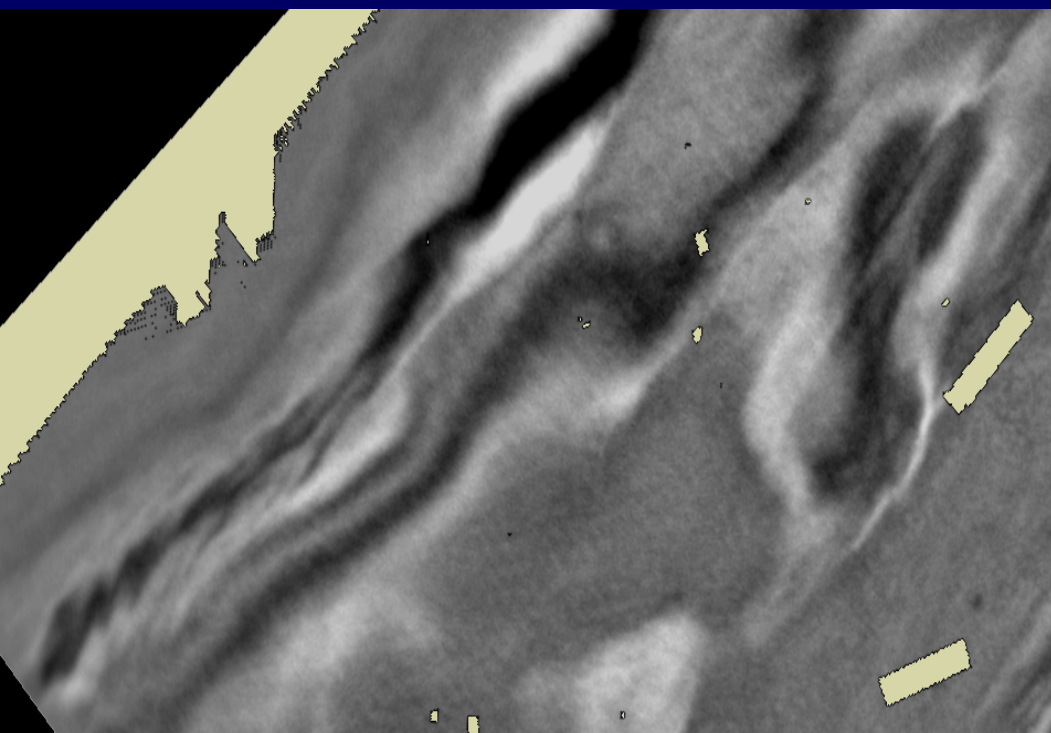# High Resolution Diffraction Imaging of Southern North Sea Reservoirs
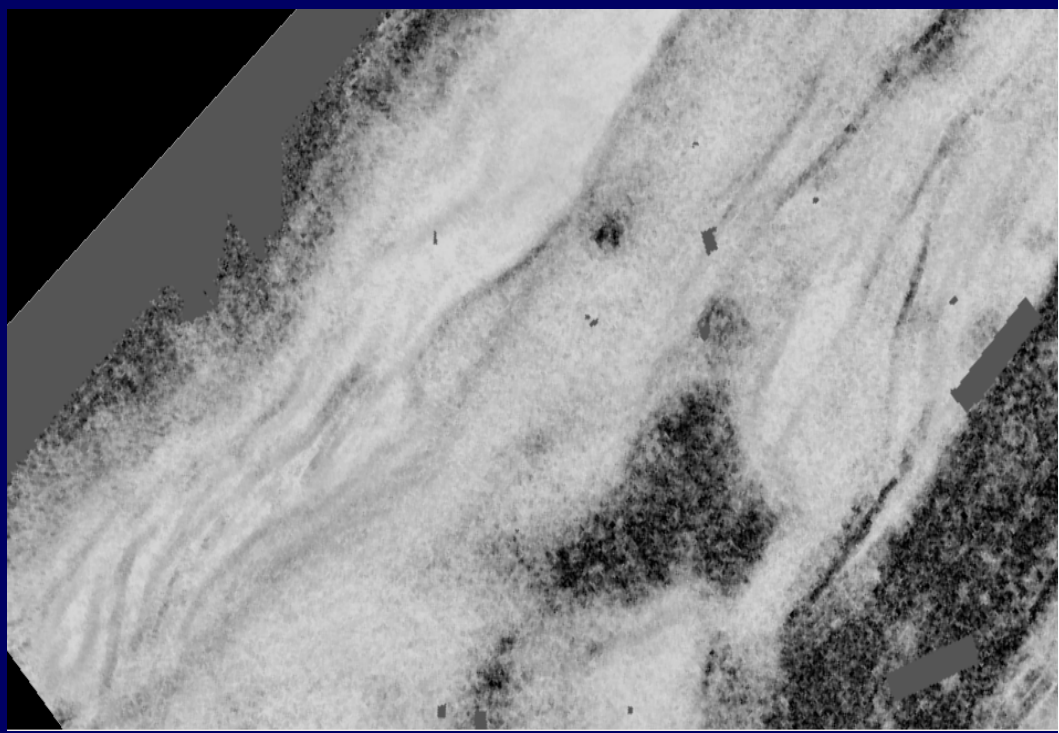
**Z-Terra Inc.**

**EBN, Utrecht**
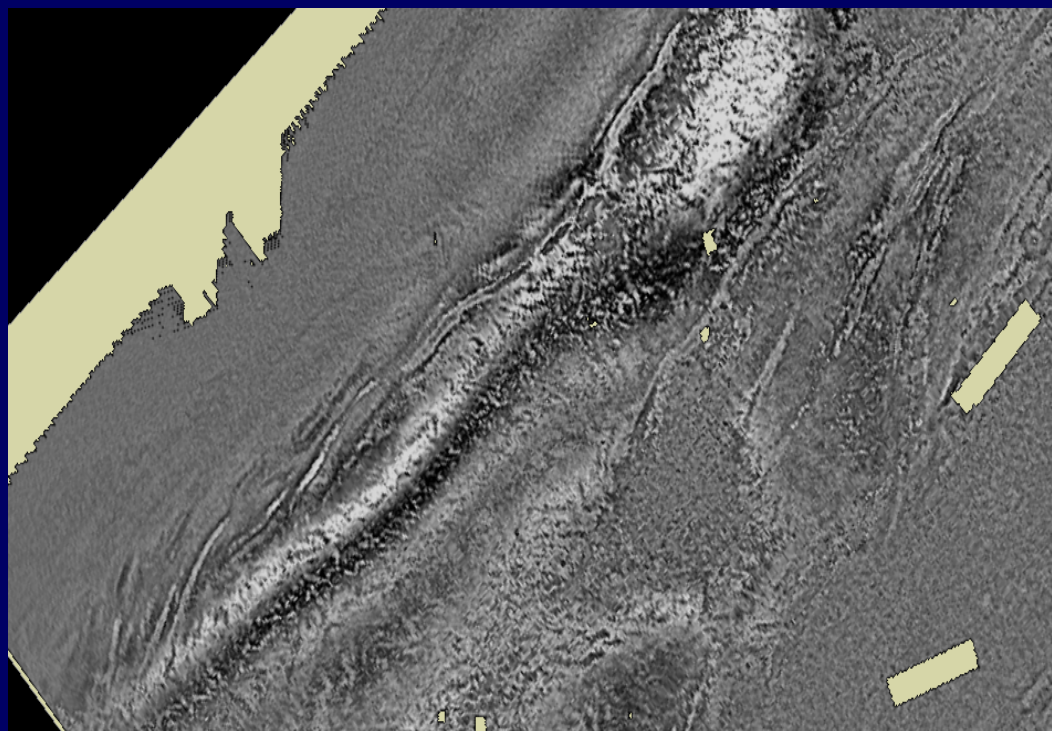**23 May 2016**

**PSDM Depth Slice**

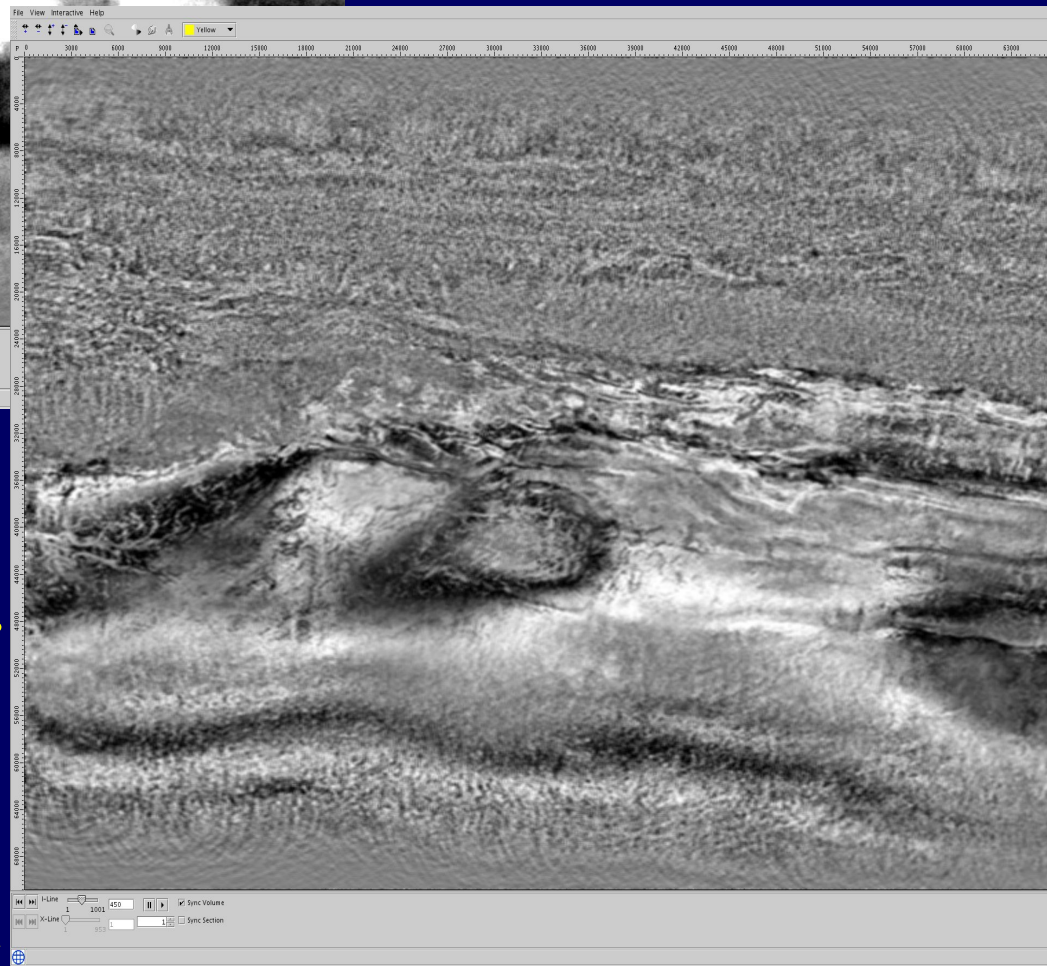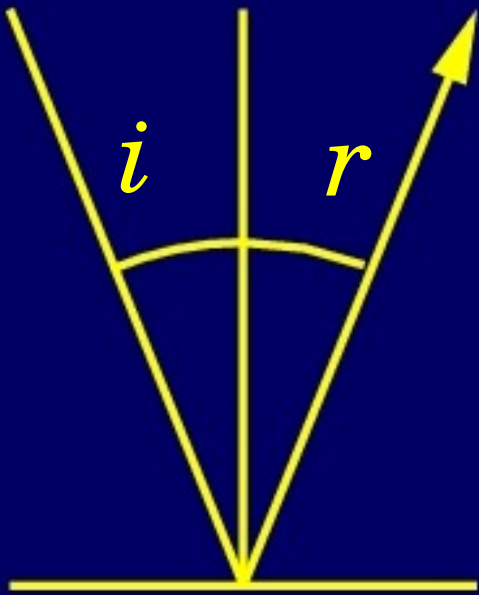**Coherence Depth Slice**

**Diffraction Imaging Depth Slice**

Data Courtesy of Seitel
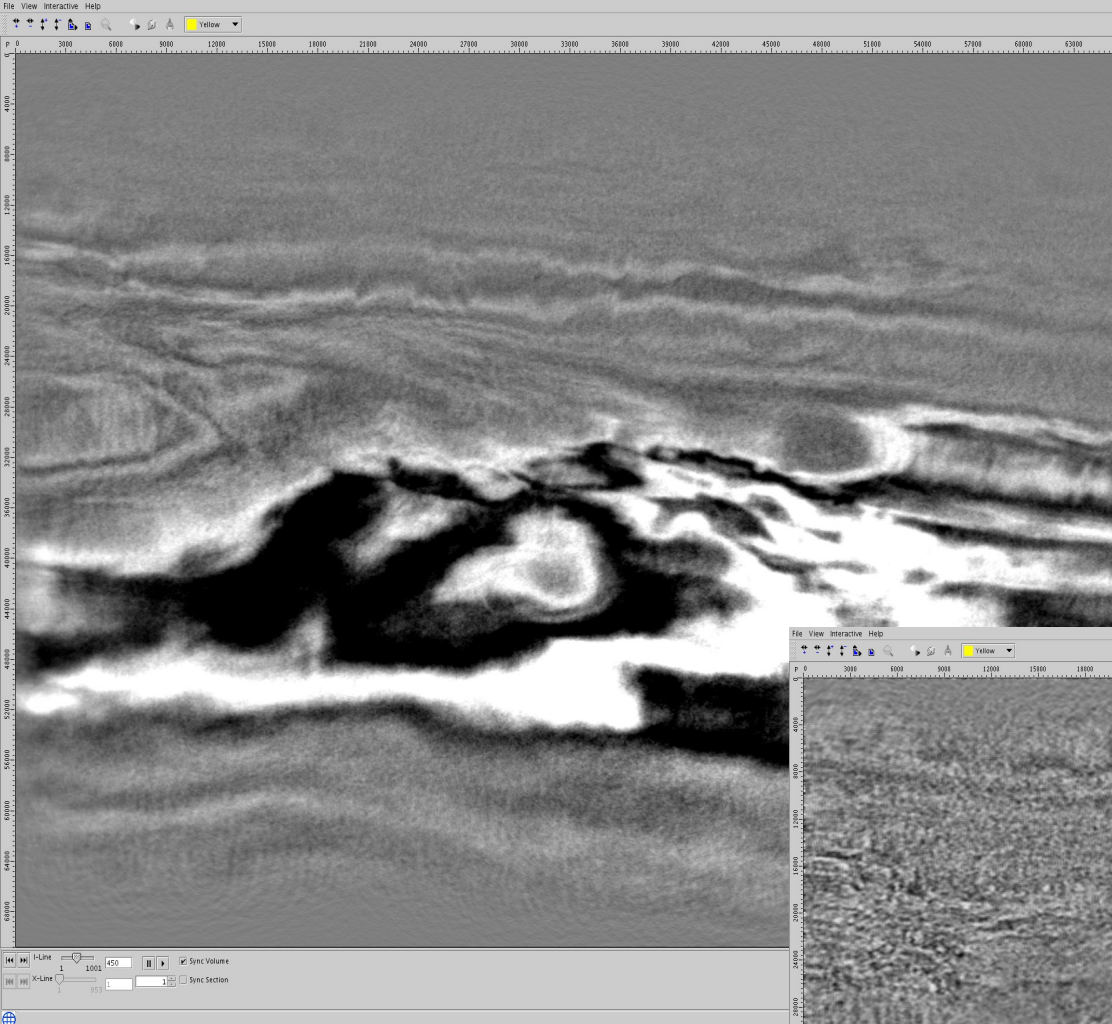
PSDM
Depth Slice

Diffraction Imaging
Depth Slice

Data Courtesy of Seitel

# Diffraction Imaging

## What is a diffraction?
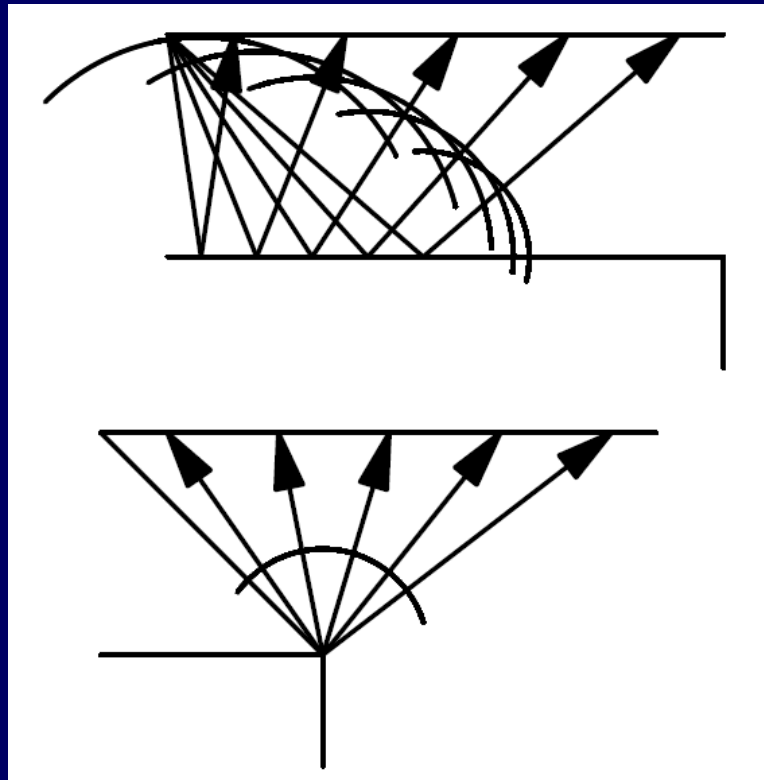


**Reflections satisfy Snell's law**

**Diffractions don't**

**Snell's law:** $i = r$

# Diffraction Imaging

**Why diffractions?**
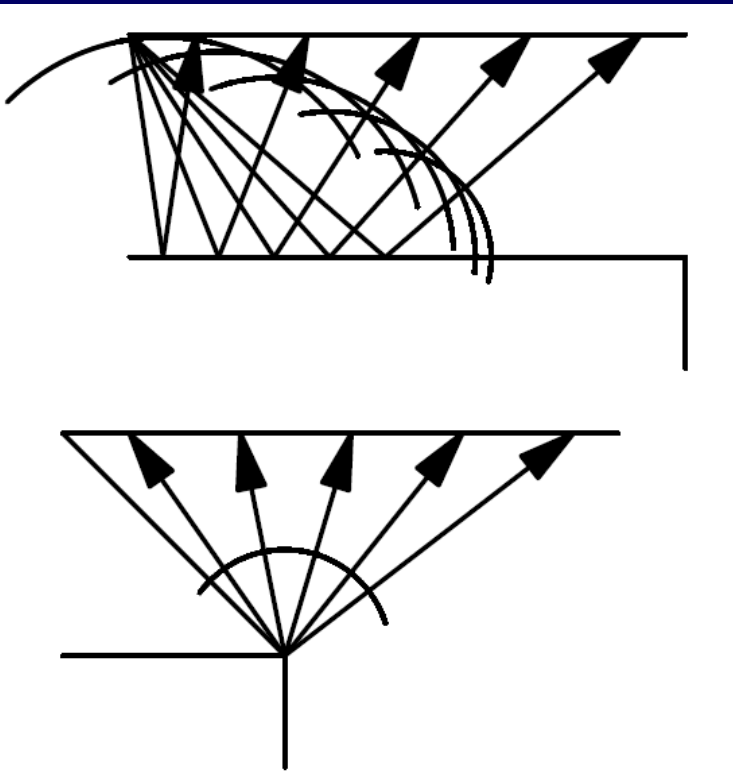
**Correct identification of geological discontinuities is an important problem in the interpretation of seismic data.**

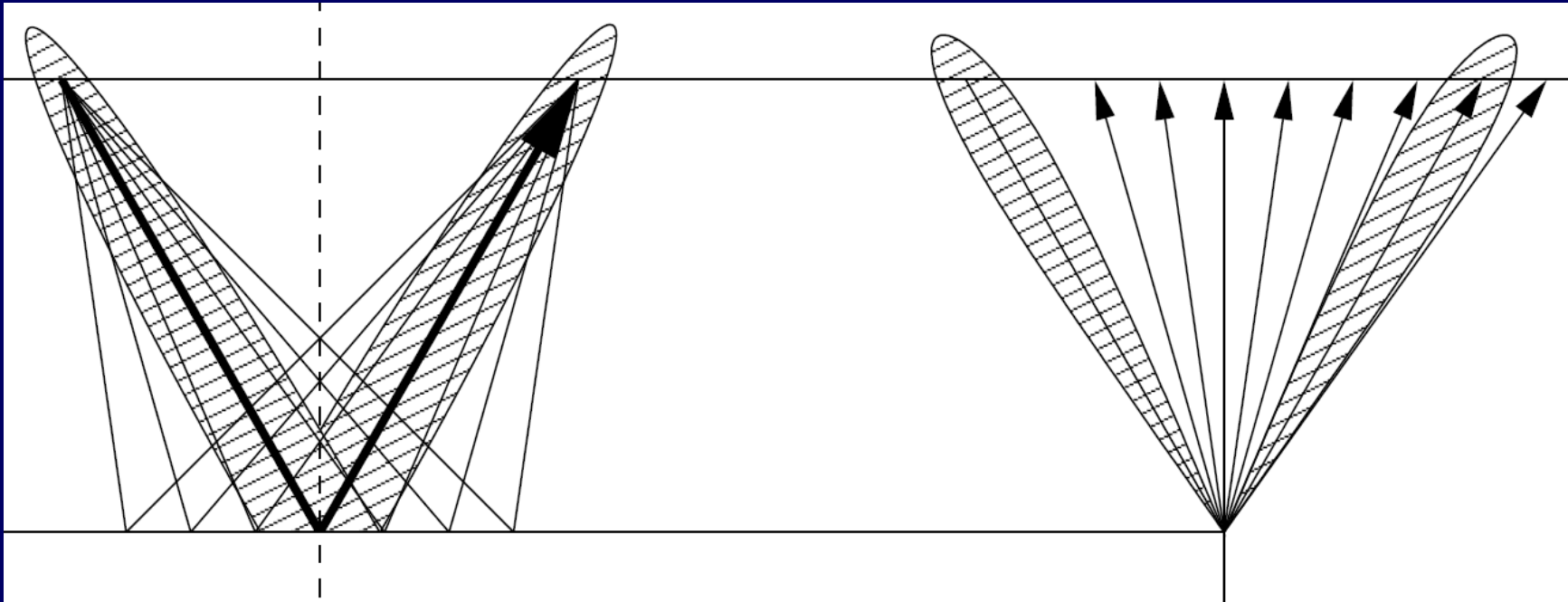**Geology: structural interpretation, super resolution.**

**Geophysics: Conventional processing/imaging uses specular reflections and may attenuate diffractions.**

# Diffraction Imaging

**Why diffraction imaging?** ⟶ 1. **Super-resolution**
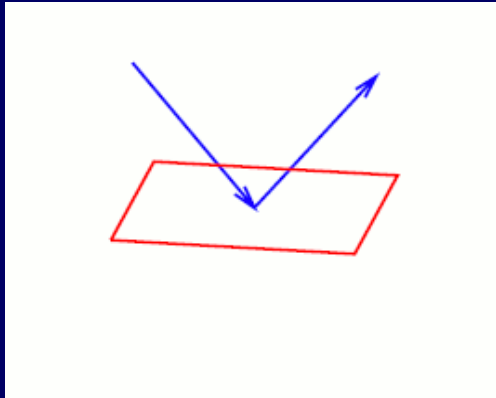2. **Superior illumination**



**Specular reflection + Fresnel zone**

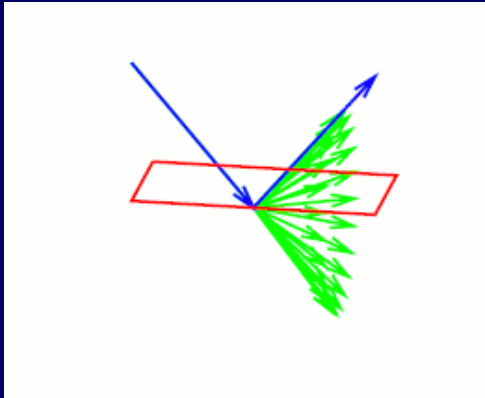**Smearing out of detail + depends on mirror orientation**

**Diffraction + Fresnel zone**
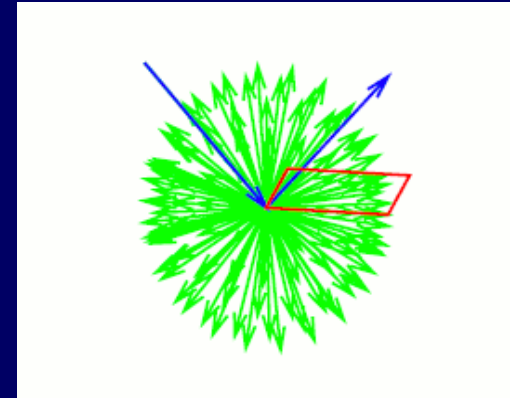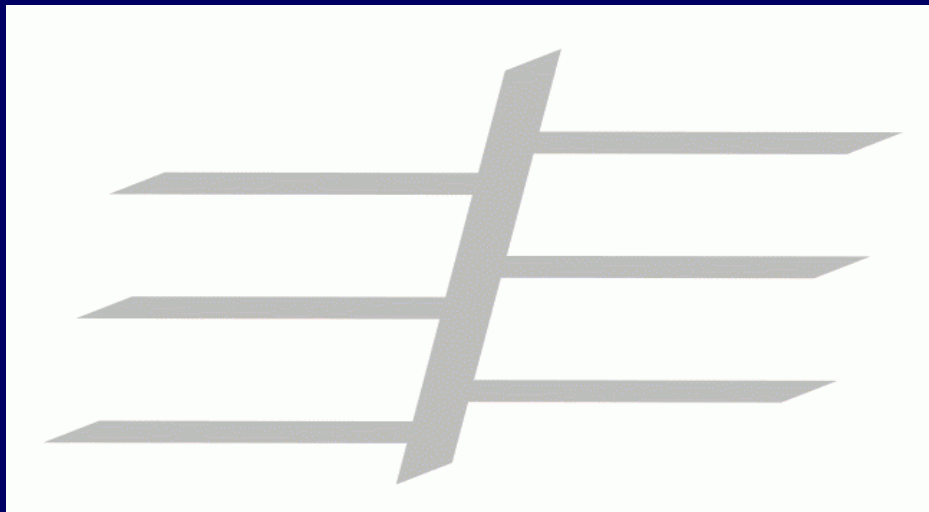
**No smearing, no mirror**
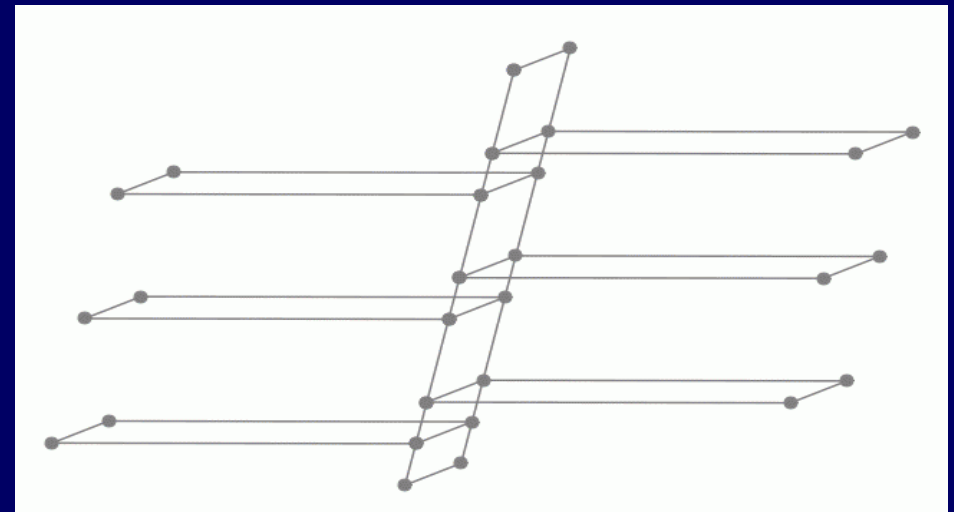
# Diffraction Imaging



**Plane reflection**



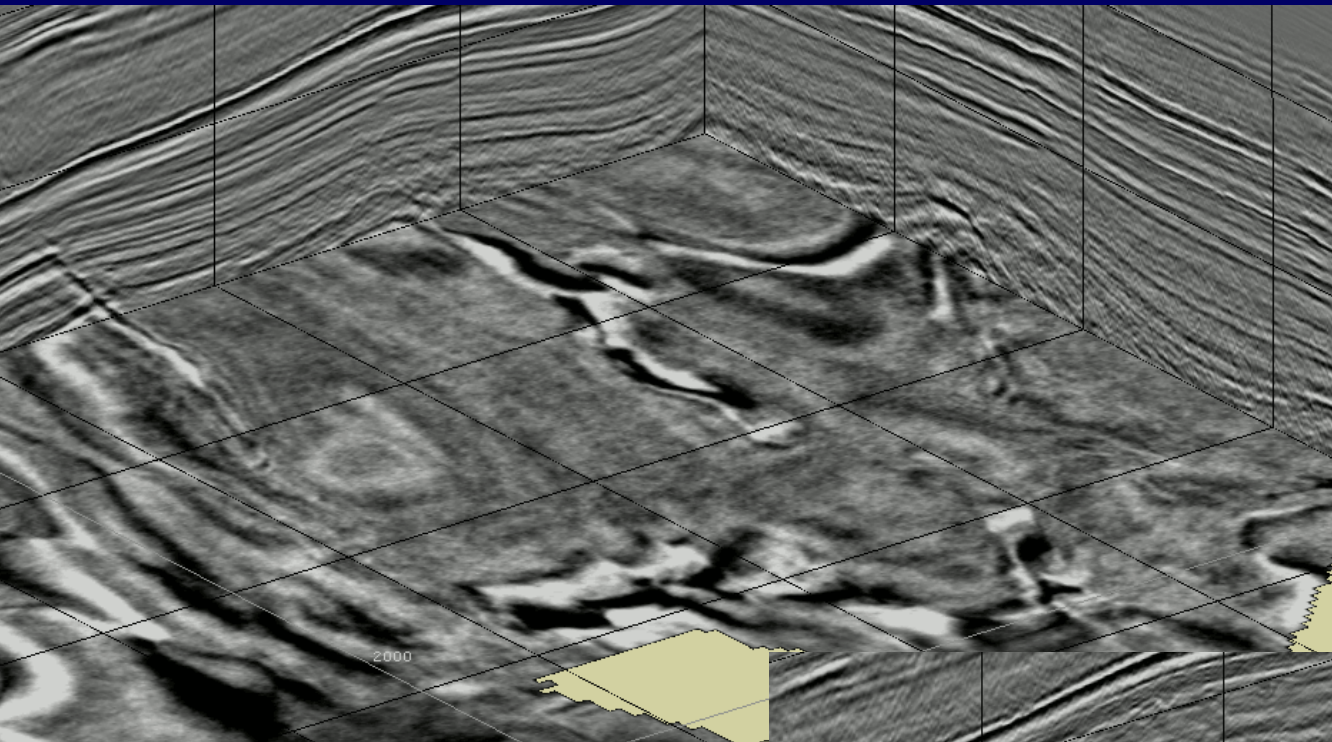**Edge diffraction**



**Tip diffraction**



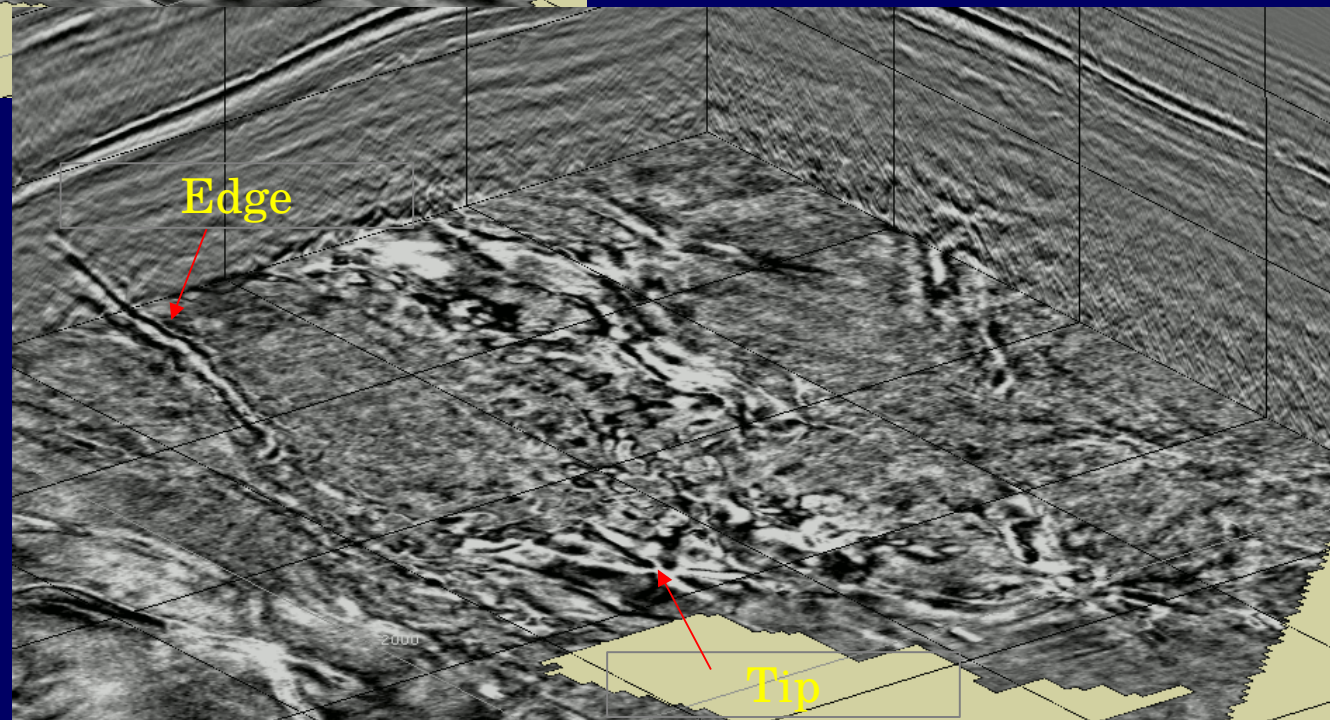**Reflection image**



**Diffraction image**

**Illumination ...!**

# Diffraction Imaging



**reflection image**

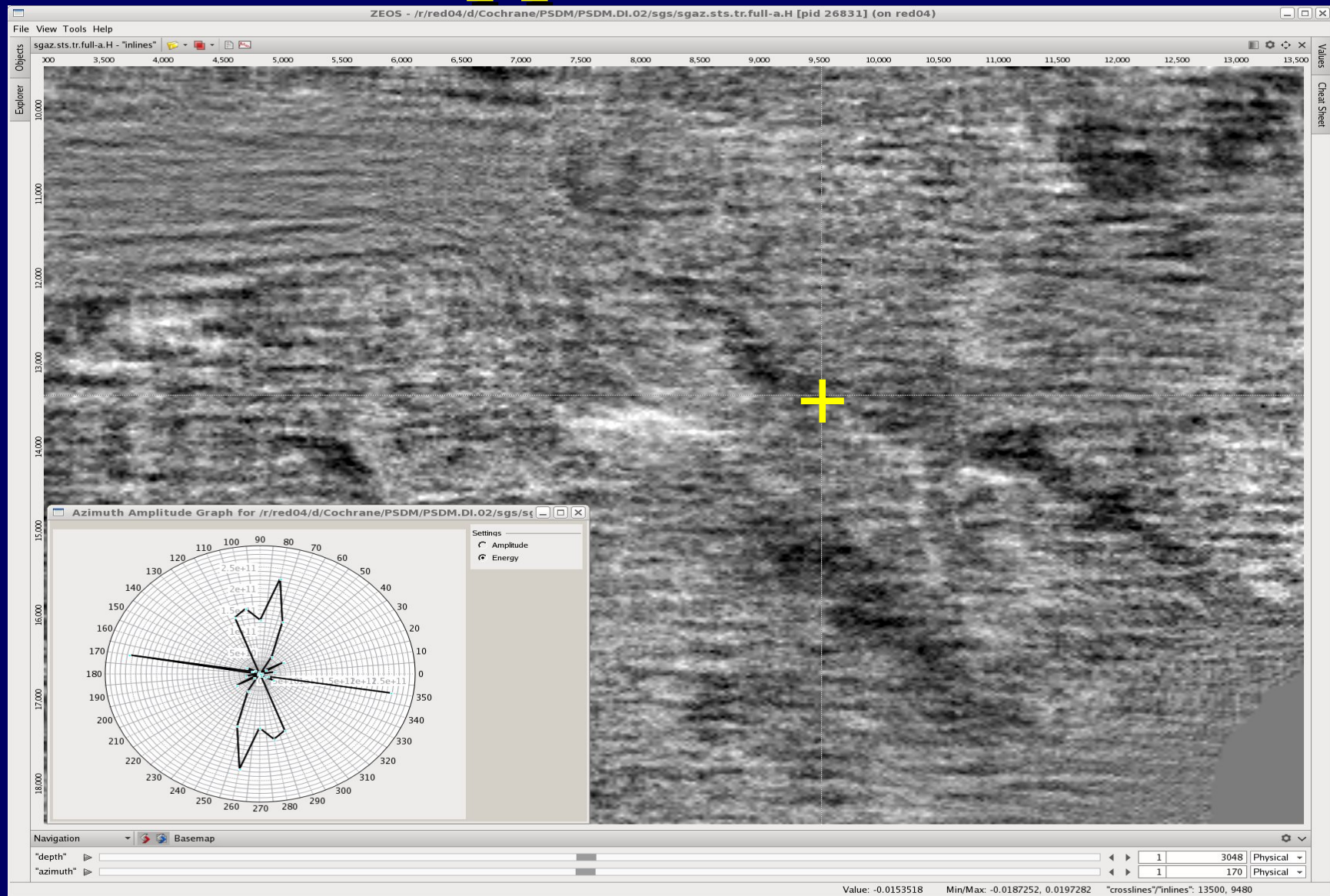**diffraction image**

Edge

Tip

**Q16 Dutch North Sea**

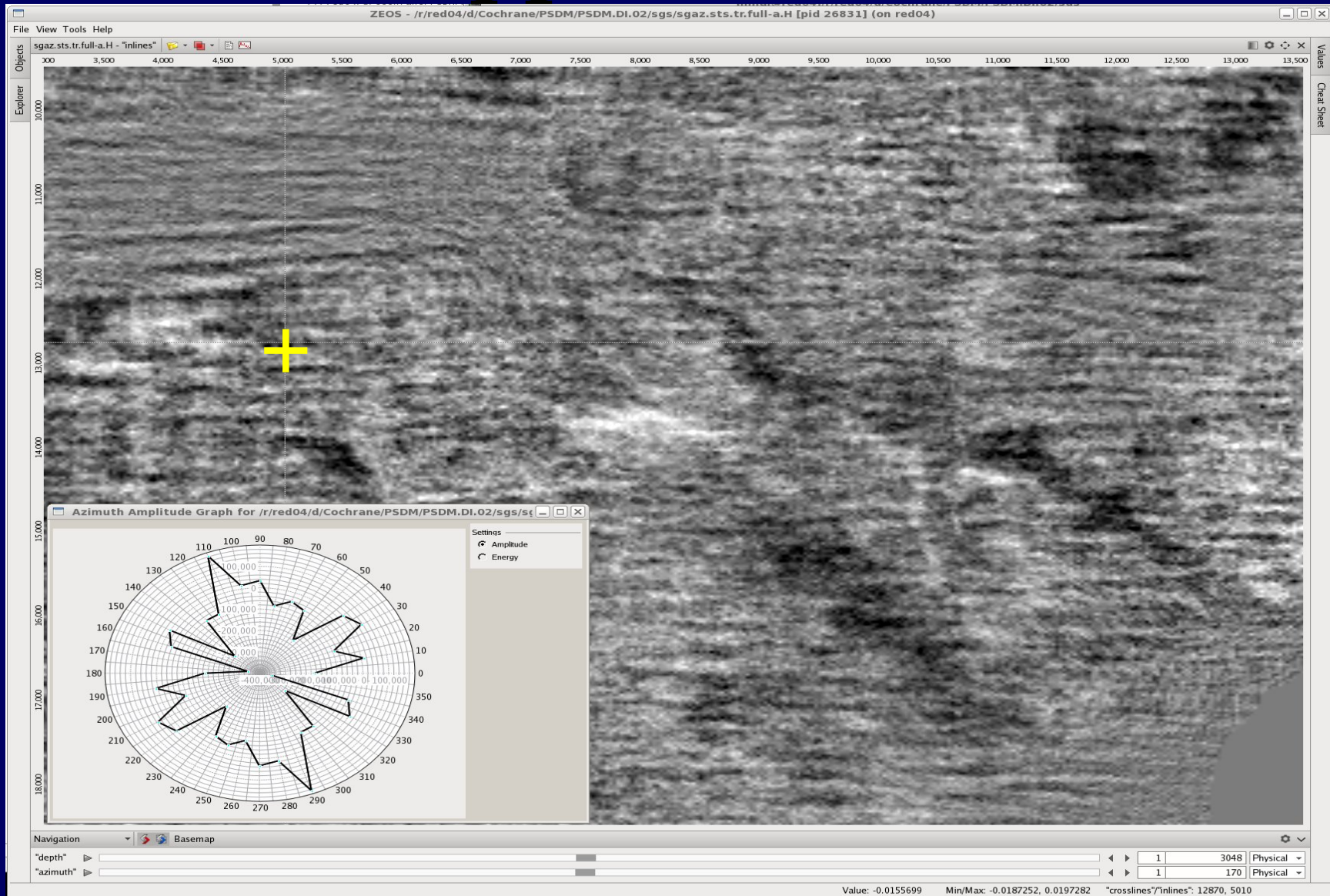Data Courtesy of Oranje-Nassau Energy

# Applications



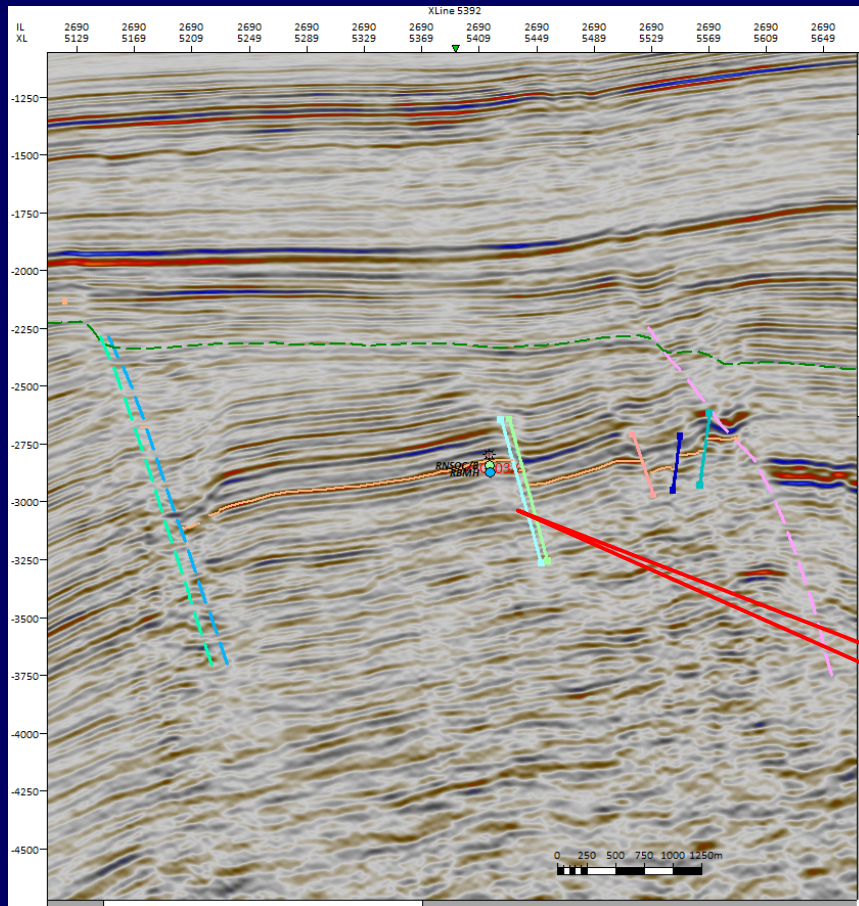Azimuthal dependence of diffractivity and reservoir fracturing  –  I

# Applications



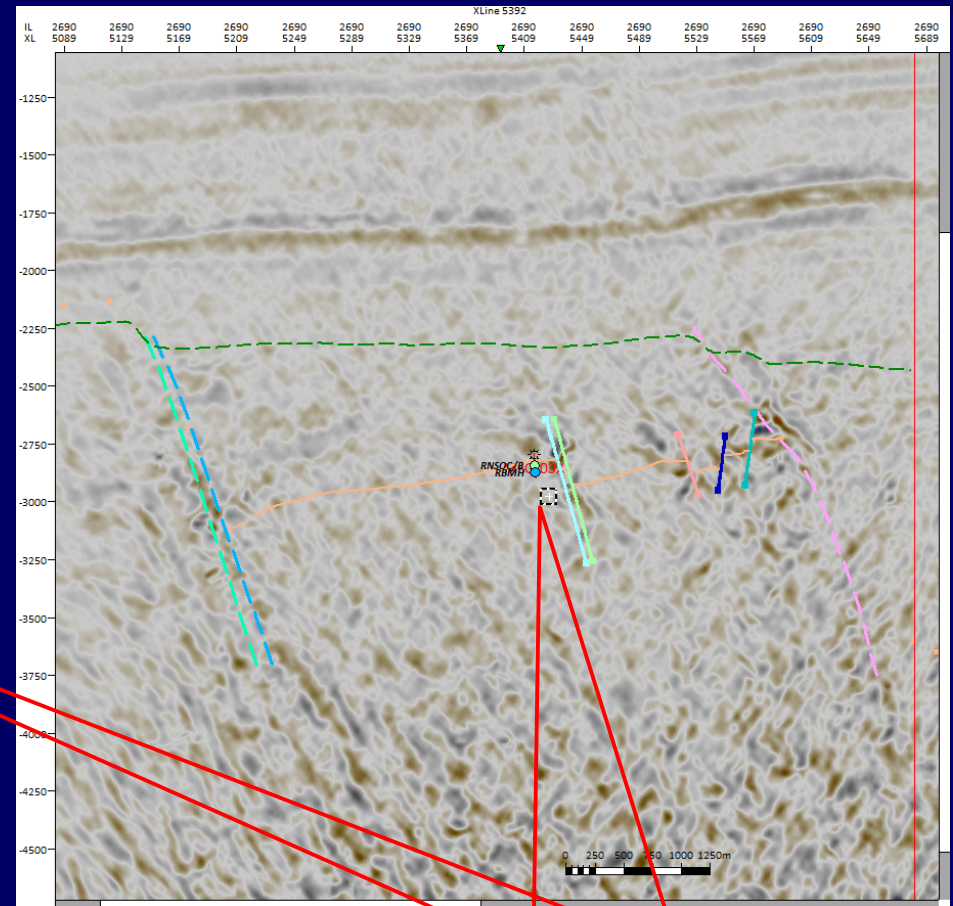**Azimuthal dependence of diffractivity and reservoir fracturing – II**
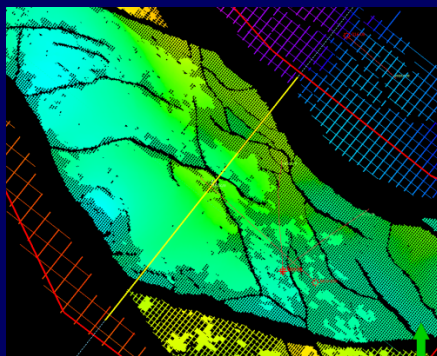
# Diffraction Imaging - Q16/North Sea



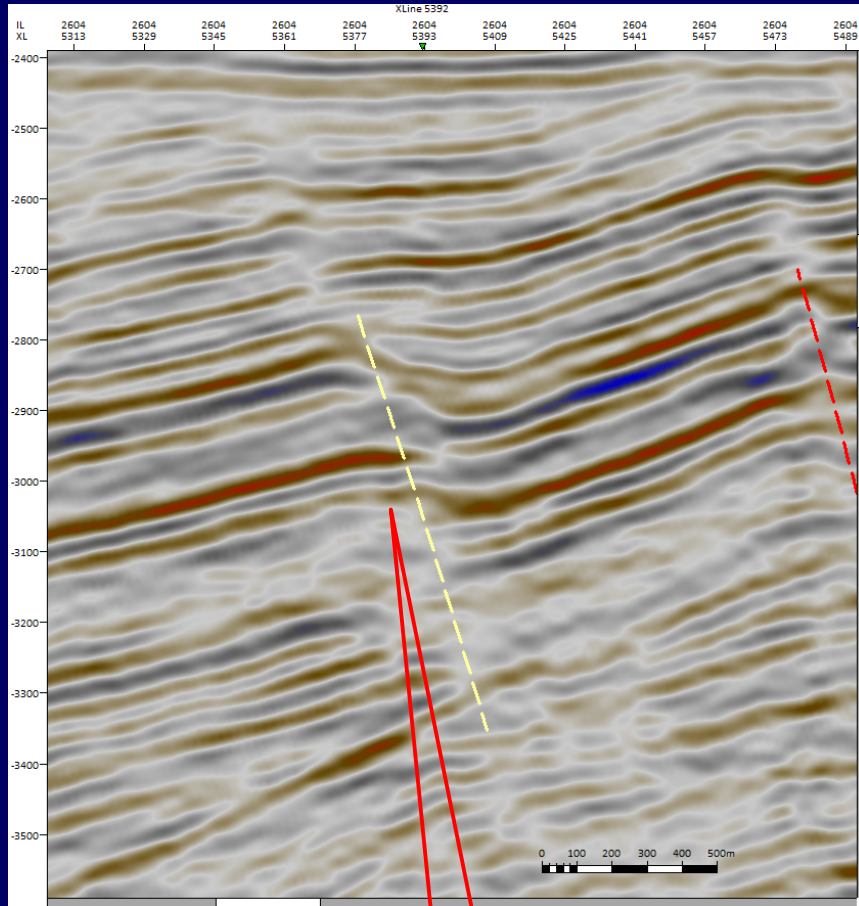**Standard Migration**

**Diffraction Image**

+ *interpretation*
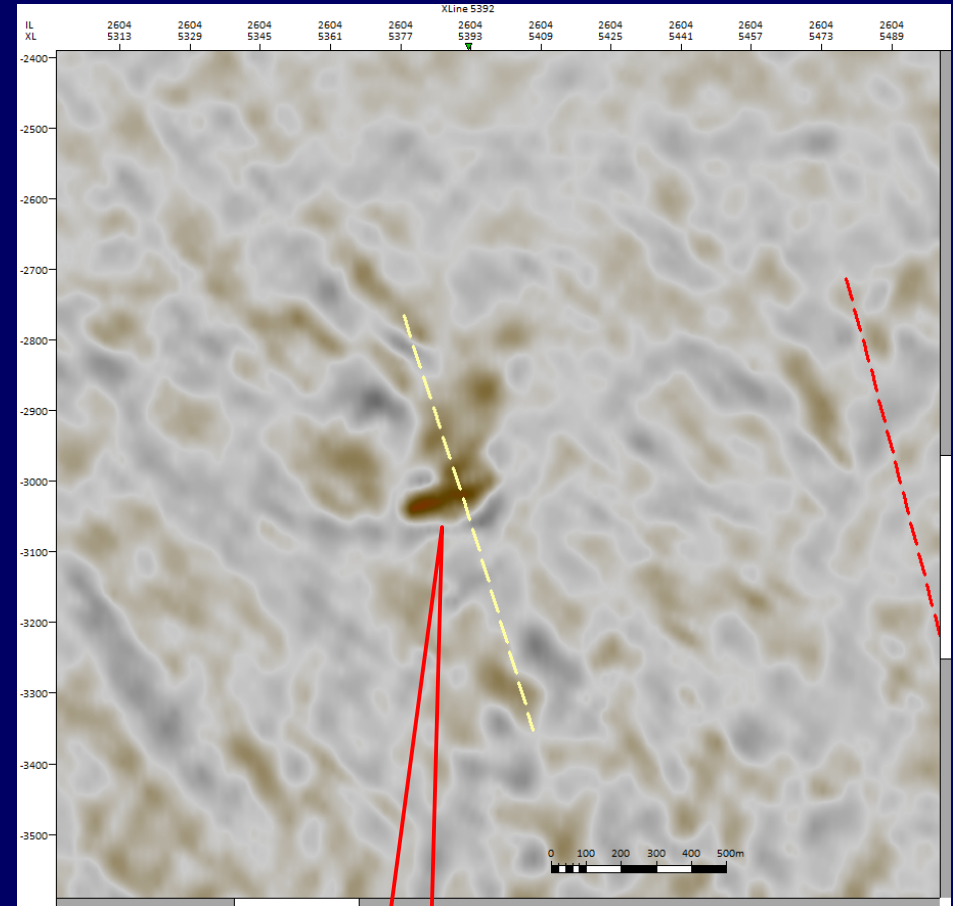→ Fault too steep?

**Q16-Maas Field
Bunter Reservoir**

IL 2690

# Diffraction Imaging - Q16/North Sea
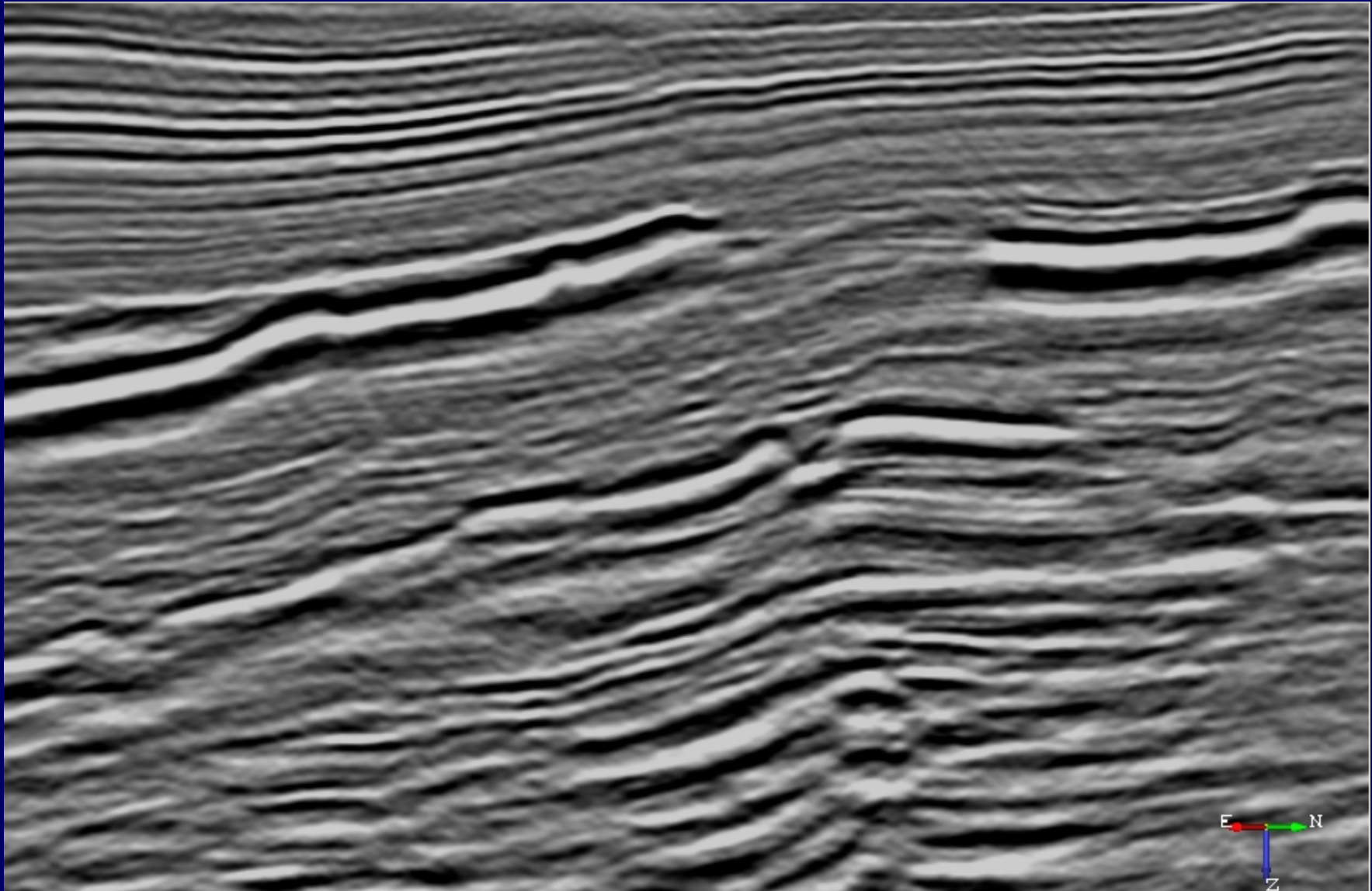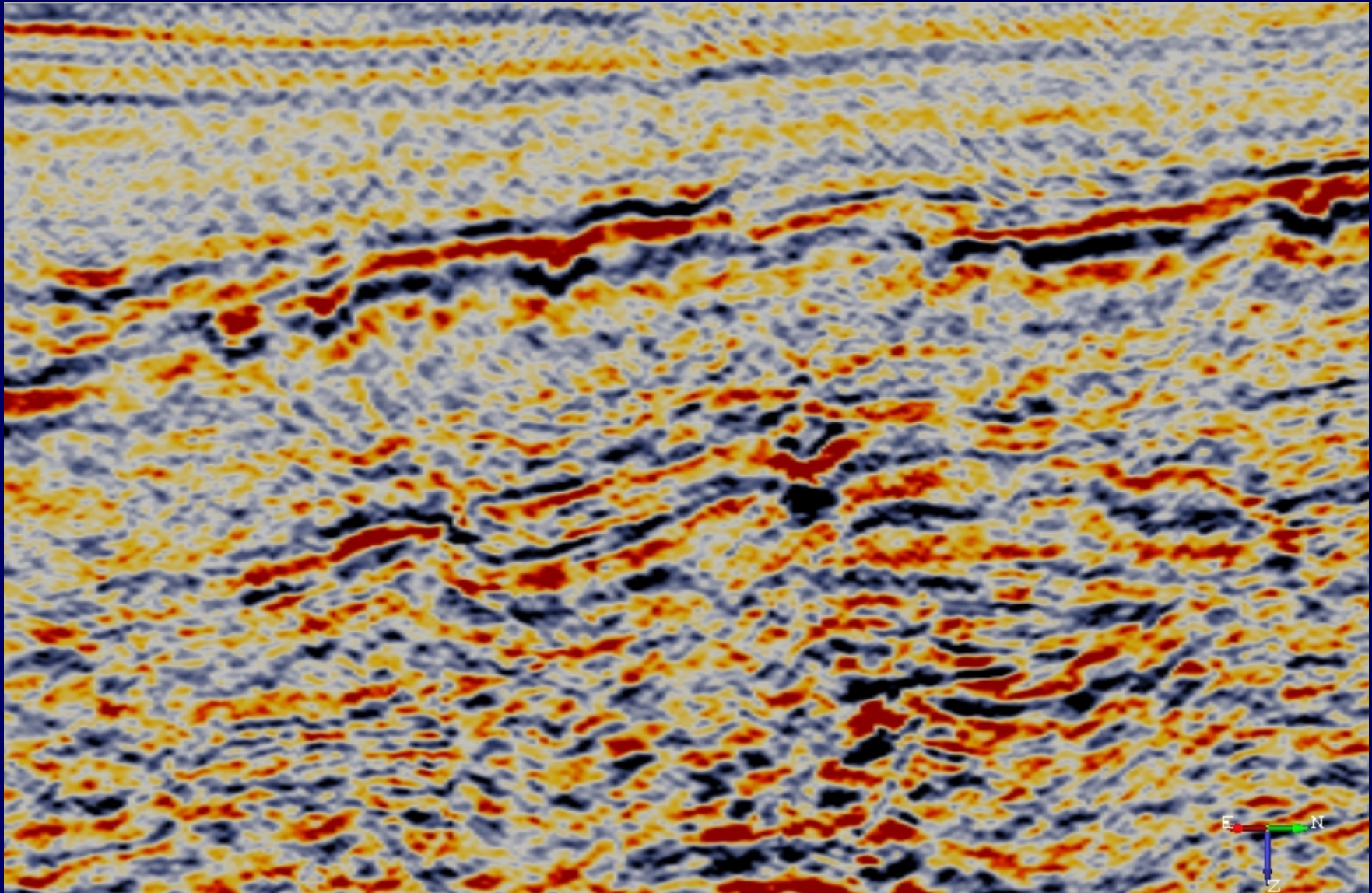
**Standard Migration**

**Diffraction Image**



??

!!

**Flat spot**

IL 2604

# Diffraction Imaging - North Sea



Standard migration

# Diffraction Imaging - North Sea



Diffraction imaging

See you at the poster!