Stacking velocity analysis with CRS Stack attributes

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Overview

- Development of the CRS Stack

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- How does the CRS Stack work ?

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- Conclusions

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for data-driven stacking

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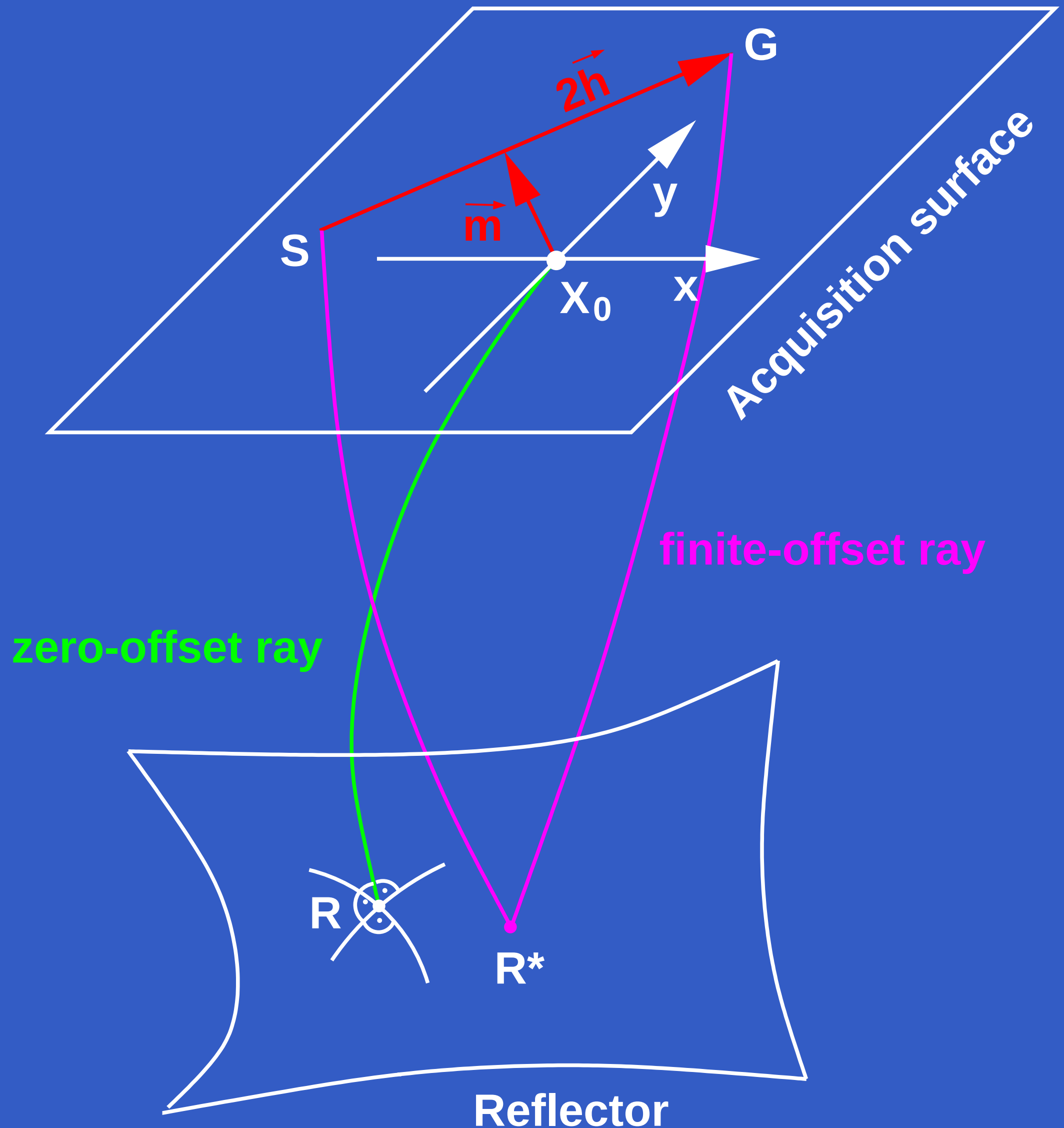
13 parameters

Arbitrary acquisition configuration

$$\vec{h} = \frac{1}{2}\begin{pmatrix} x_G - x_S \\ y_G - y_S \end{pmatrix}$$

$$\vec{m} = \frac{1}{2}\begin{pmatrix} x_G + x_S \\ y_G + y_S \end{pmatrix}$$



CRS stacking operators for ZO

3-D case:

$$t_{hyp}^2 = \left(t_0 - \vec{\mathbf{c}} \cdot \vec{\mathbf{m}}\right)^2 + \left(\vec{\mathbf{m}}^{\mathbf{T}} \underline{\mathbf{A}}\, \vec{\mathbf{m}} + \vec{\mathbf{h}}^{\mathbf{T}} \underline{\mathbf{B}}\, \vec{\mathbf{h}}\right)$$

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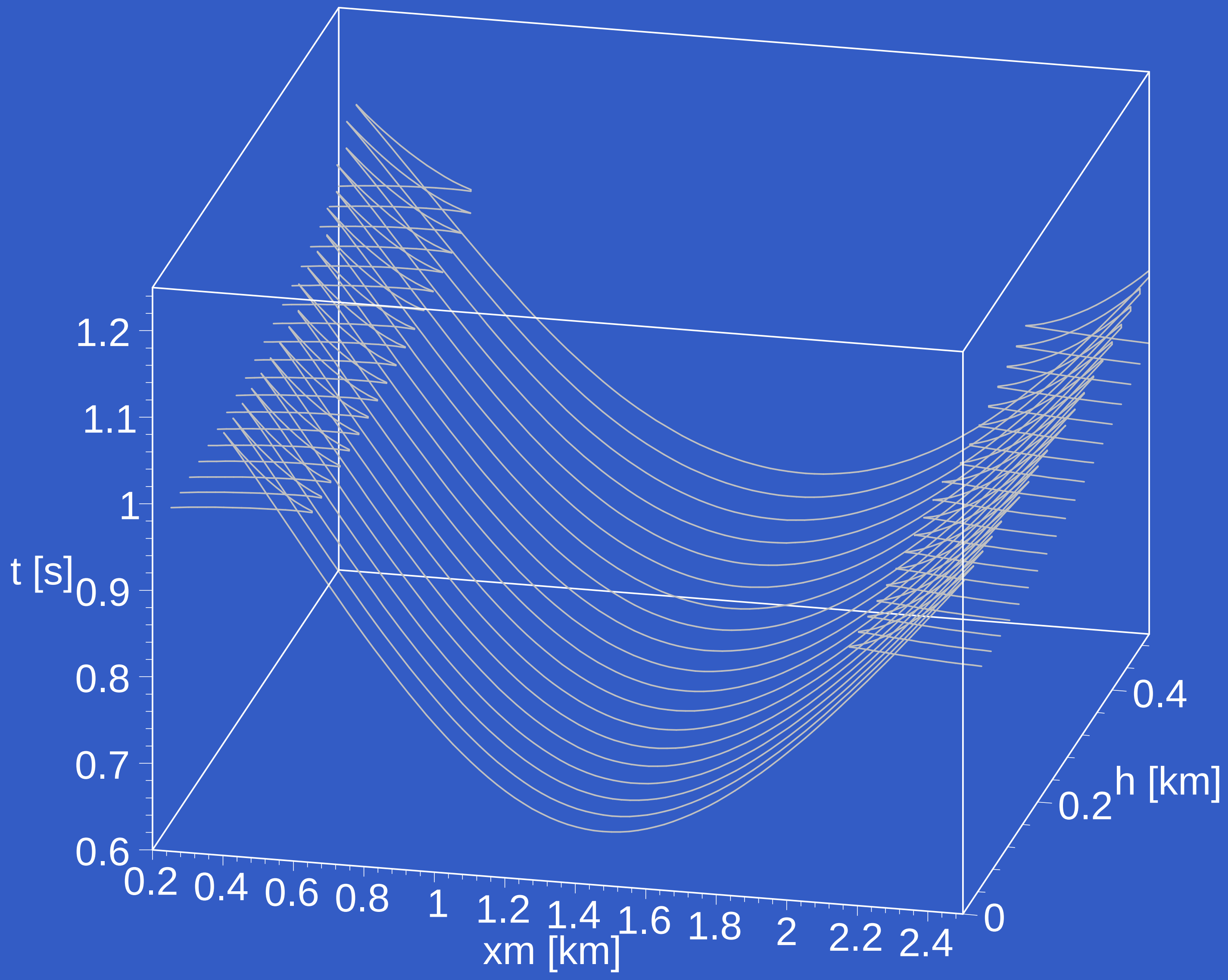
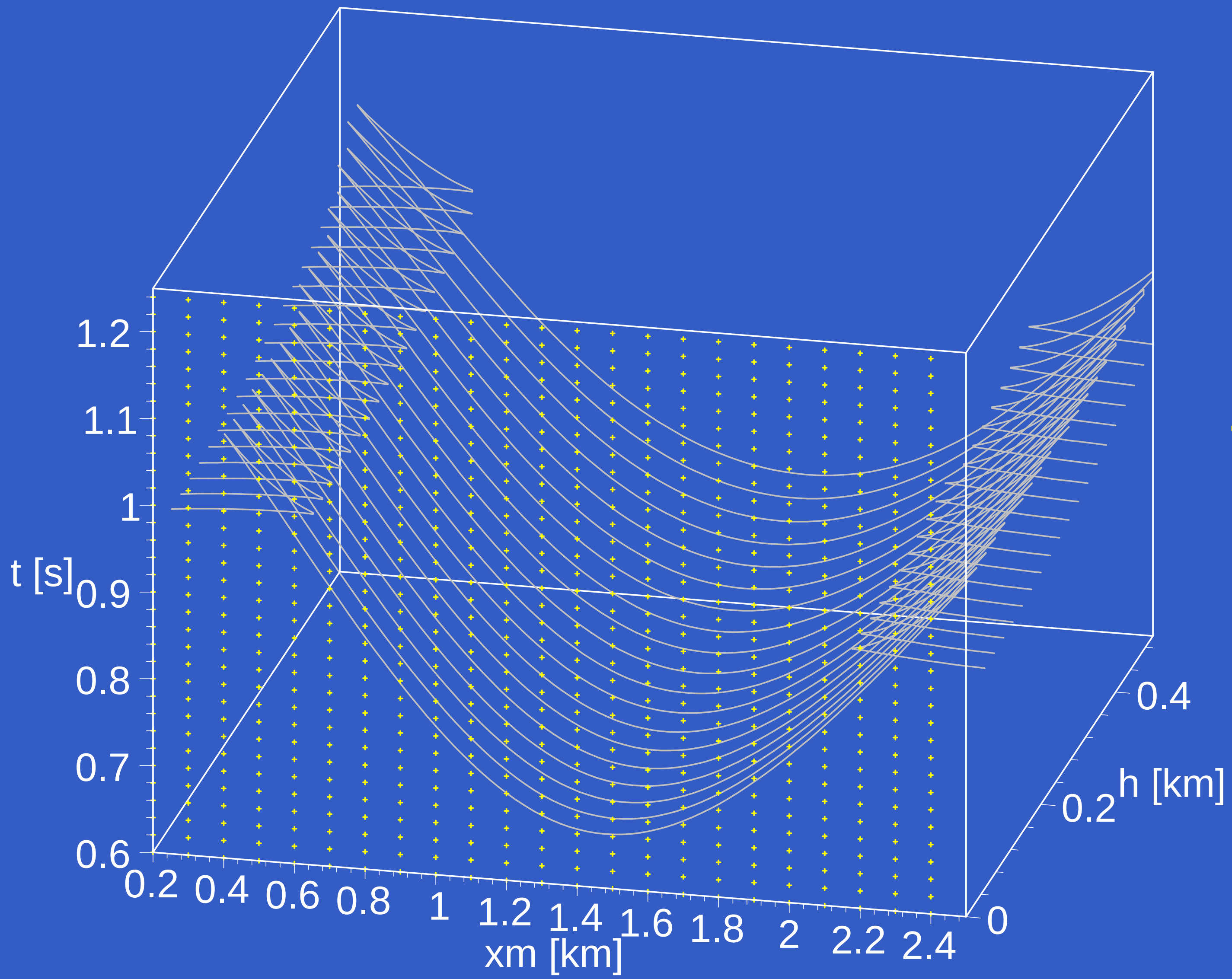
Implementation



Data volume

Implementation



Data volume

ZO grid

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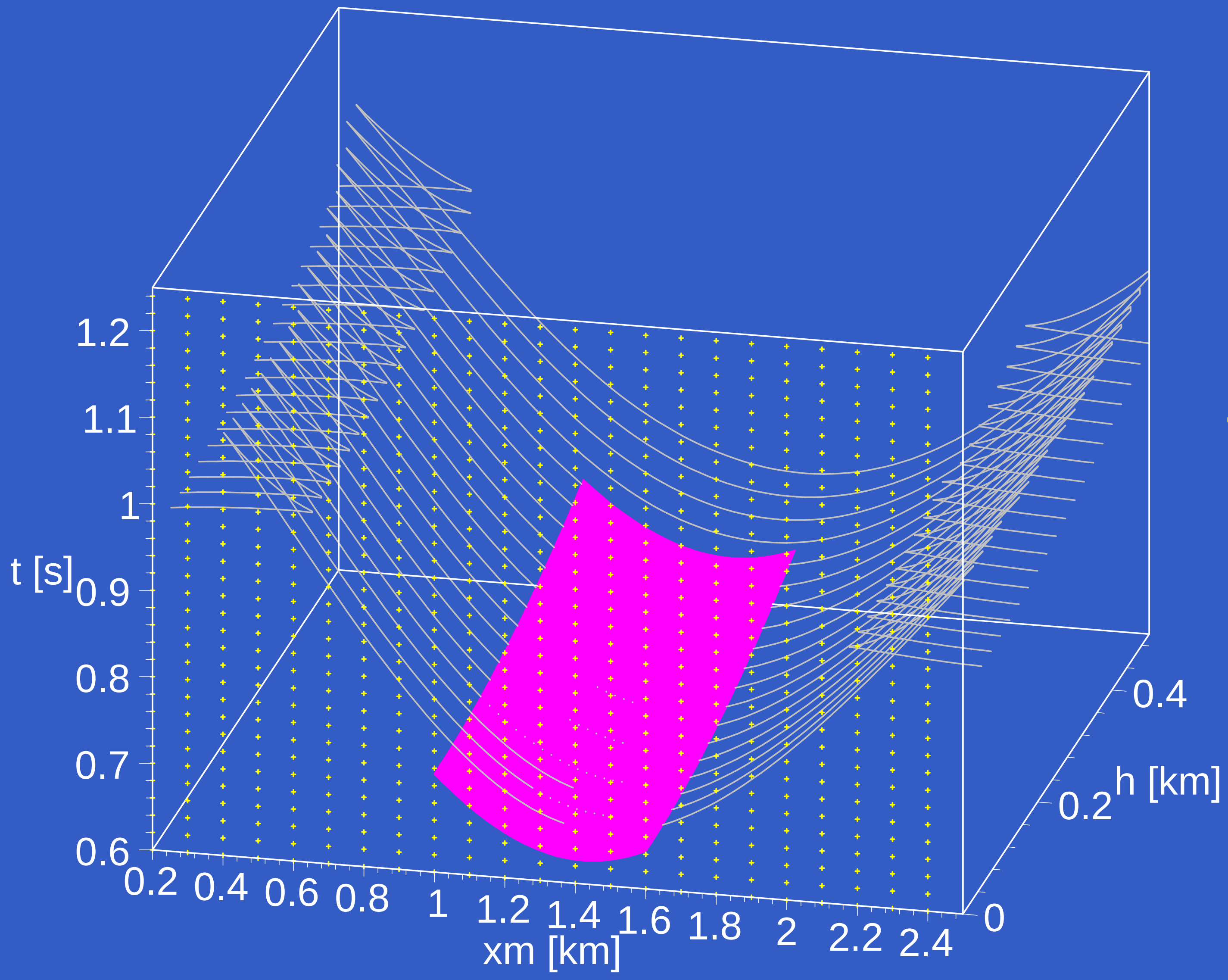

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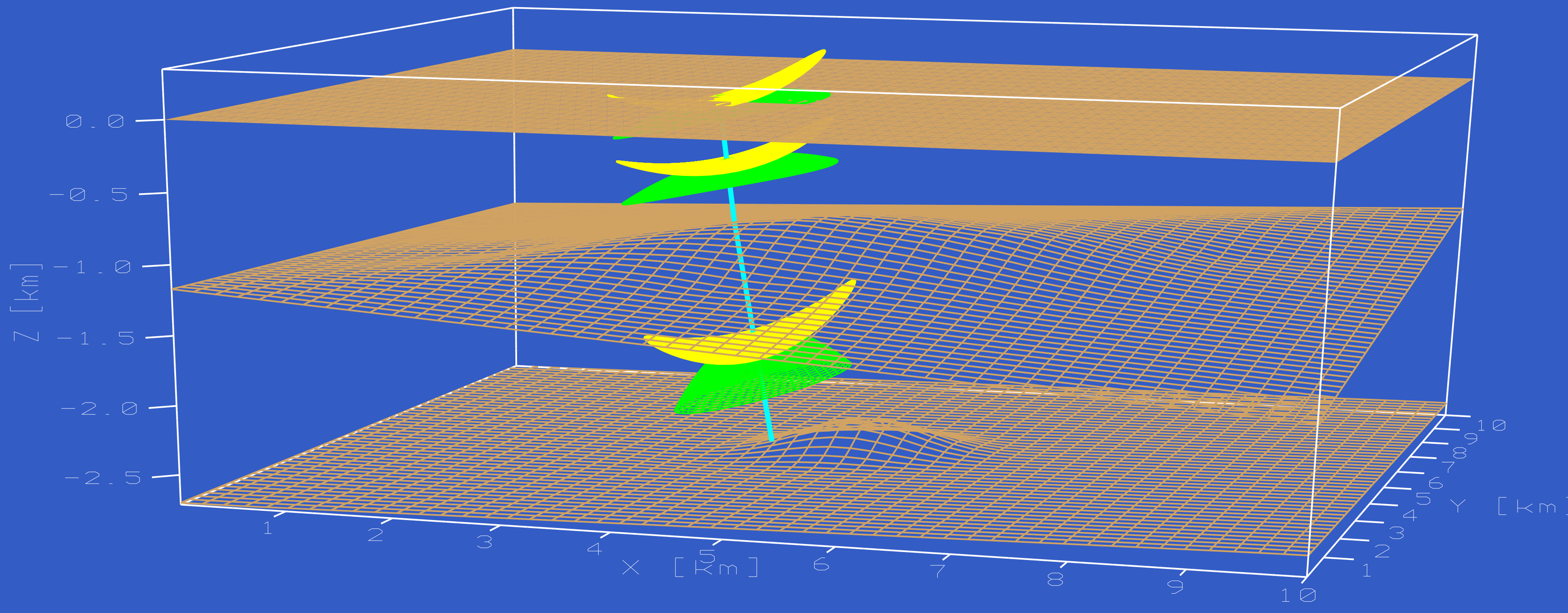
  - coherence value

Attributes

NIP and Normal wave along ZO ray



Attributes

$\longrightarrow$ CRS Stack attributes have many applications

- more accurate stacking velocity

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$$1/v^2_{\text{stack}} = \frac{2\,t_0}{v_0}\,\frac{\cos^2\alpha}{R_{\text{NIP}}}$$

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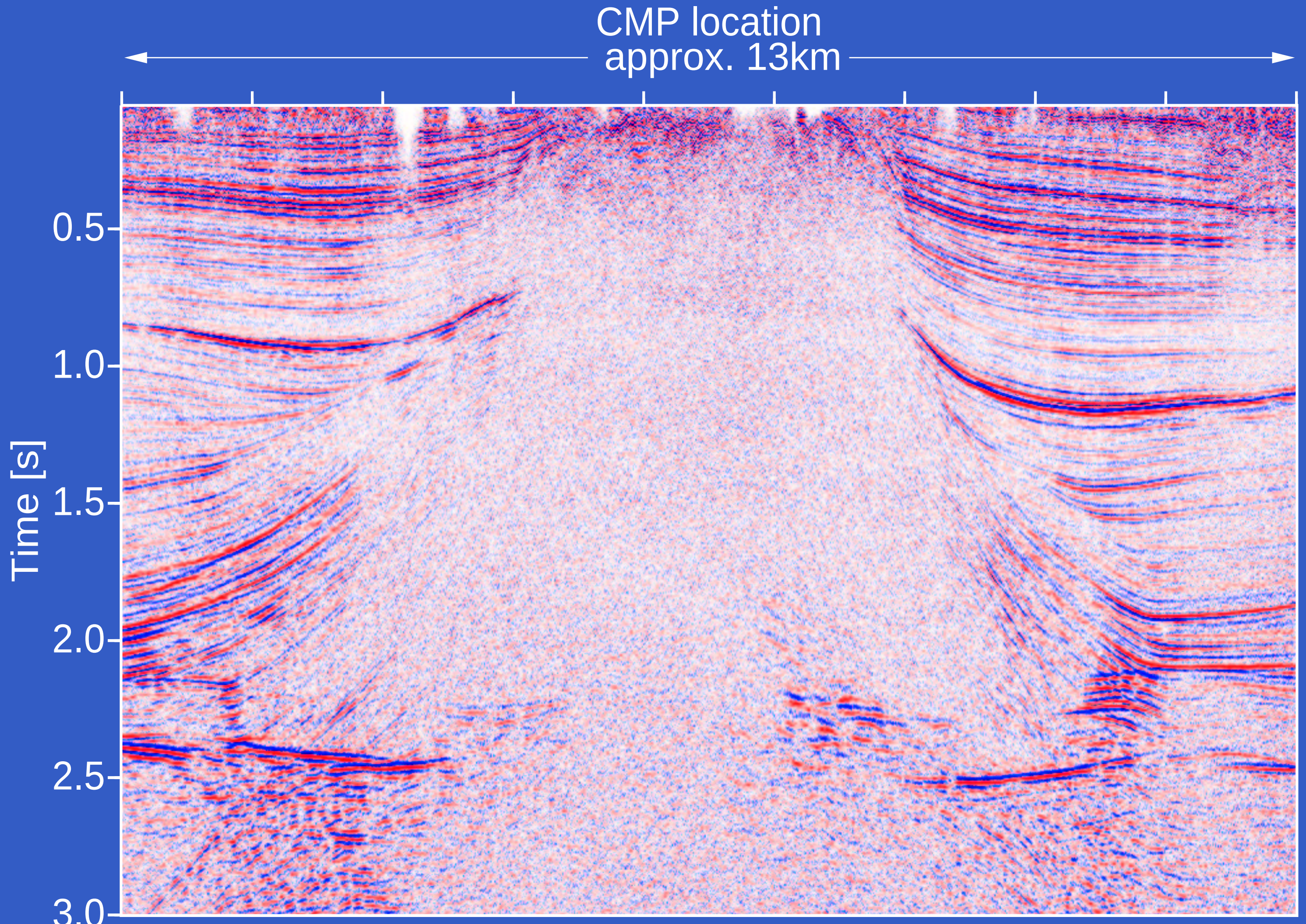
- attribute and coherence sections help to identify events

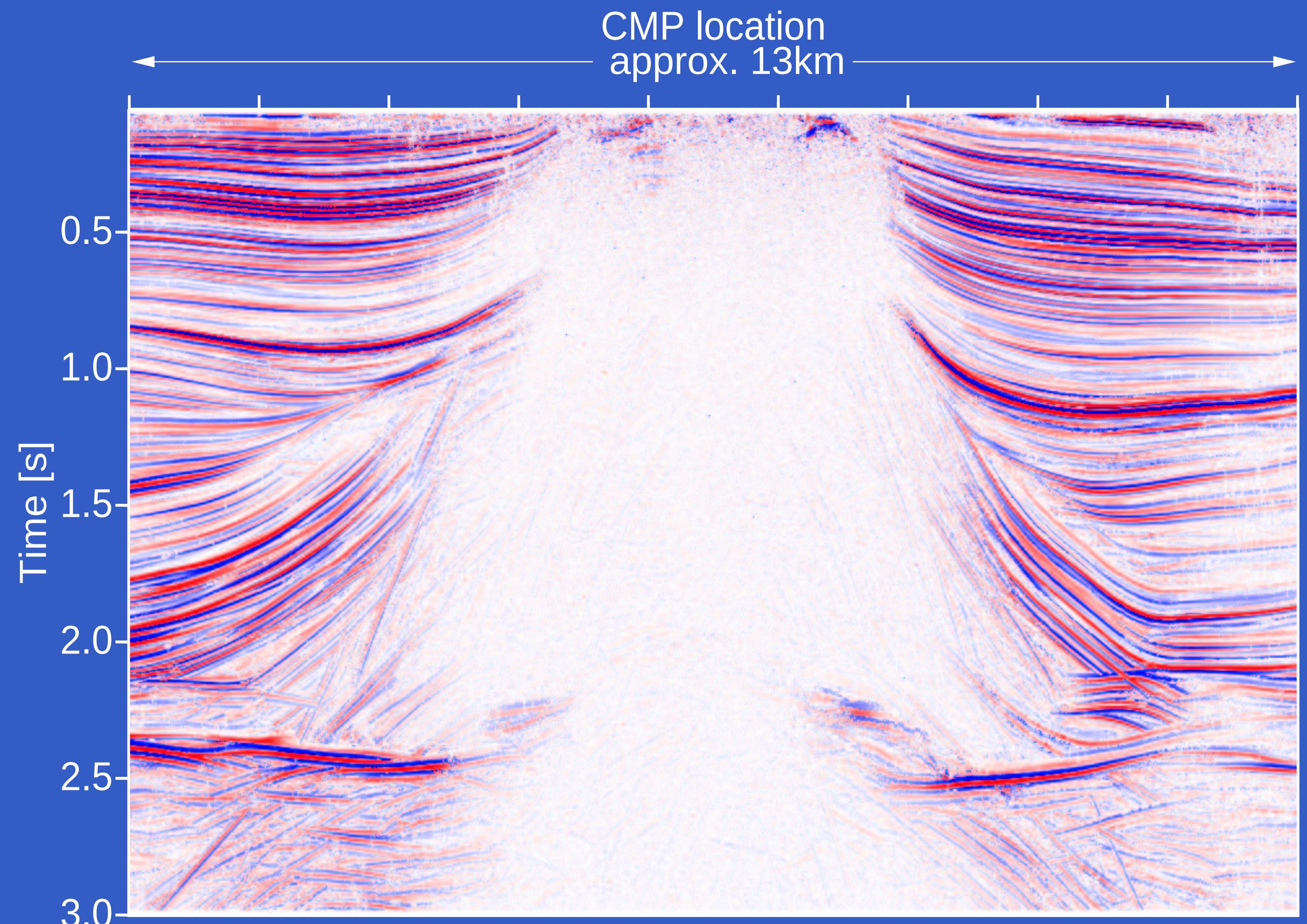
Real data example

Result of NMO/DMO/Stack



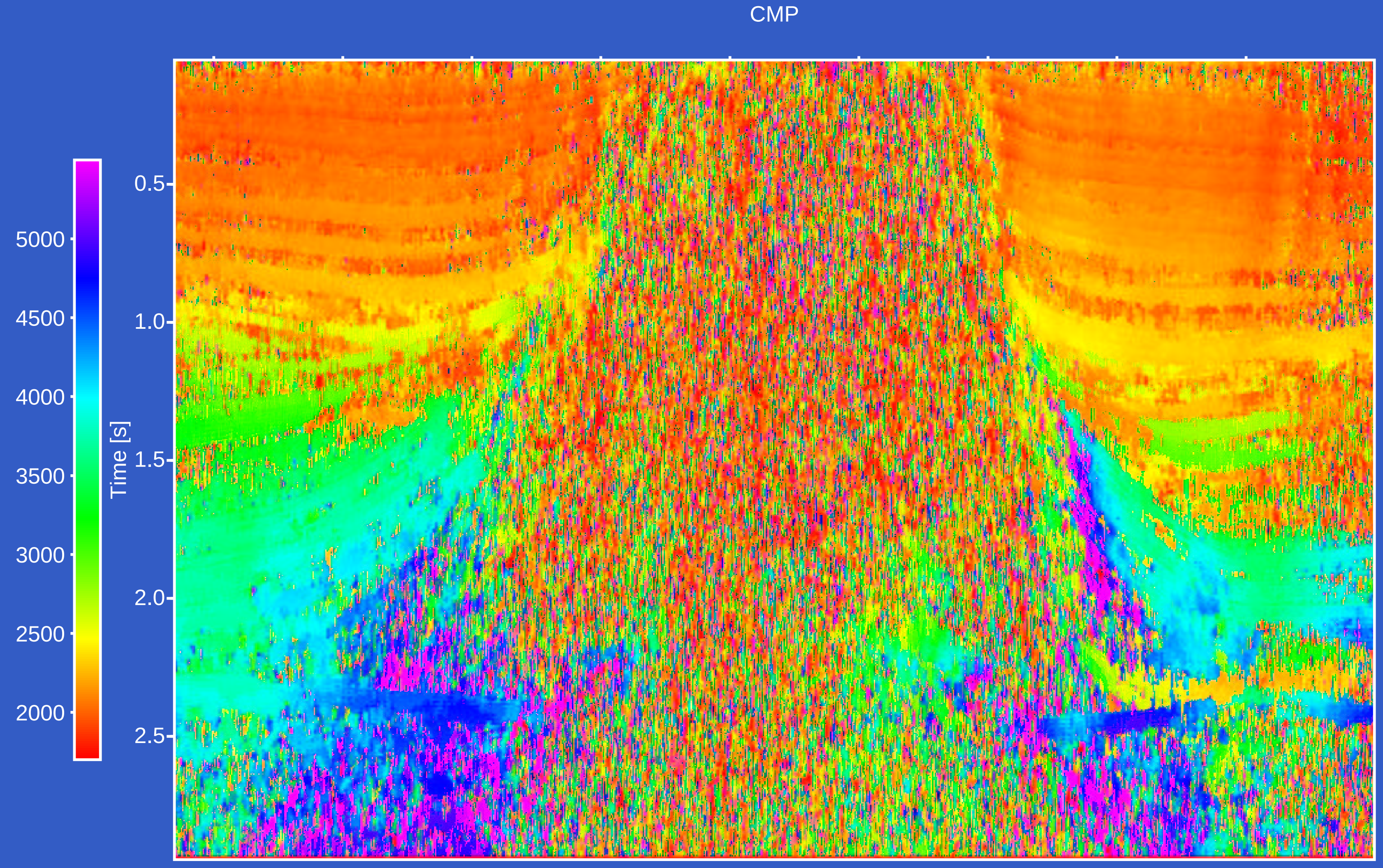
Real data example

Result of CRS Stack



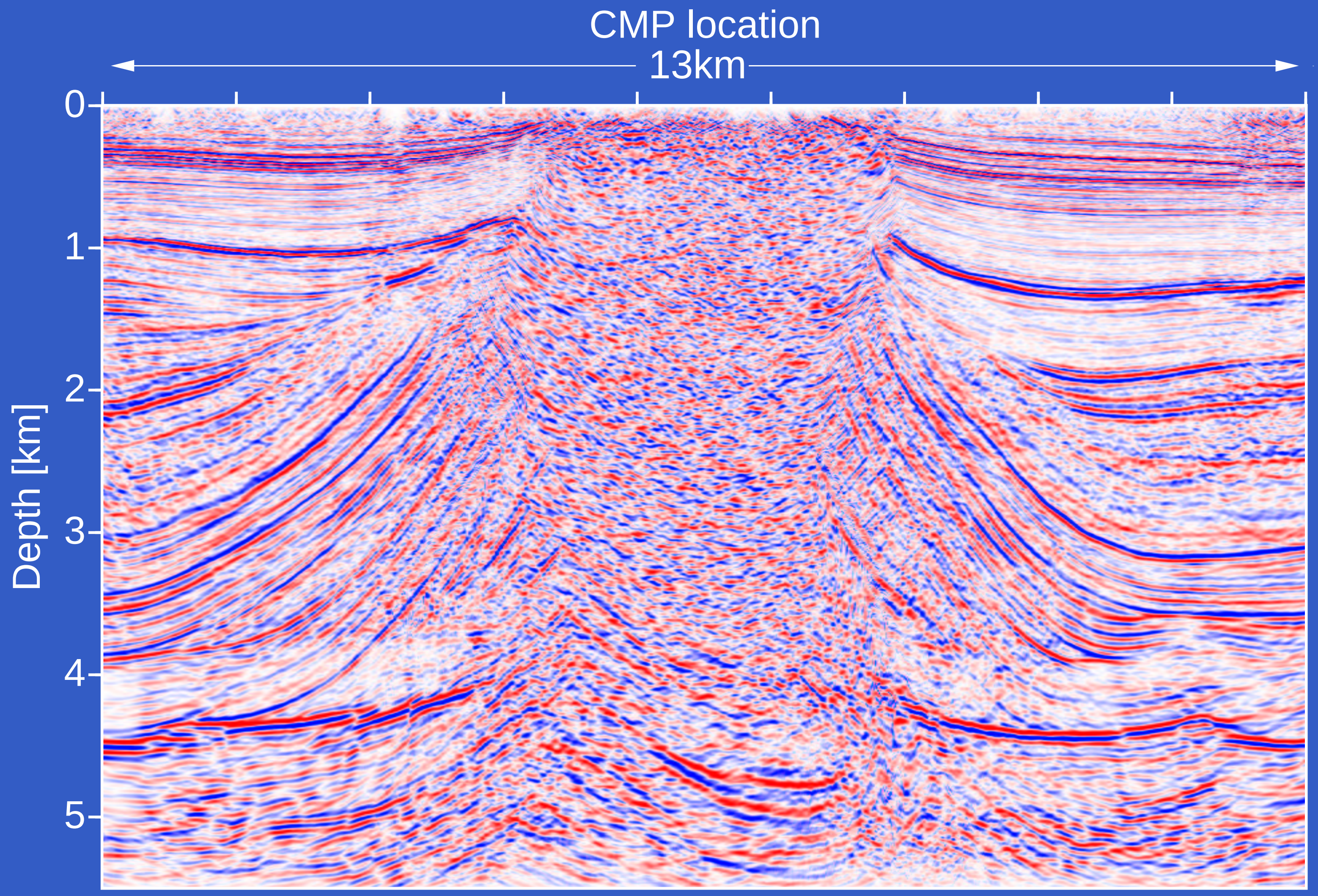
Real data example

Detected stacking velocity in [m/s]

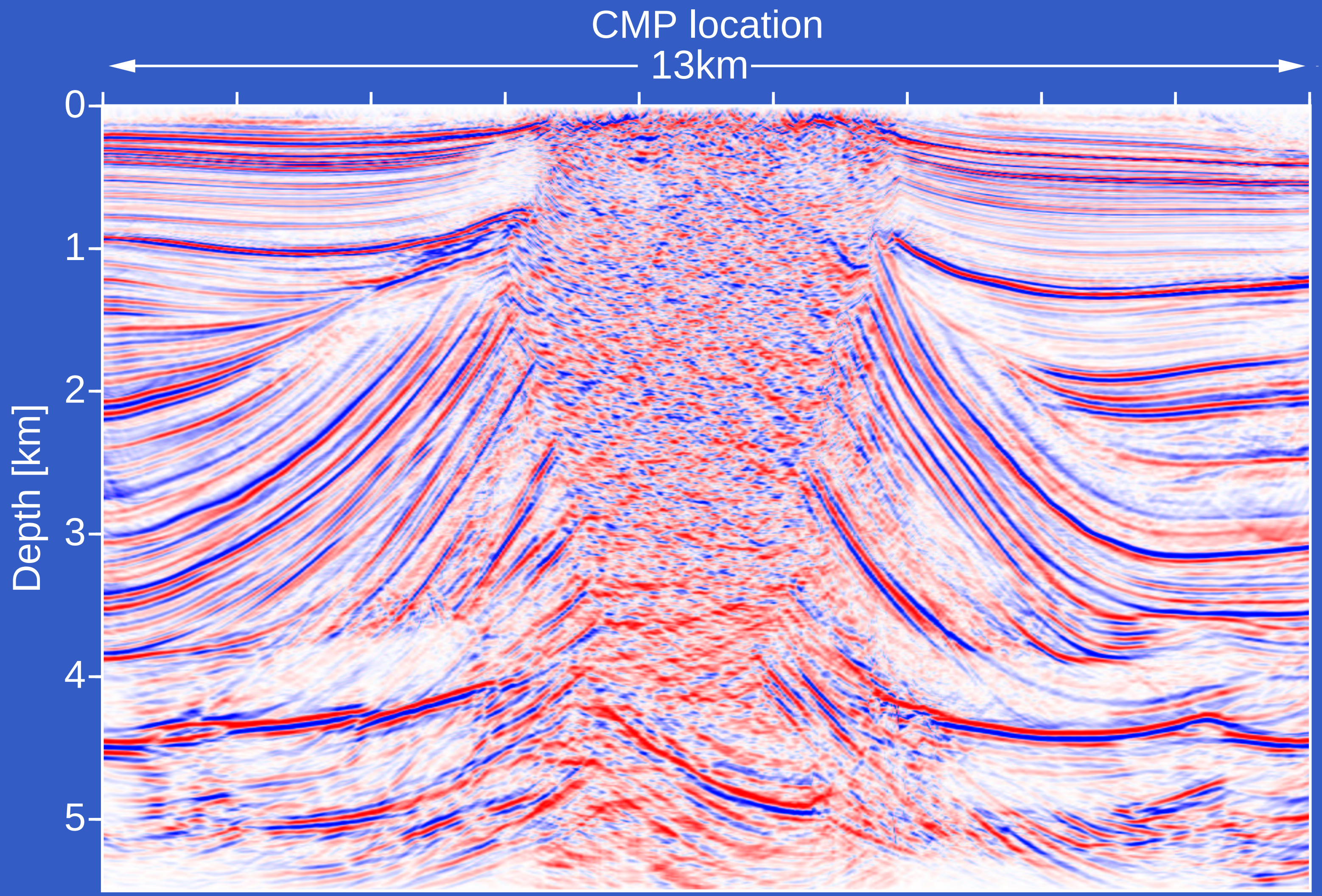


Real data example

Depth migration of NMO/DMO/Stack

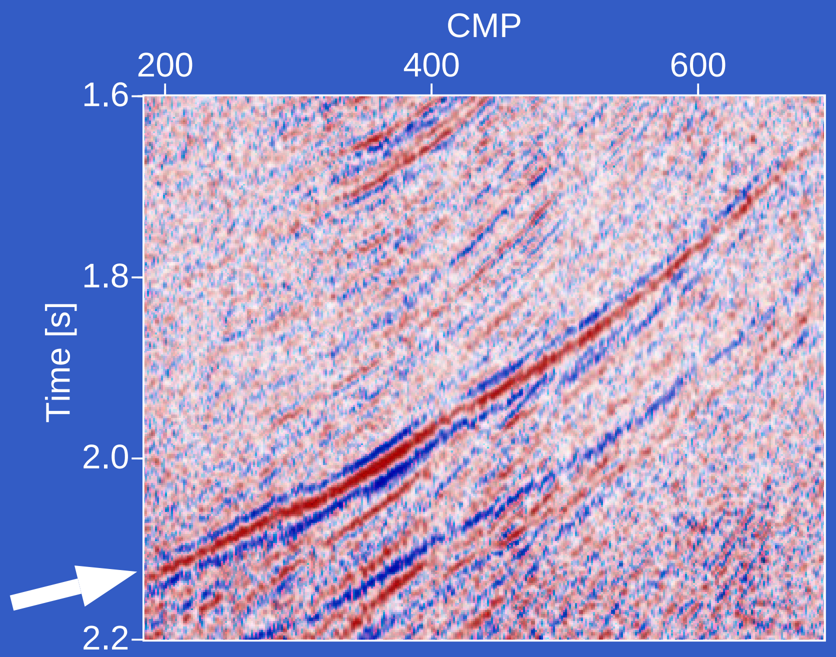


Depth migration of CRS stack

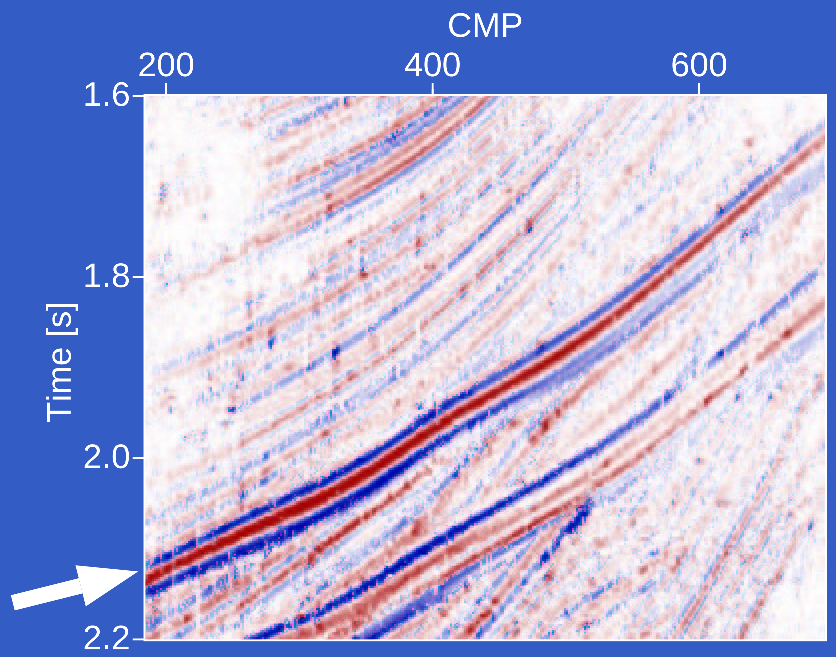


Real data example

Applications of the attributes



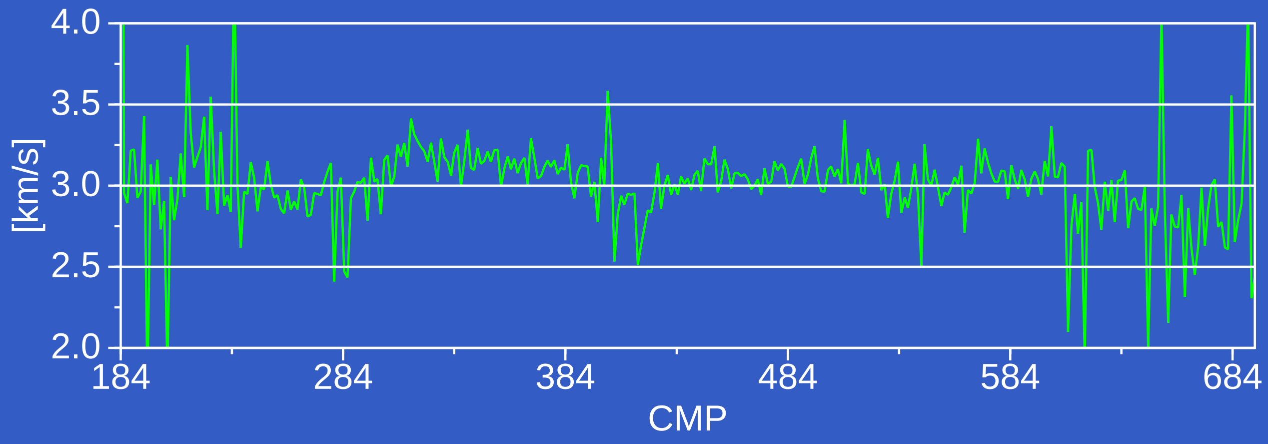
CMP section



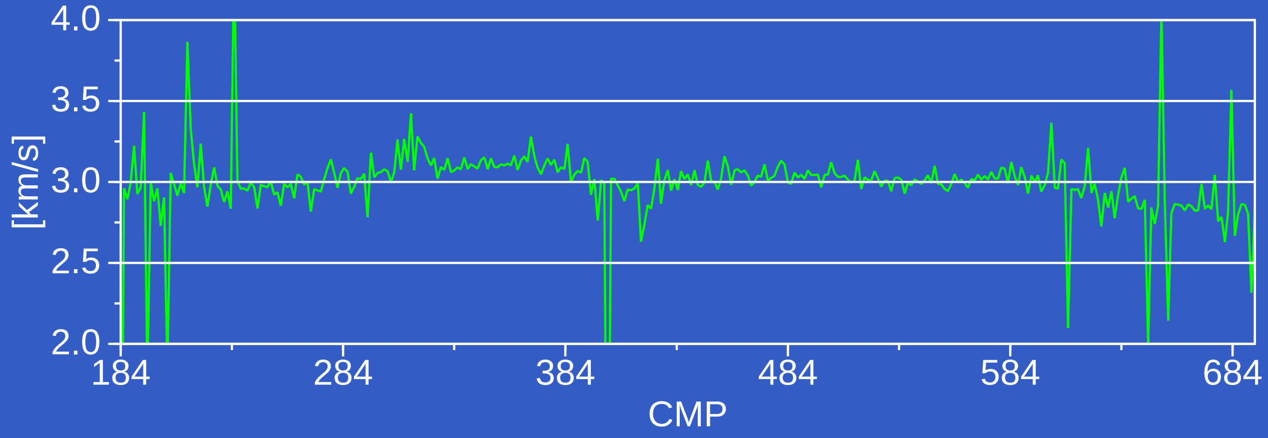
CRS section

Real data example

CMP stacking velocity



CRS stacking velocity



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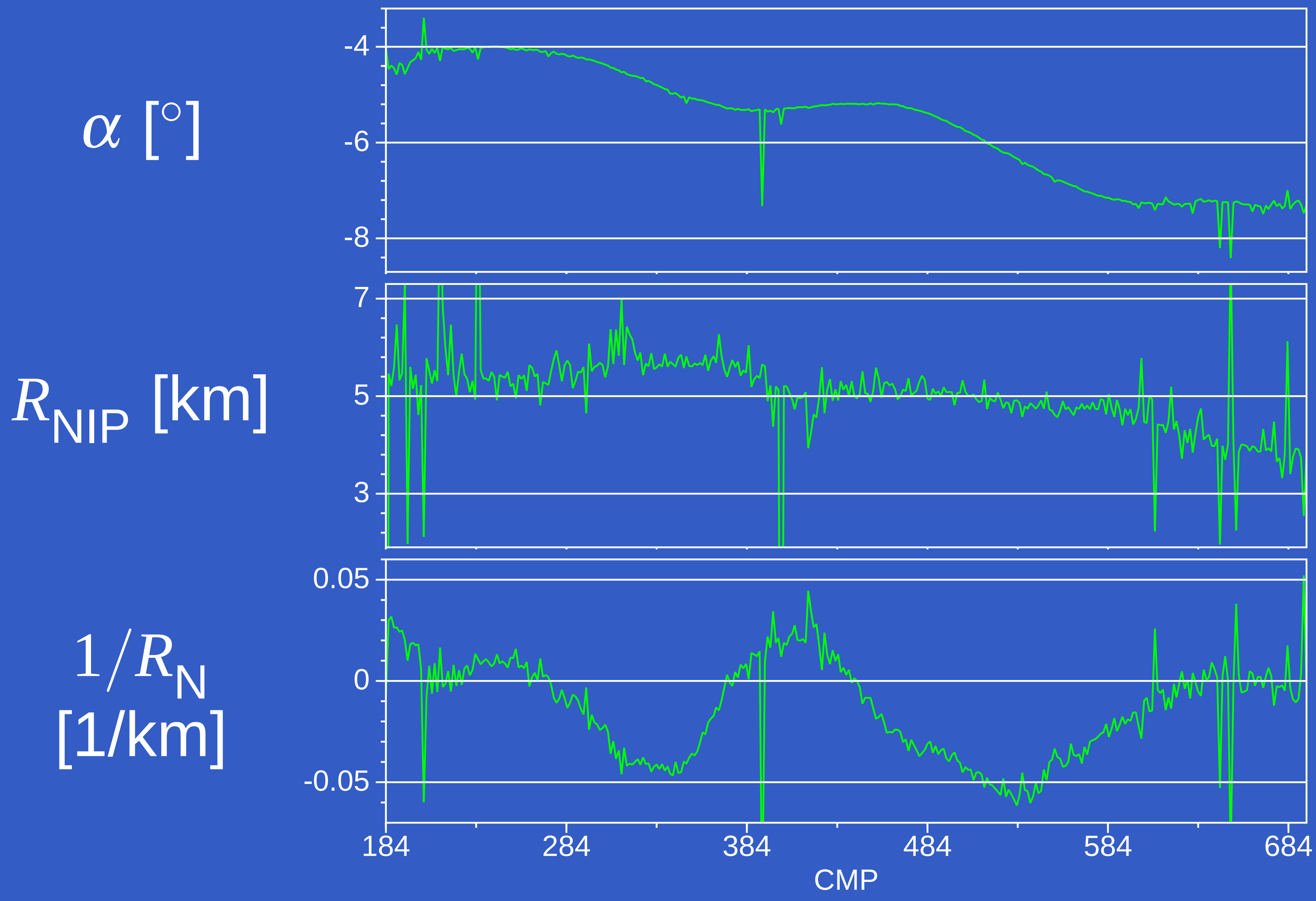
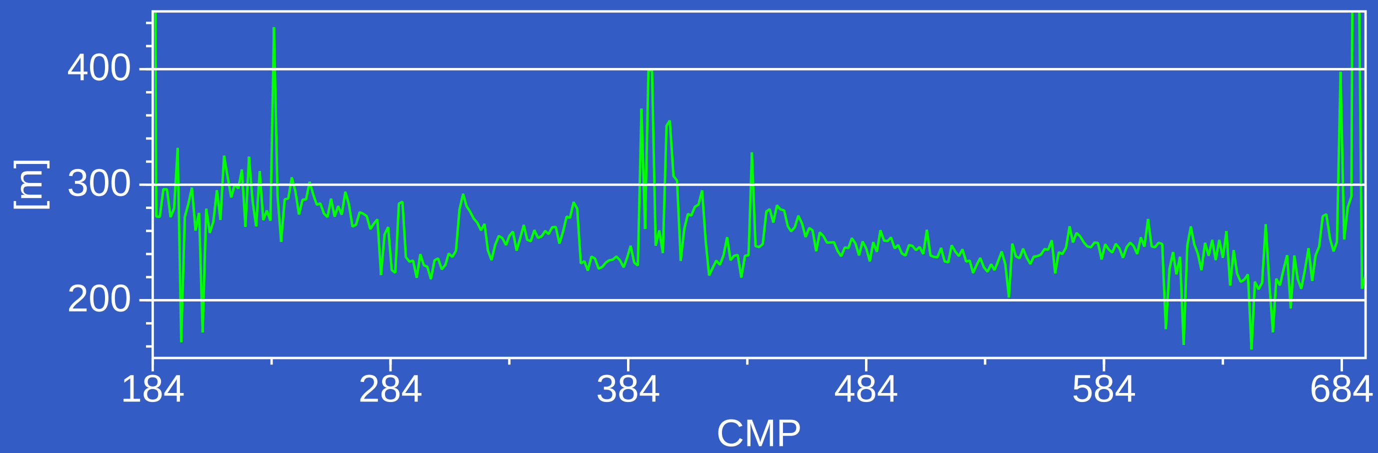
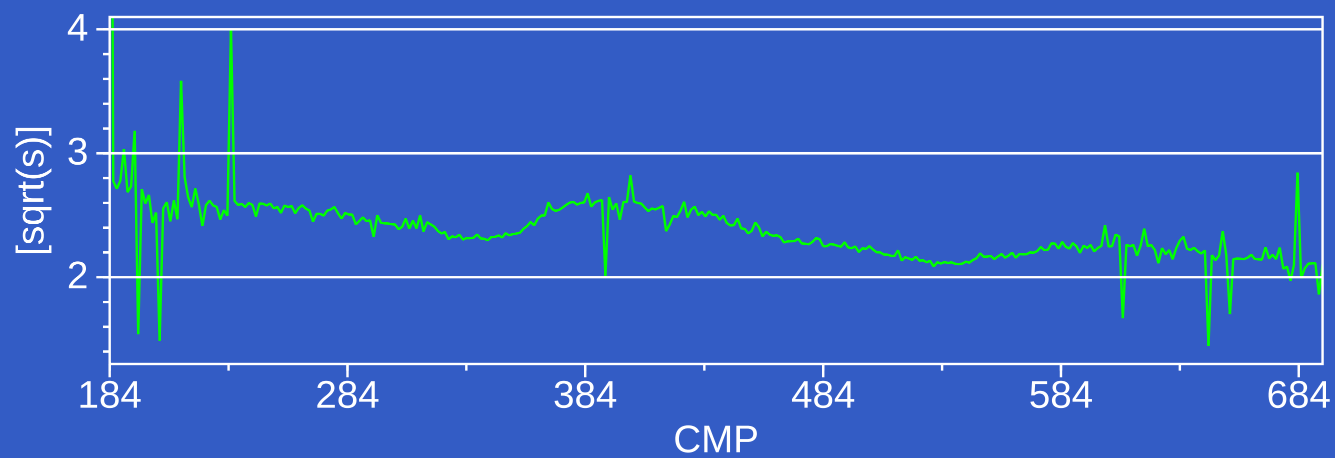


Real data example

Projected Fresnel zone



Normalized in-plane geometrical spreading



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CRS Stack makes velocity analysis more reliable

Acknowledgments

This work was supported by the sponsors of the *Wave Inversion Technology Consortium.*

Related presentations:

B015	3D zero-offset Common Reflection Surface Stack for land data – real data example
B016	Improved resolution in time and depth processing by macromodel independent CRS Stacking
E023	Generalization of the Common-Reflection-Surface Stack
P165	Topographic correction using CRS parameters
P166	2D and 3D ZO CRS stack for a complex top-surface topogr aphy
P167	A fourth-order CRS moveout for reflection and diffraction events