Enhanced Coherency Processing (ECP) – imaging for low signal seismic in complex tectonics

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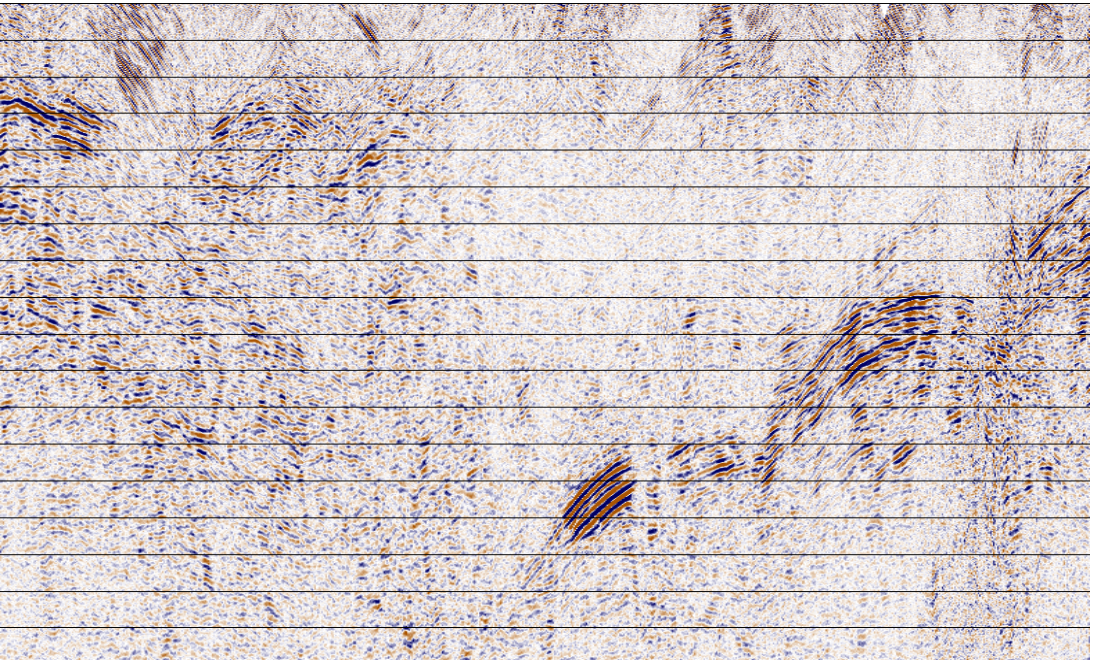
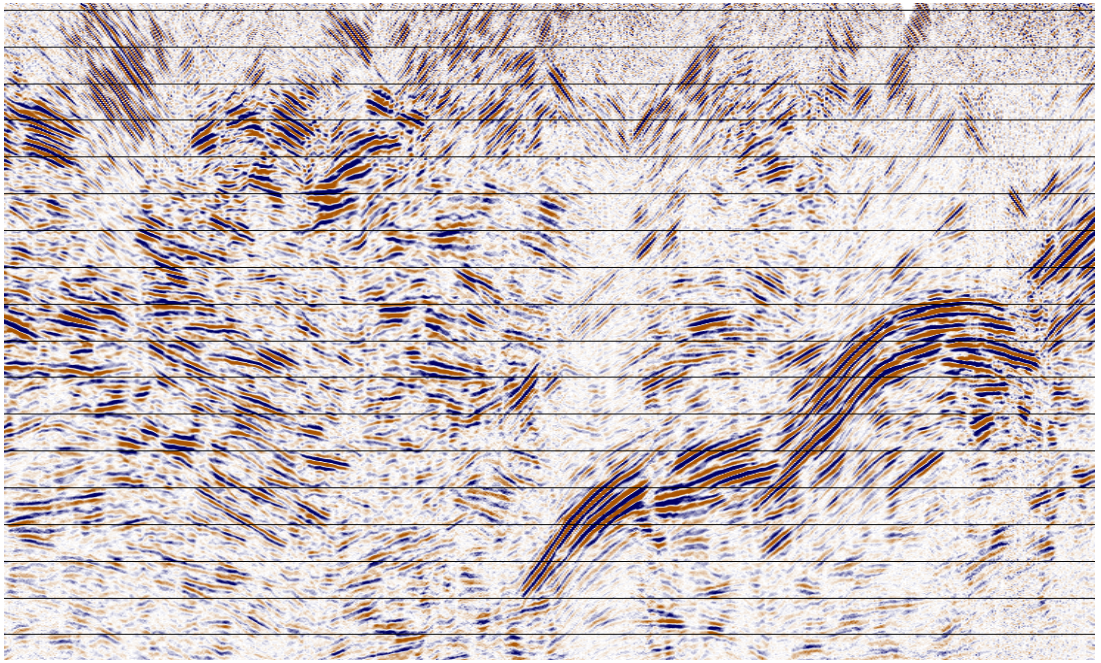
Introduction – Generalized Stacking

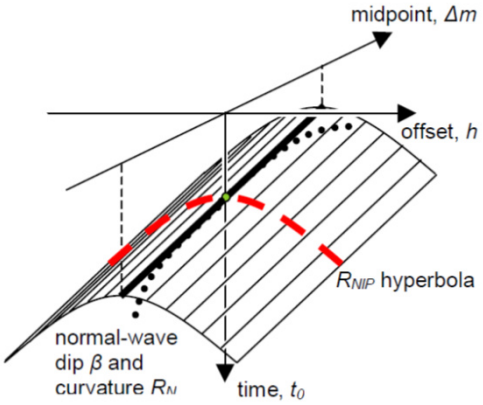




Classical CMP stacking fails when complicated tectonics makes seismic wavefronts complex, even multivalues.

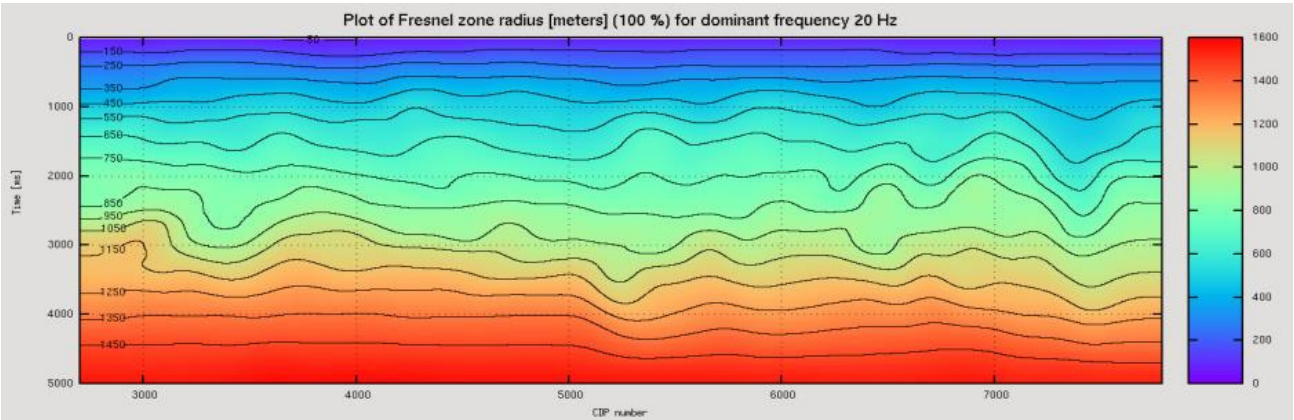
Introduction – multiattribute model

Multi-attribute model instead of one parameter (stacking velocity) stacking drives creation of seismic image. The idea is old, and went through series of implementations, but became attractive.



Solution based on Gunther's work, EAGE 2006

Radius of the Fresnel 1st zone is partially rock carachteristic

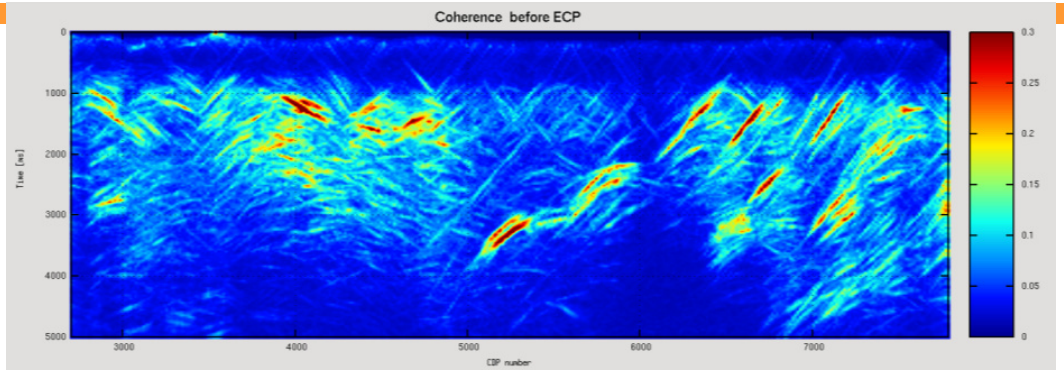


At maximum Fresnel 1st zone limit subvolume of space within which parameters of wavefront are estimated

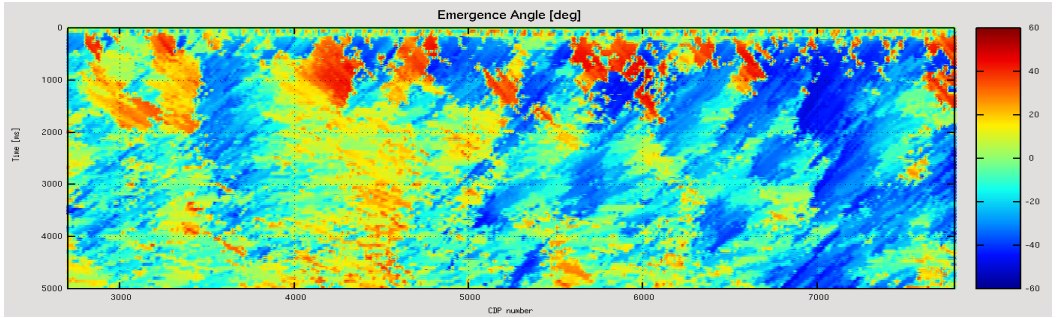
Introduction – multiattribute model

The following 3 attributes characterize waves:

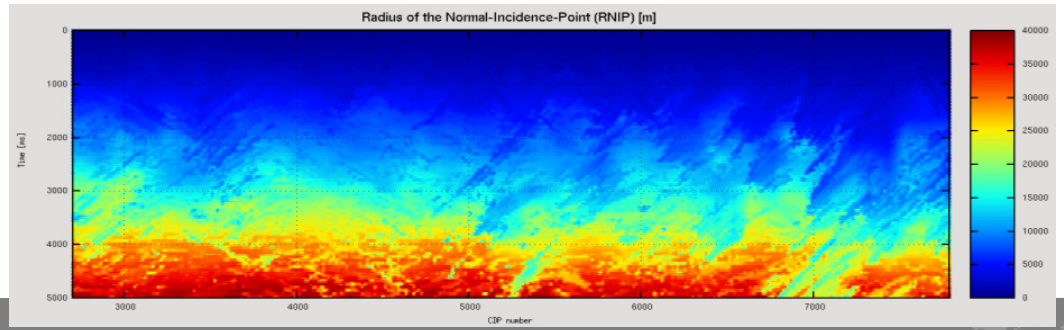
Local coherency of the wavefield



Emergence angle of seismic waves

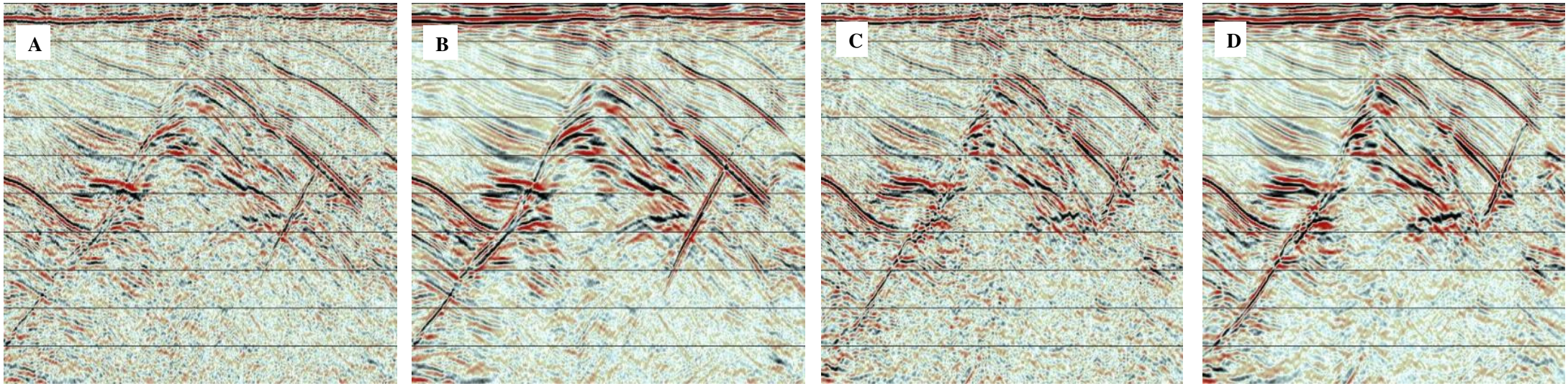


Radius of the local wave front curvature R_{NIP}



In the ECP solution, interactive interpretation is important

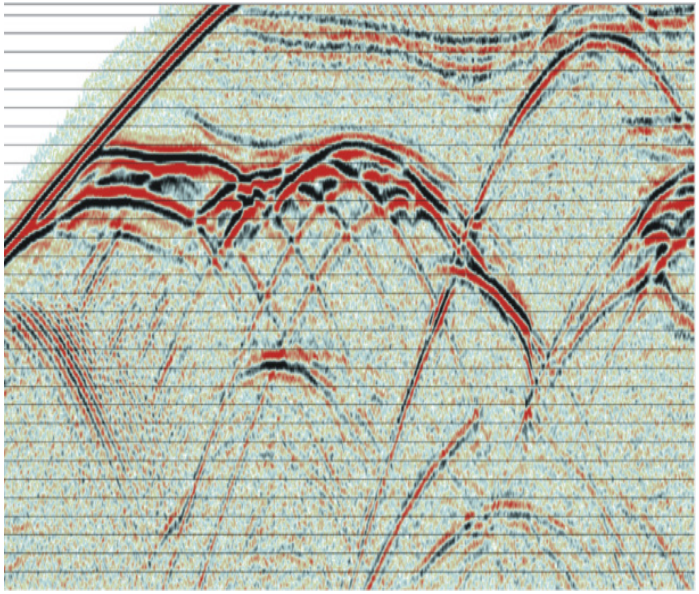
Real data example – ECP enhances, but also filter the data



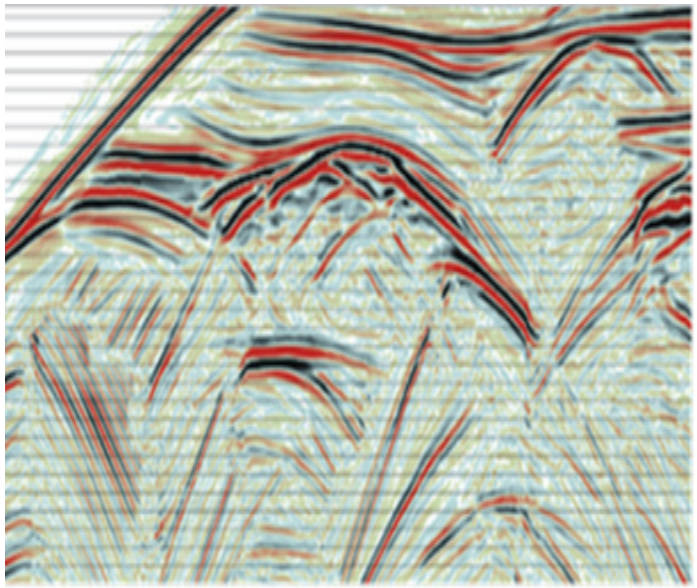
A – stacked section, B – Stack after ECP C – PreSTM, no ECP, D – PreSTM after PECP

Note: stacking velocity model was kept constant for this comparison.

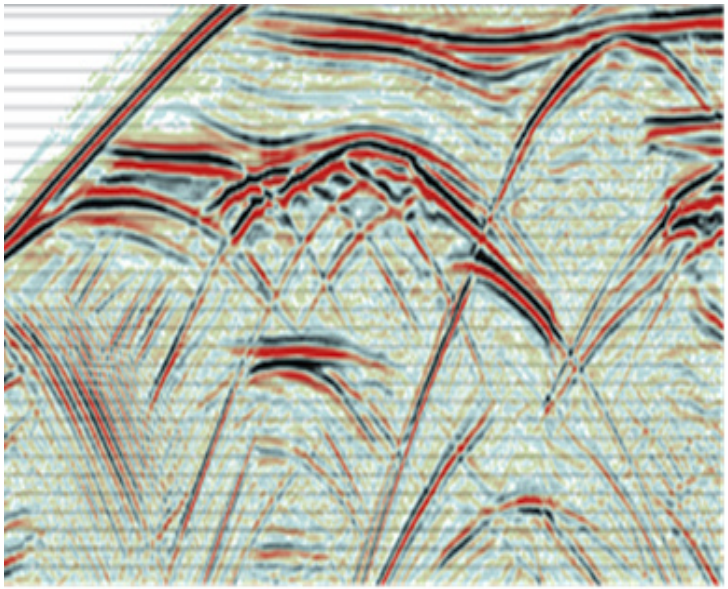
Conflicting dips – exercise on synthetic dataset



NO ECP Stack

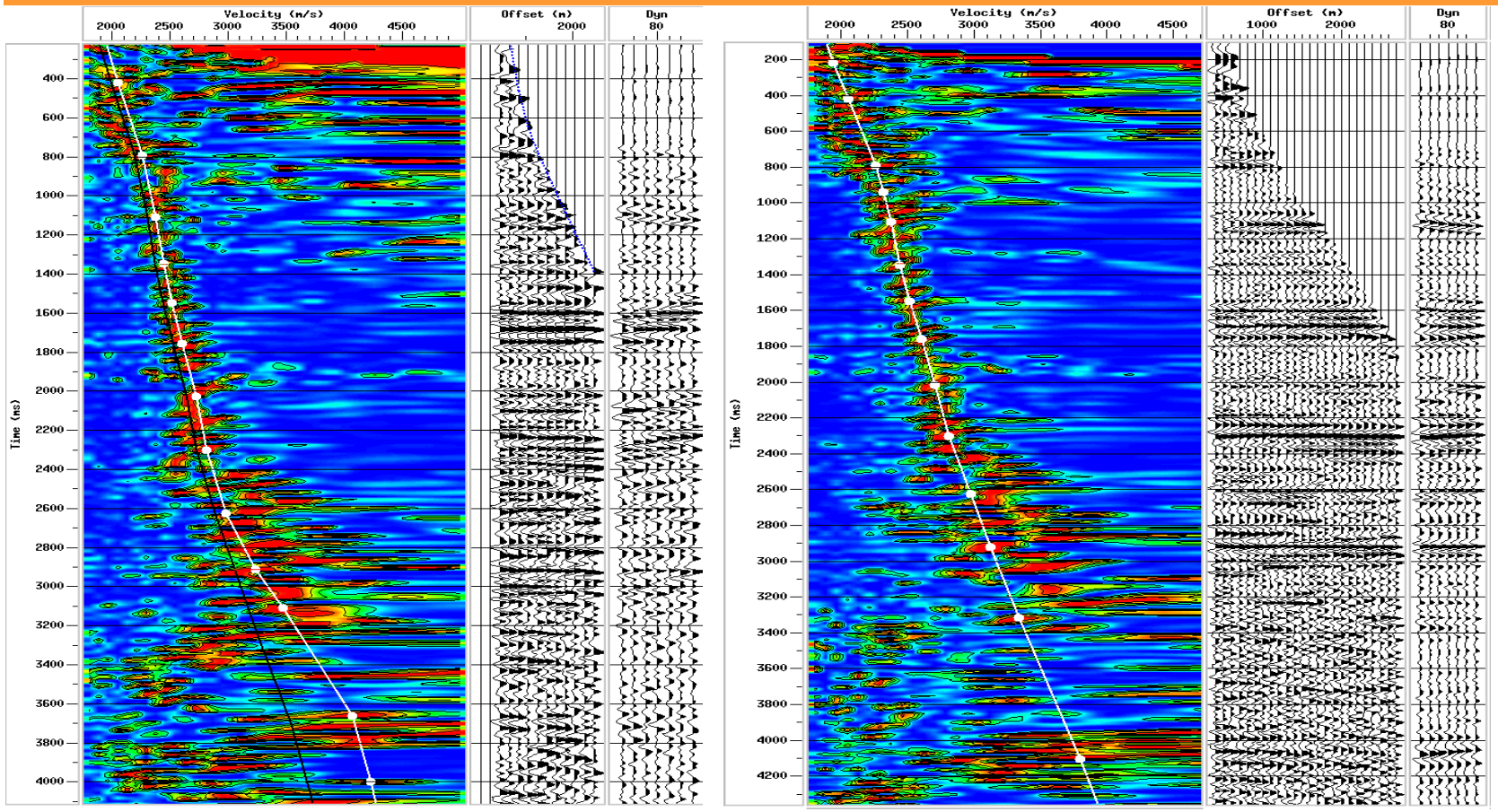


Stack after ECP



PreSTM after ECP

Test on synthetic seismic: 3D shot gather after inverse Q filter



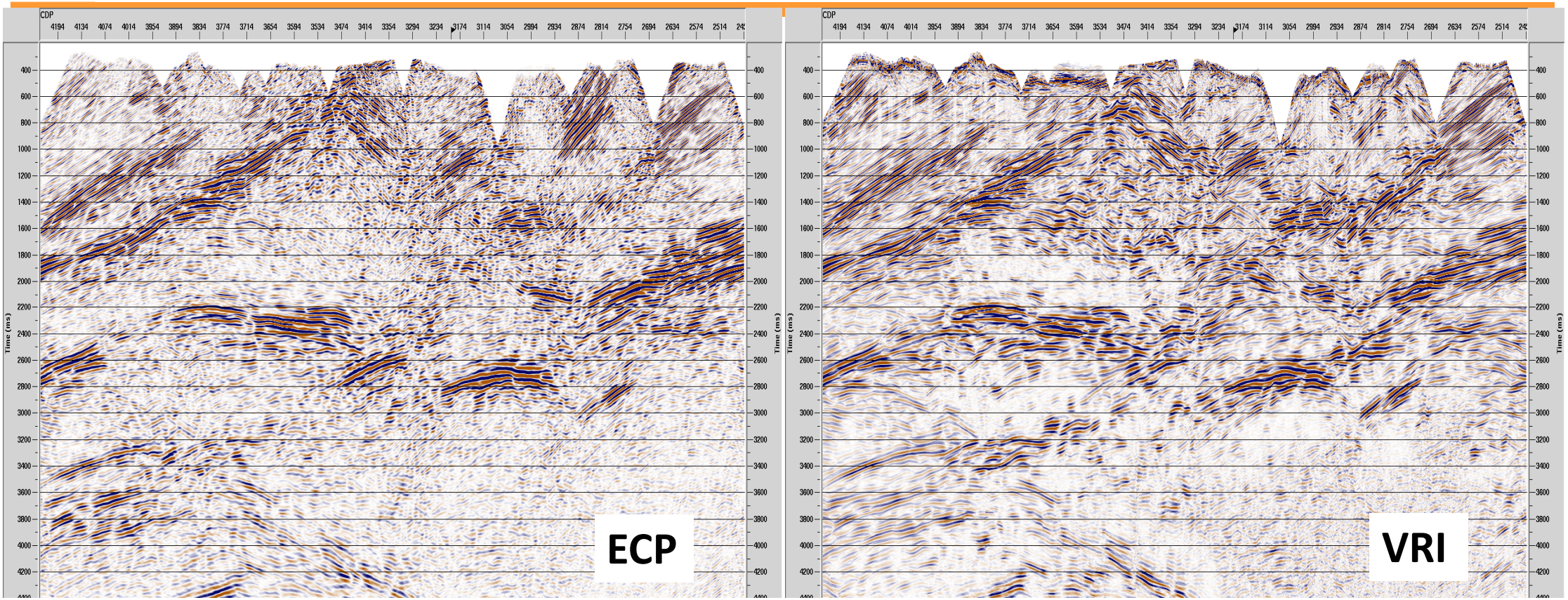
Velocity analysis before and after ECP

ECP can improve performance of different processing modules.

It is not merged into large system, but is used as „Multifactor Interactive Processing" module.

See more: Pagglicia et al., EAGE 2016.

Recent development – Virtual Ray Imaging (VRI)



Oposite to ECP, the VRI method is model–independent. It is based on idea of R. P. Feynman to process statistically all virtually feasible paths of waves considered in a given experiment.

Conclusions

- Presented or mentioned methods are dedicated to complex tectonics
- Methods well work in overthrust areas
- Can provide initial model for prestack migration where classical tools fail

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