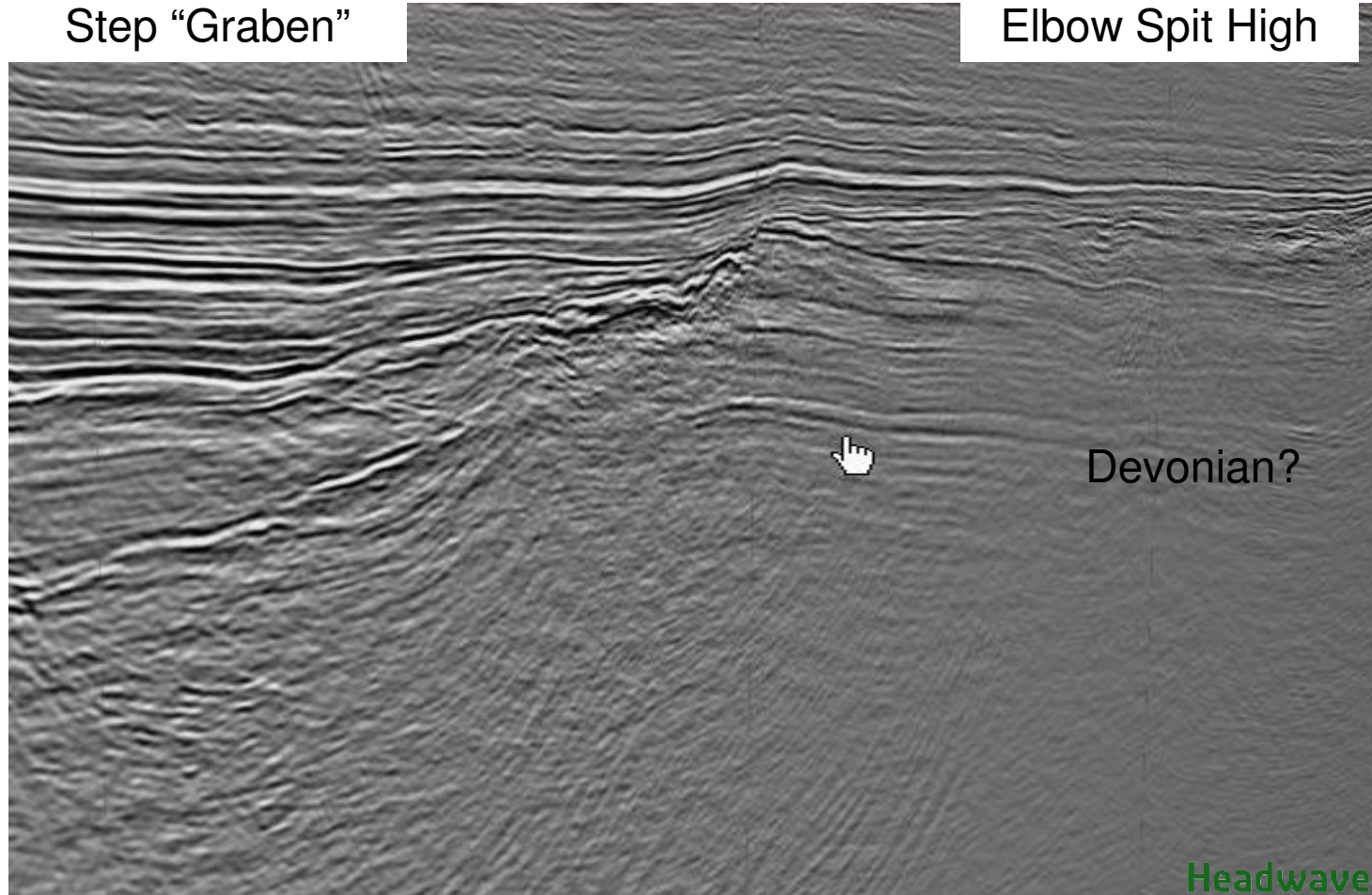
2D SW-NE line in the northern Dutch offshore



2D SW-NE line in the northern Dutch offshore (Zero offset only, flipped)

Step "Graben"

Elbow Spit High



Devonian?

Headwave

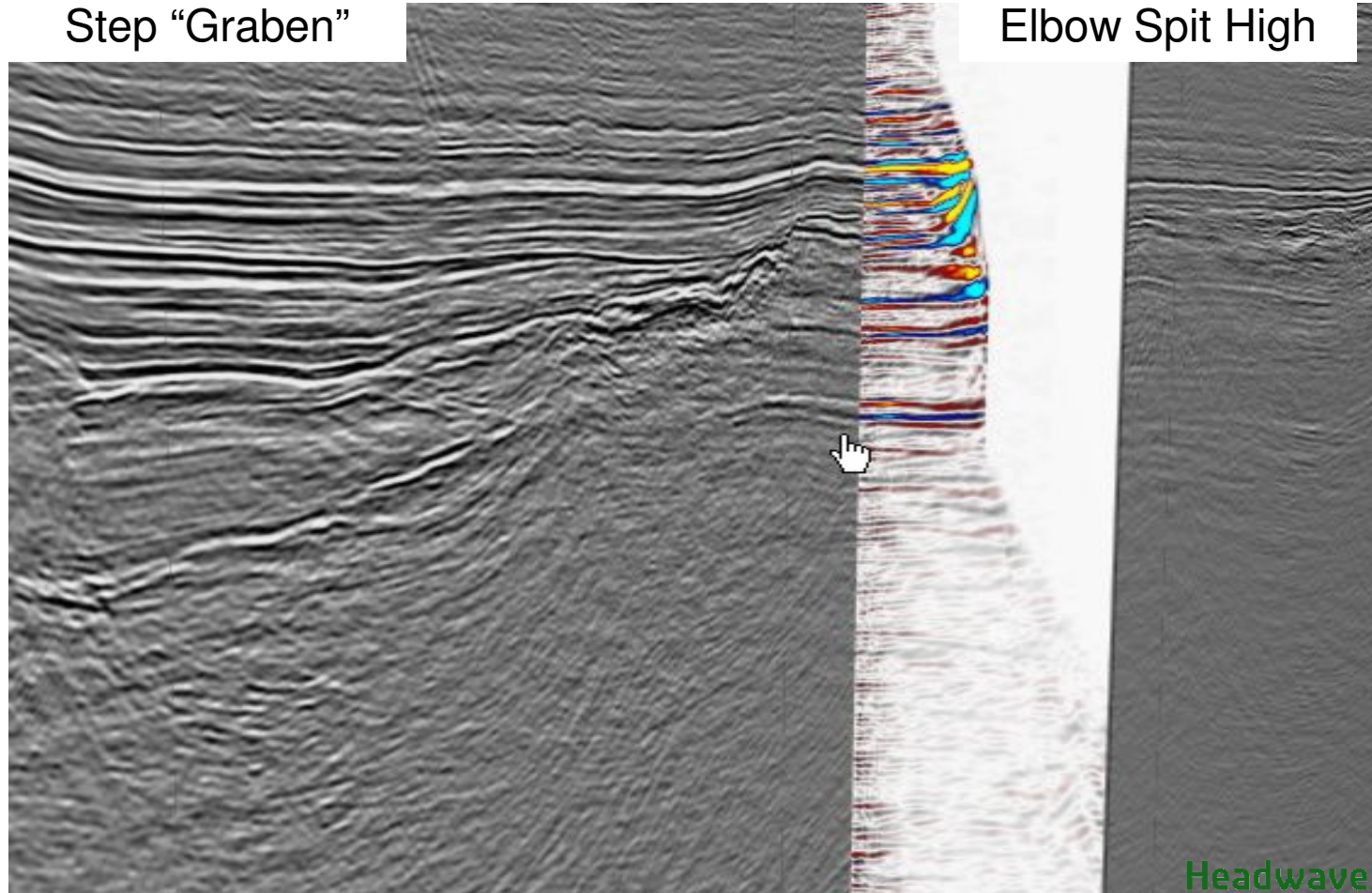


Long offset NSR data, courtesy Fugro-TGS

2D northern Dutch offshore Inspect Devonian

Step "Graben"

Elbow Spit High

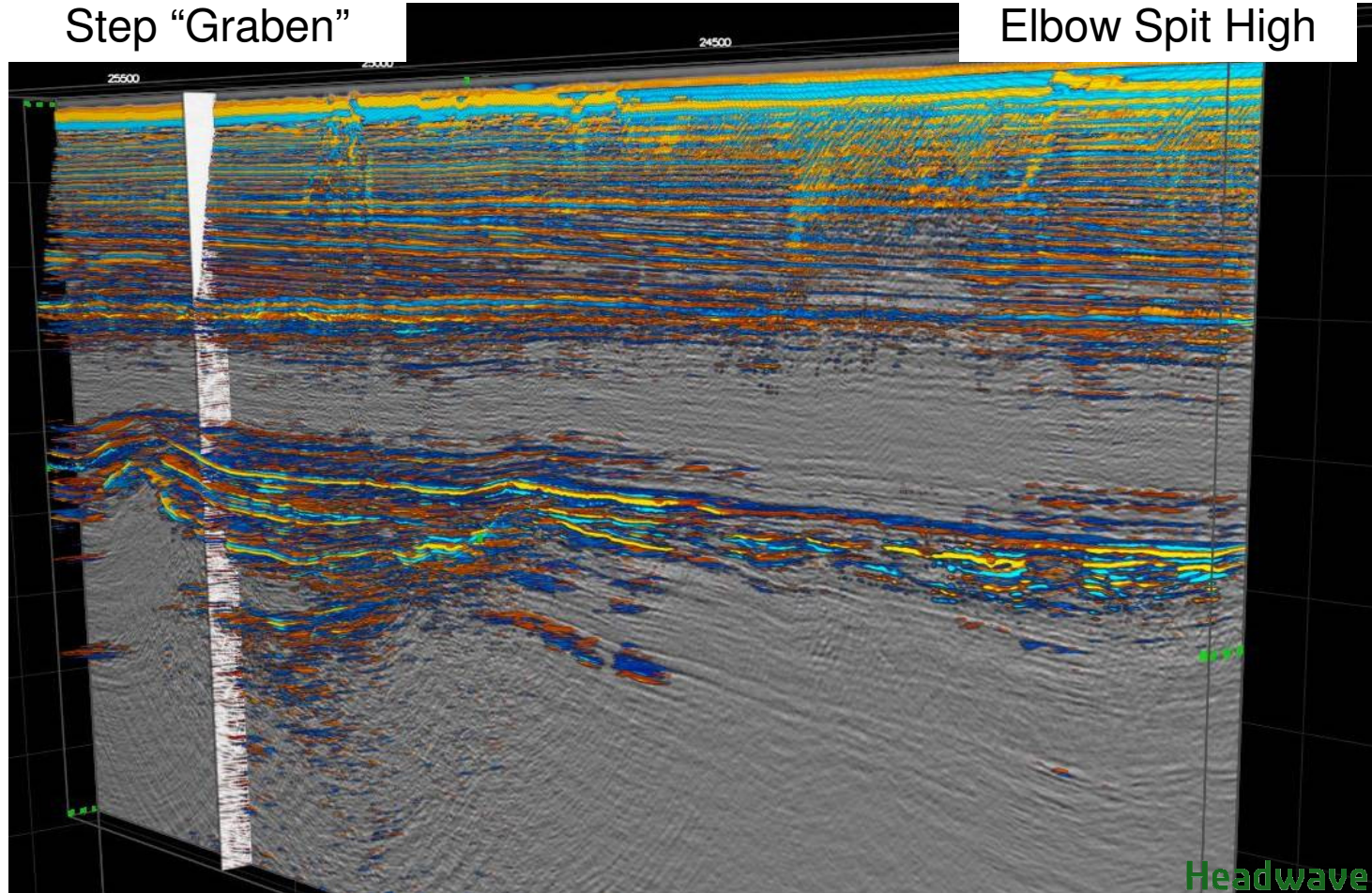


Long offset NSR data, courtesy Fugro-TGS

2D northern Dutch offshore Inspect in semi-transparent Prestack Probe

Step "Graben"

Elbow Spit High



Headwave

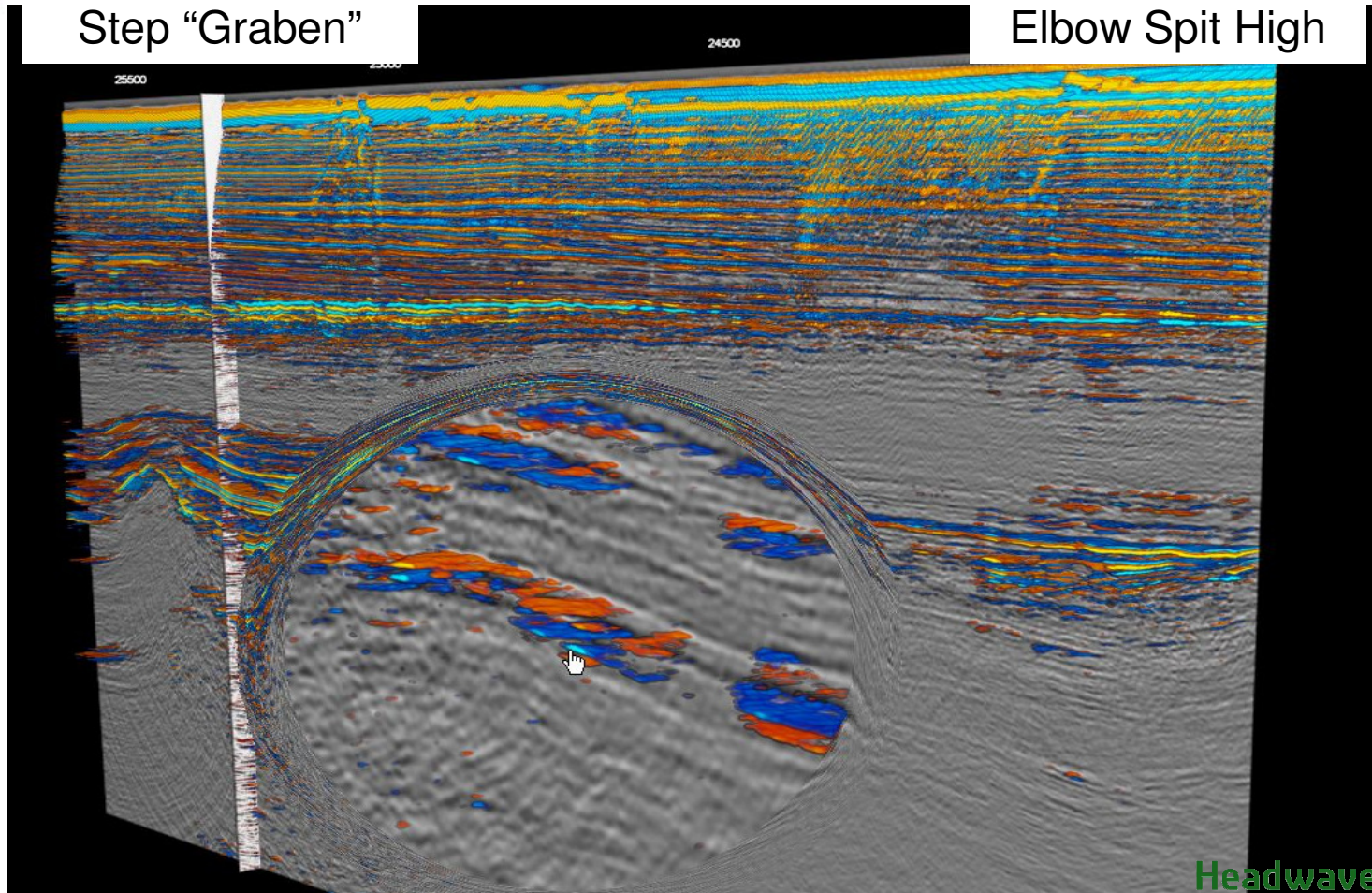


Long offset NSR data, courtesy Fugro-TGS

2D northern Dutch offshore Inspect in semi-transparent Prestack Probe

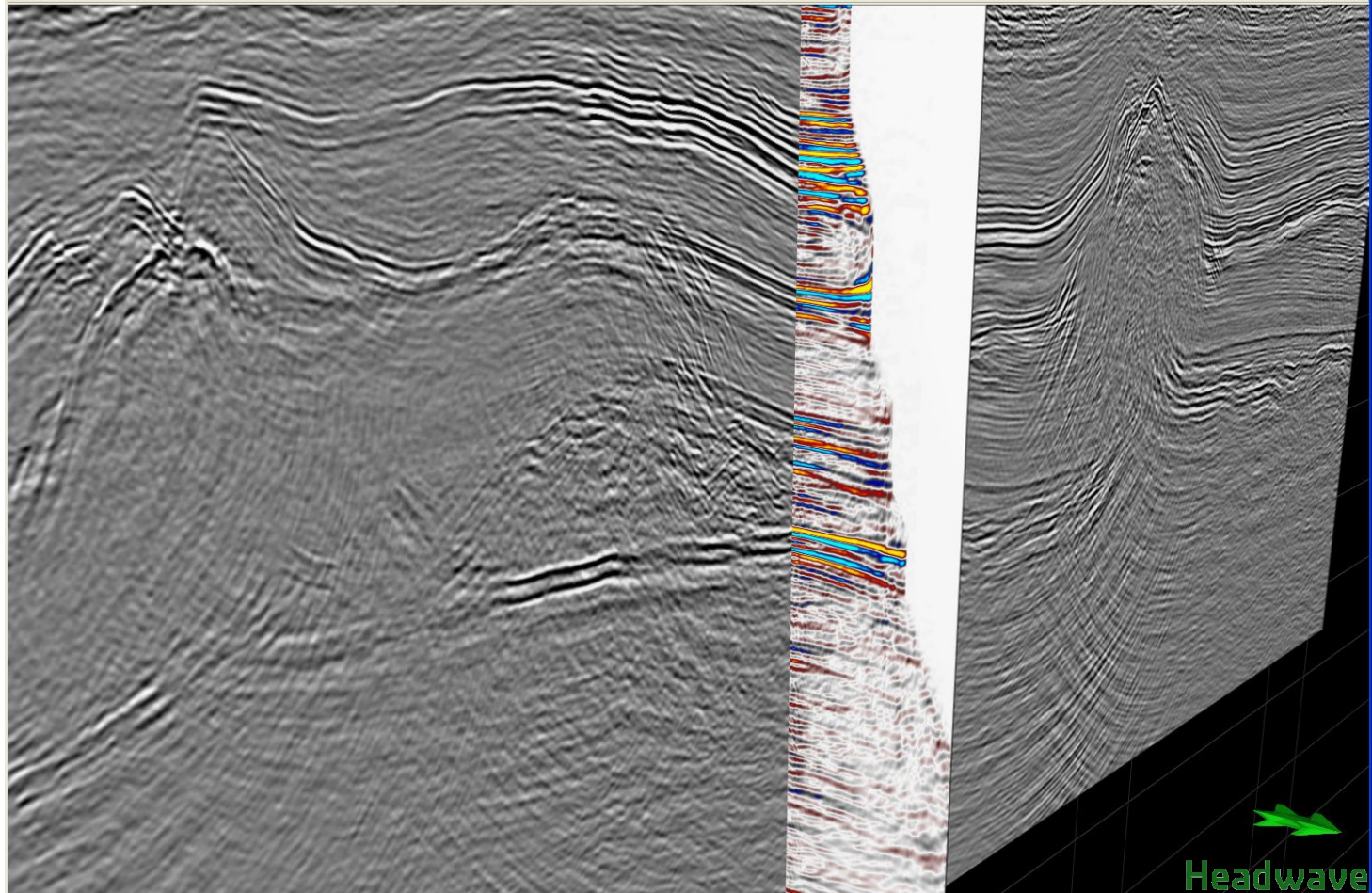
Step "Graben"

Elbow Spit High



Long offset NSR data, courtesy Fugro-TGS

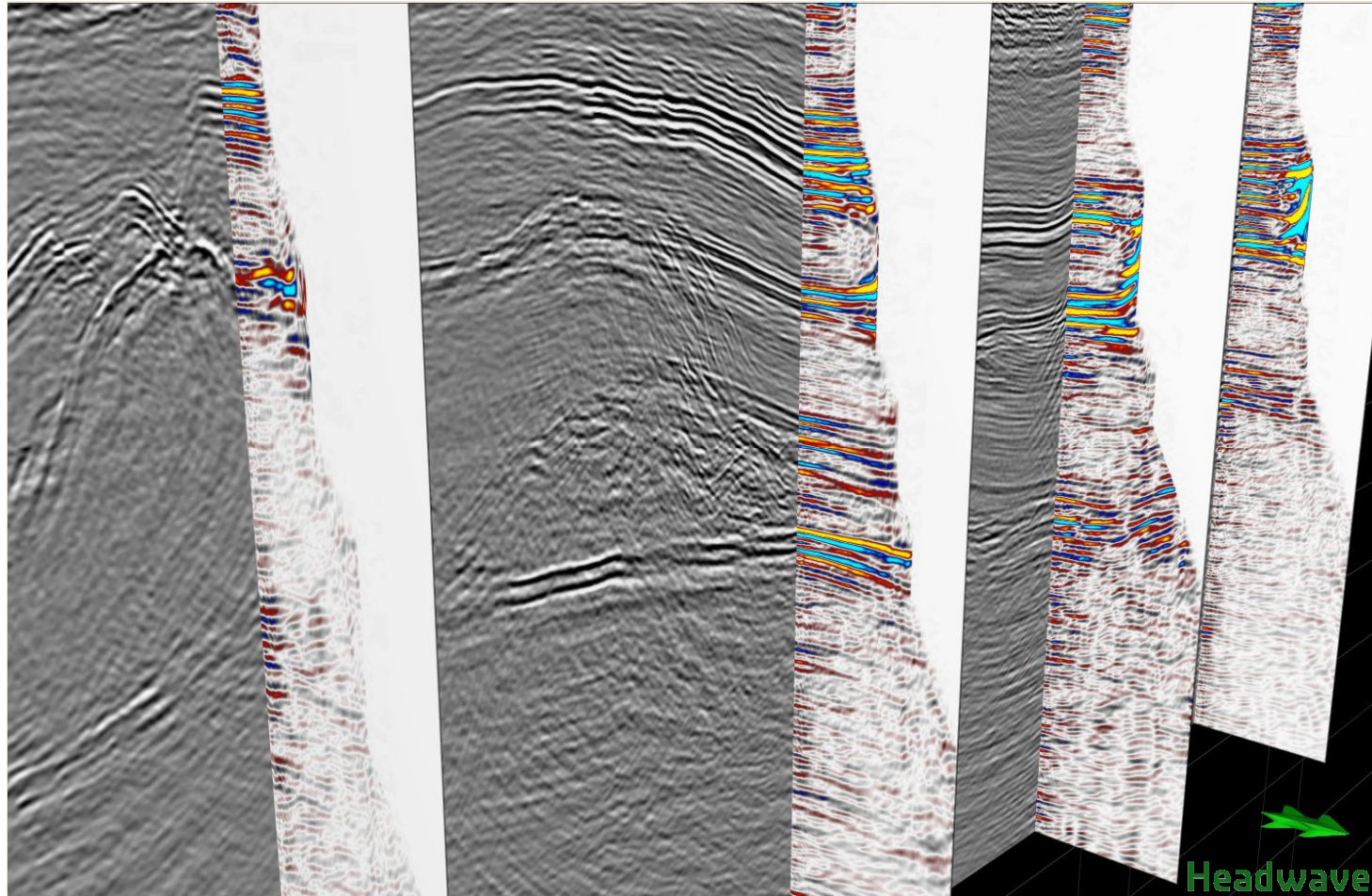
2D northern Dutch offshore Inspect Triassic /Lower Cretaceous



Long offset NSR data, courtesy Fugro-TGS



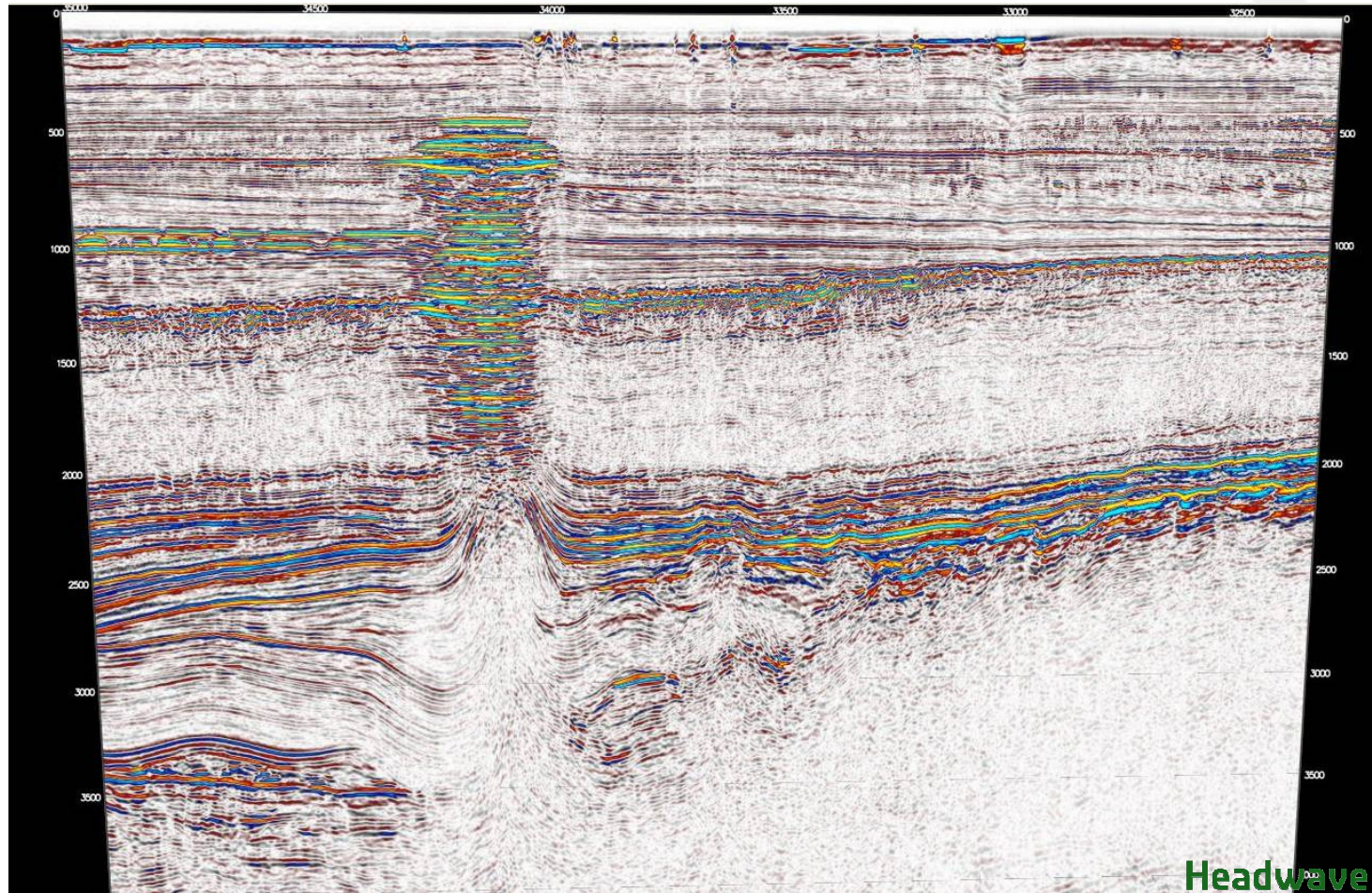
2D northern Dutch offshore Inspect Triassic /Lower Cretaceous



Long offset NSR data, courtesy Fugro-TGS



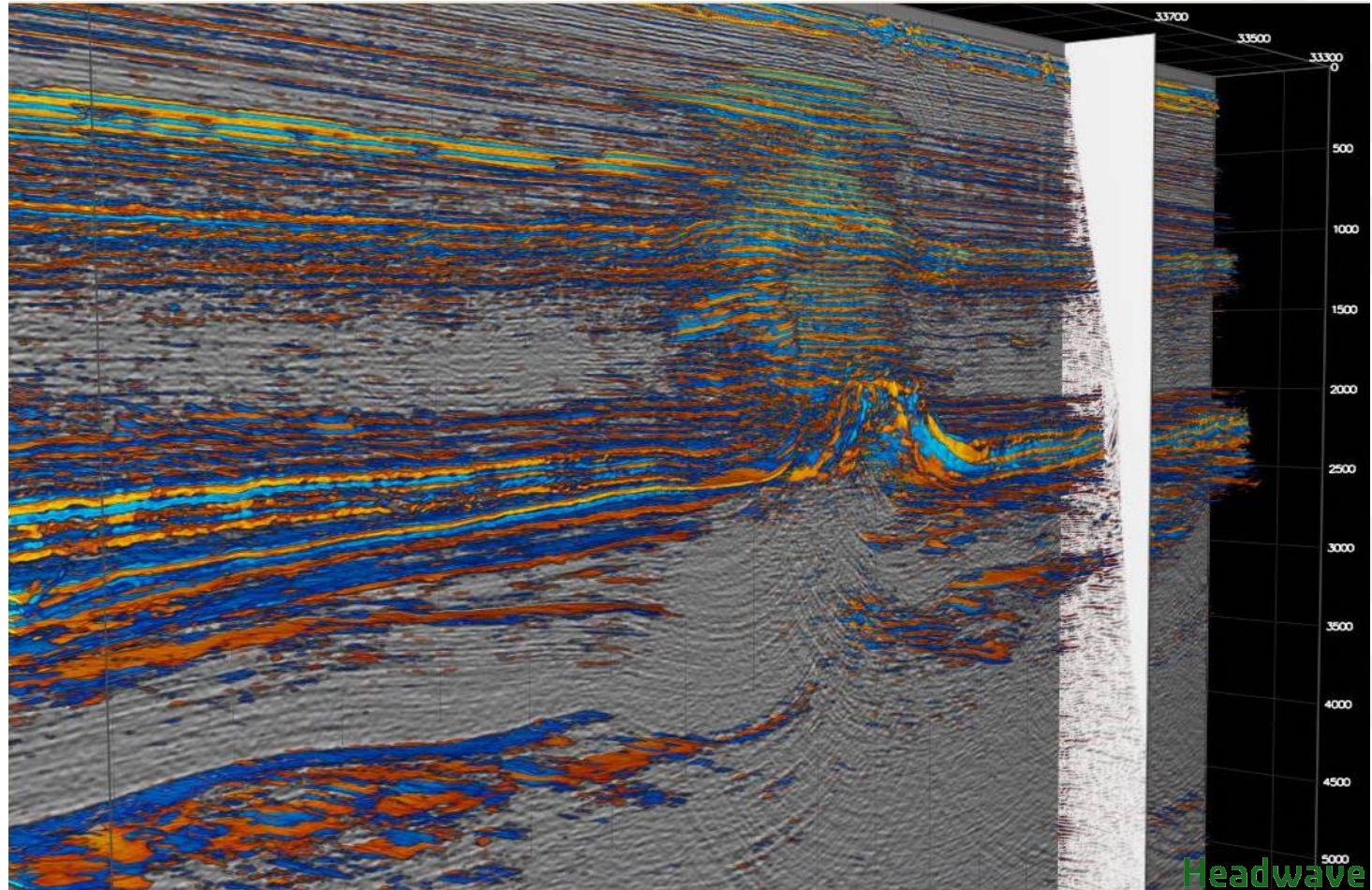
2D northern Dutch offshore Inspect Shallow Gas & deeper: Full stack



Long offset NSR data, courtesy Fugro-TGS



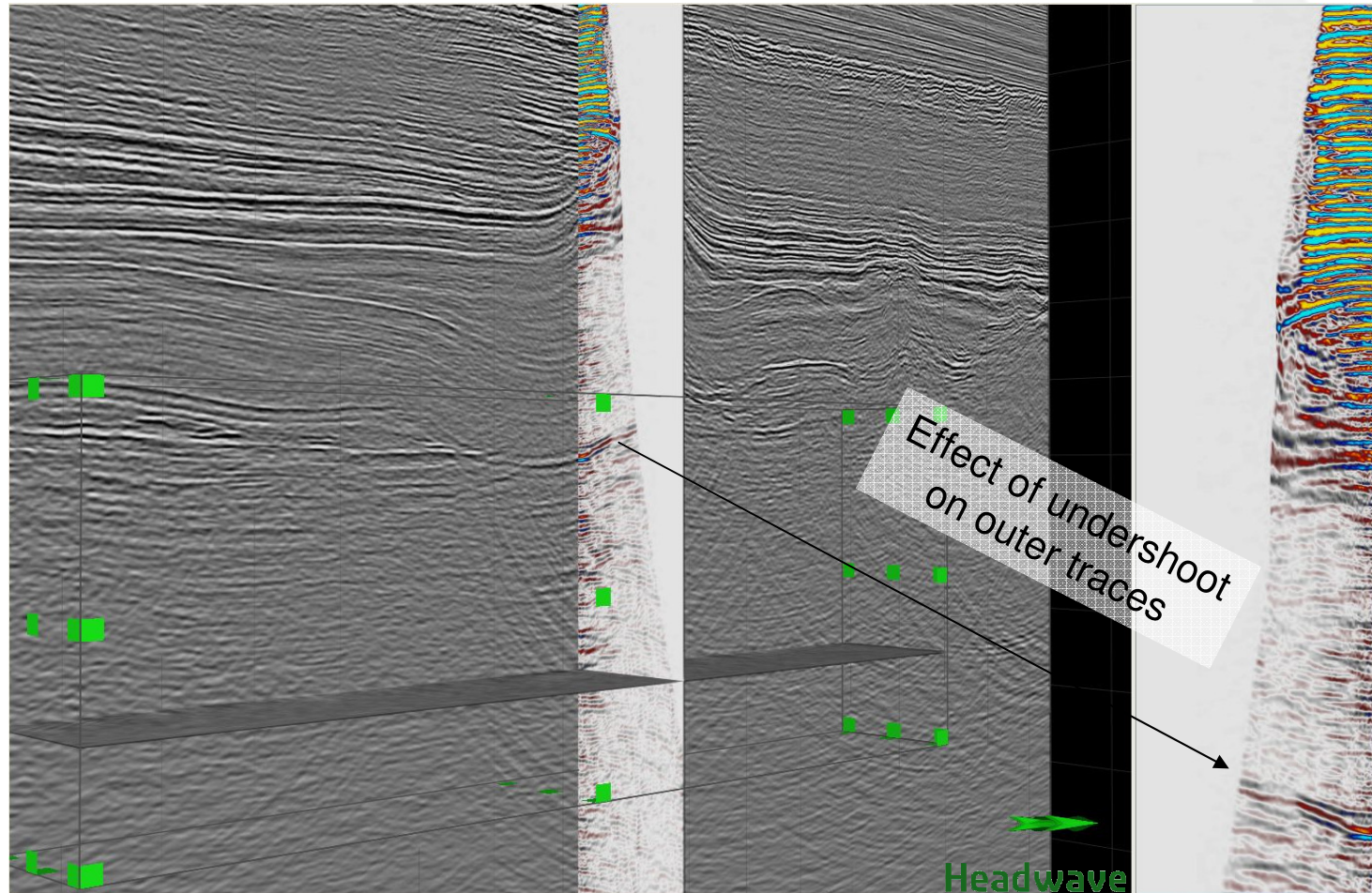
2D northern Dutch offshore Inspect Shallow Gas & deeper: Prestack Probe



Long offset NSR data, courtesy Fugro-TGS



2D northern Dutch offshore Inspect Shallow Gas & deeper: Prestack gather



Long offset NSR data, courtesy Fugro-TGS





Conclusions

- Prestack allows direct check at critical locations during all phases of the Field life cycle
 - Check quality of current seismic data
 - Full offset inspection for amplitude and Δt
- For 3D seismic: E & P
 - QC data and parameters
- For 2D seismic: Reconnaissance
 - Quick view of potential of leads
 - QC and impact of long offsets for design of modern 3D seismic
 - The regional 2D long offset lines reveal interesting features in undeveloped plays

Let's go Prestack

EBN conclusions

- EBN has licensed the Fugro-TGS 2D long offset lines covering the northern part of the Dutch offshore (including the prestack data)
- These high quality regional lines lie in an area where only limited 3D seismic data with short offsets is available
- The real time analysis of amplitude versus offset (**AvO**) on this modern dataset enables new prospects to be quickly evaluated

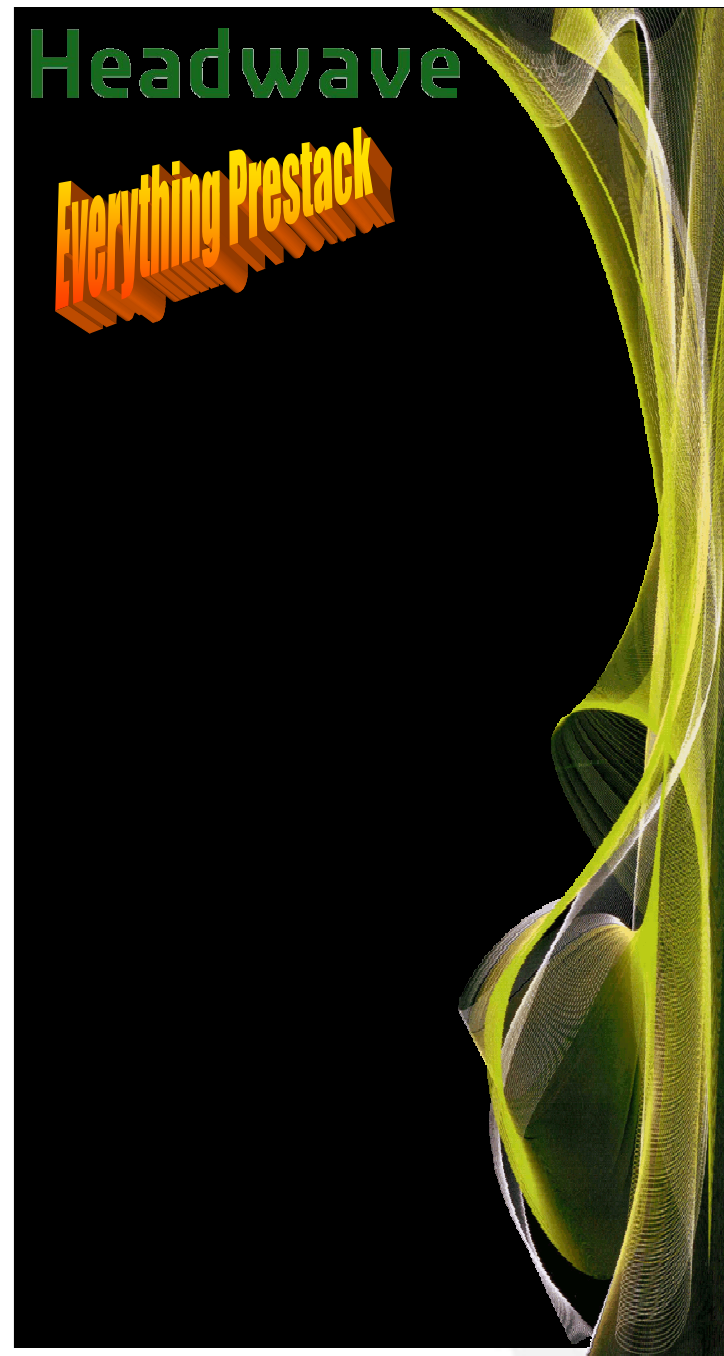


Acknowledgements

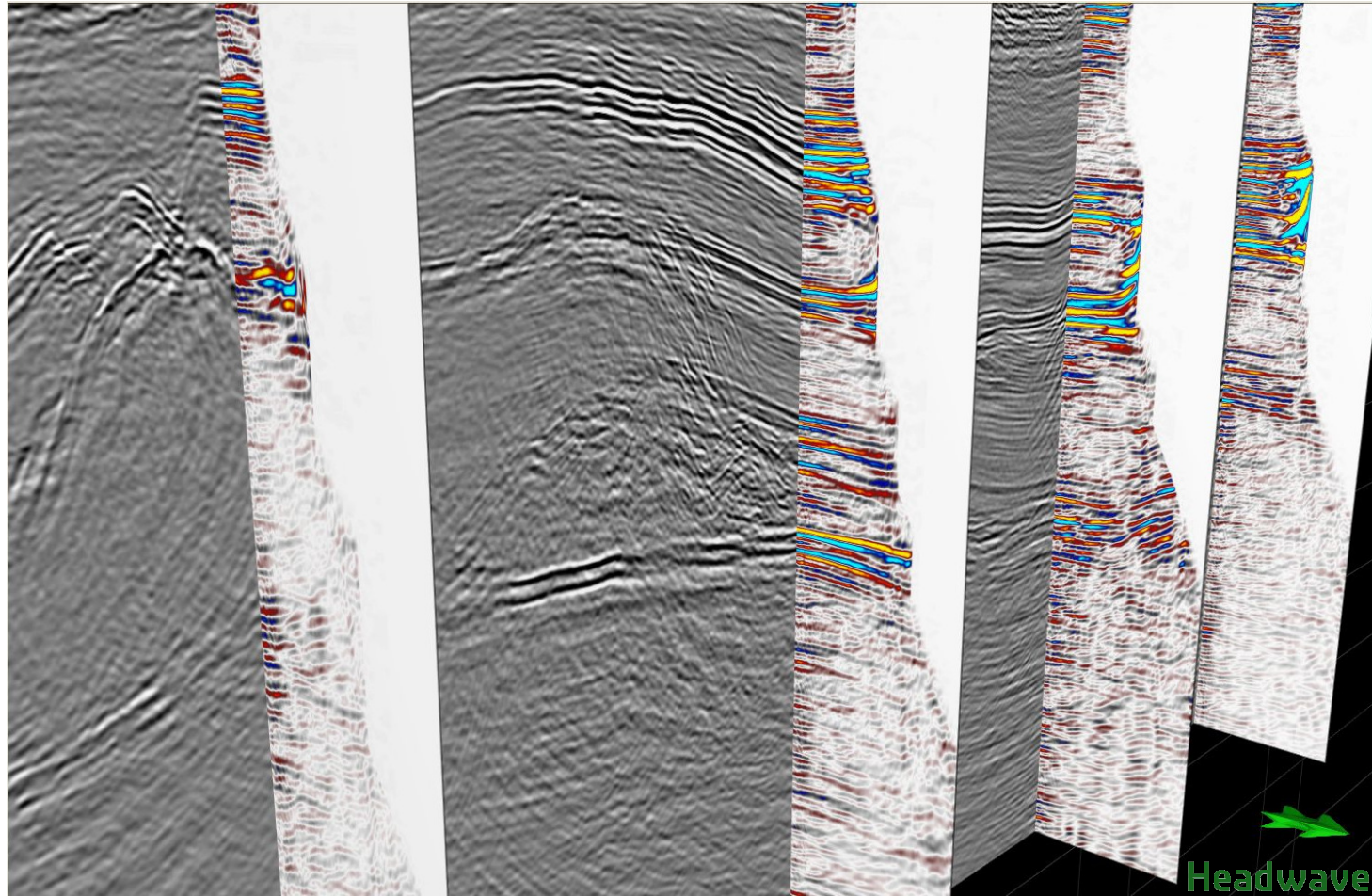
3D data



2D data



Any further questions??



Long offset NSR data, courtesy Fugro-TGS

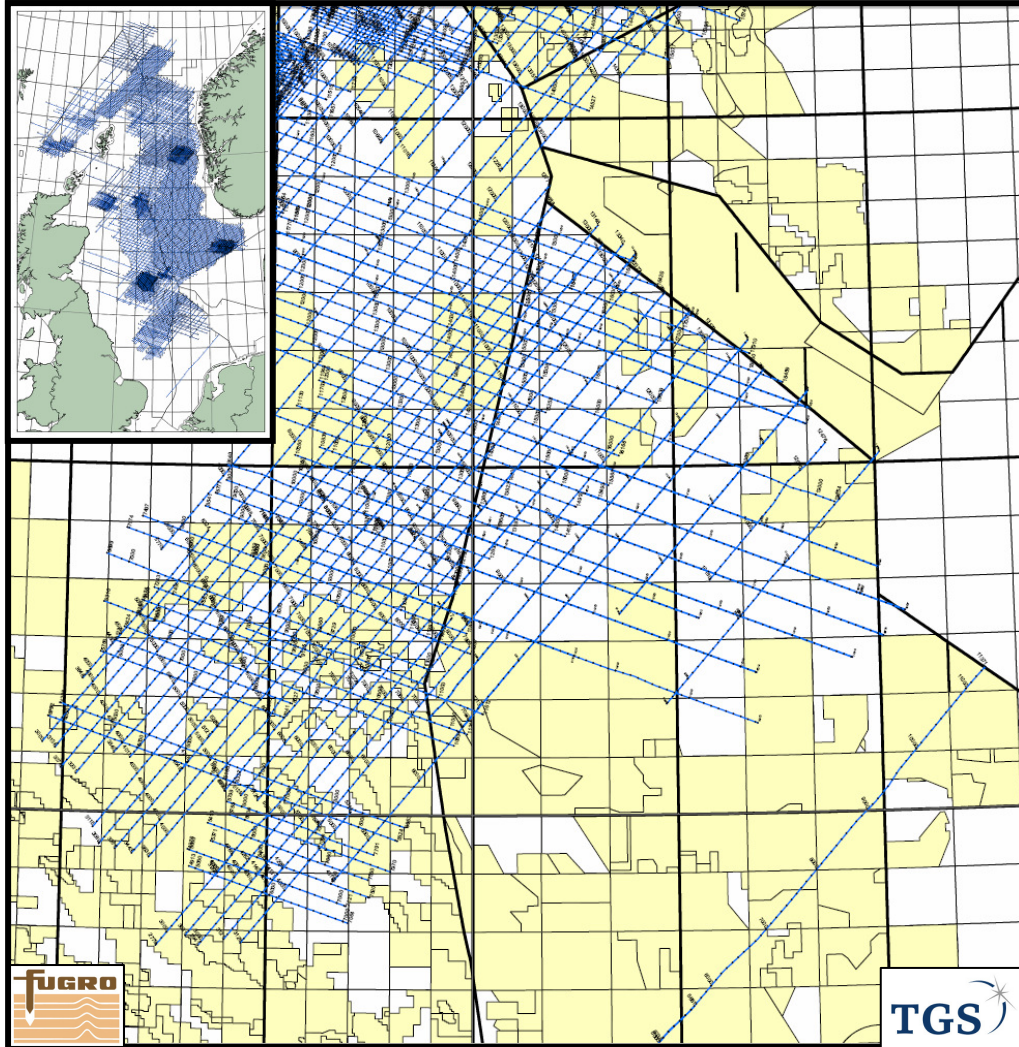




Backup



North Sea Renaissance (NSR)



2D Long Offset Seismic Data

Over 100,000 km acquired in the UK and Norway since 2003

3,139 km acquired in the Netherlands since 2005

Of which 1,830 km were acquired in 2009

Objective – deep imaging

Data courtesy of
TGS and Fugro