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Dip-Guided Auto-tracker for Seismic Interpretation

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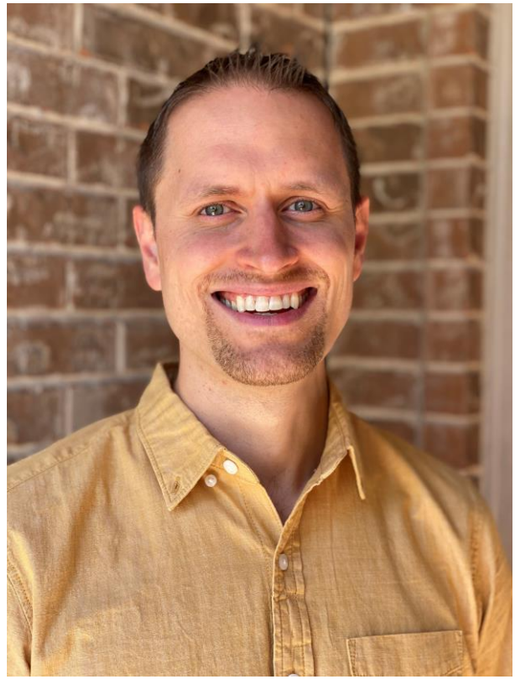
About the Author



Computational Geoscientist

Chevron Technical Center

Biography

- PhD Electrical Engineering with 7 years experience at Chevron
- Professional Interests: Seismic Interpretation, Computational Geometry, Static Reservoir Modeling, Software Engineering, Artificial Intelligence

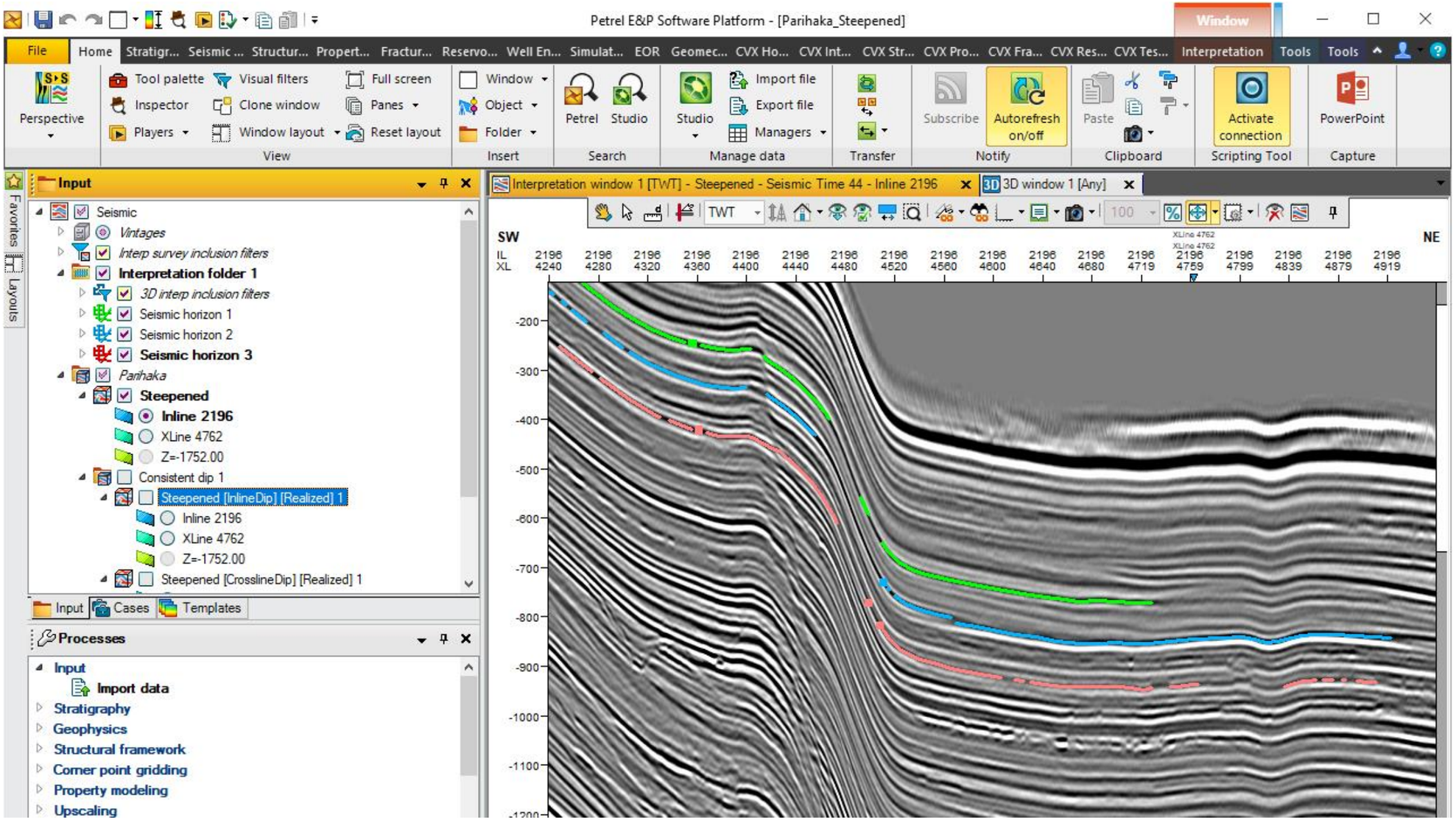
Acknowledgements

- Project team members
  - Barton Payne, Anne Dutranois-Coumont, Bin Qiu
- Feature advice and feedback:
  - Barton Payne, Anne Dutranois-Coumont, Steve Holdaway, Eric Stromboe, Antonio Nocioni, and many others
- Petrel plugin deployment team: Fred Xu, Sarah Vitel, Edmund Ing
- MathWorks

Motivation

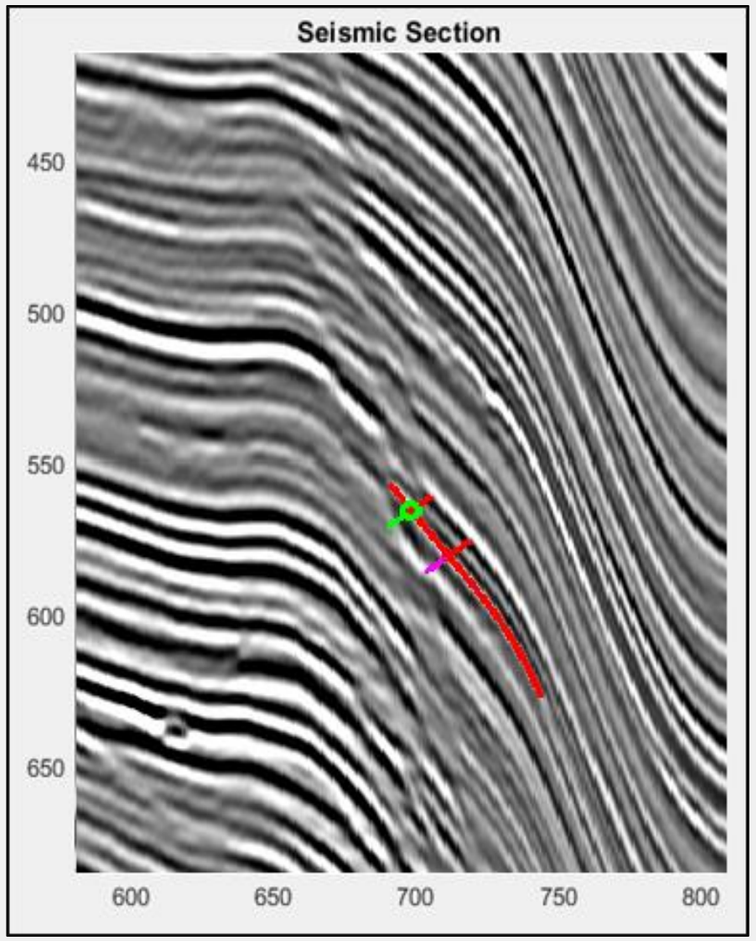
- MATLAB’s efficient language structure, mathematical libraries, and flexible visualizations are powerful tools for rapidly designing algorithms
- Quality of algorithm designs depends on the variety of test datasets
- The easiest way to get feedback and testing from busy interpreters is to bring your algorithm conveniently to their environment
- MATLAB provides flexible capabilities to deploy algorithms directly into Petrel plugins for rapid iterative improvement and deployment.

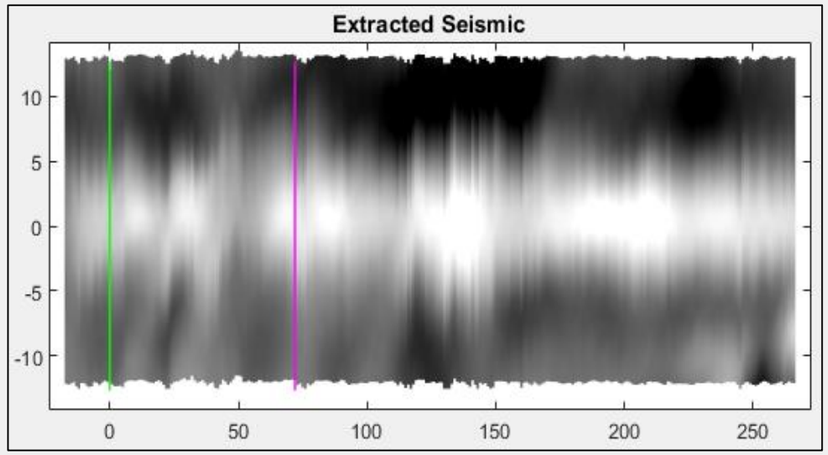
Conventional Horizon Auto-tracking

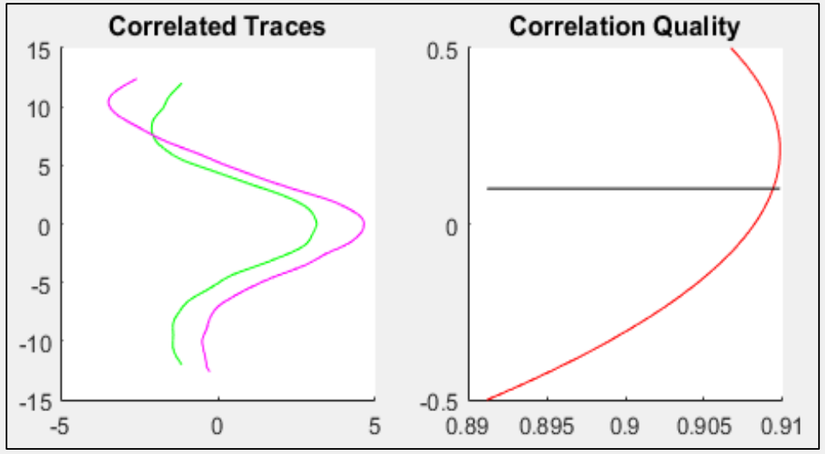


'The Parihaka seismic data shown is courtesy of the Government of New Zealand Petroleum and Minerals'

Simple/flexible visualization tools

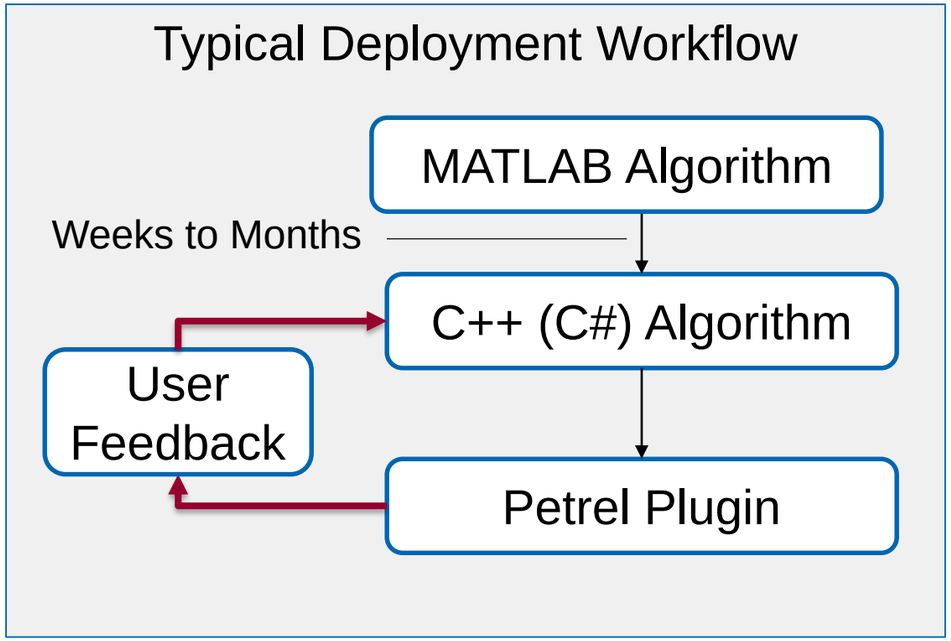


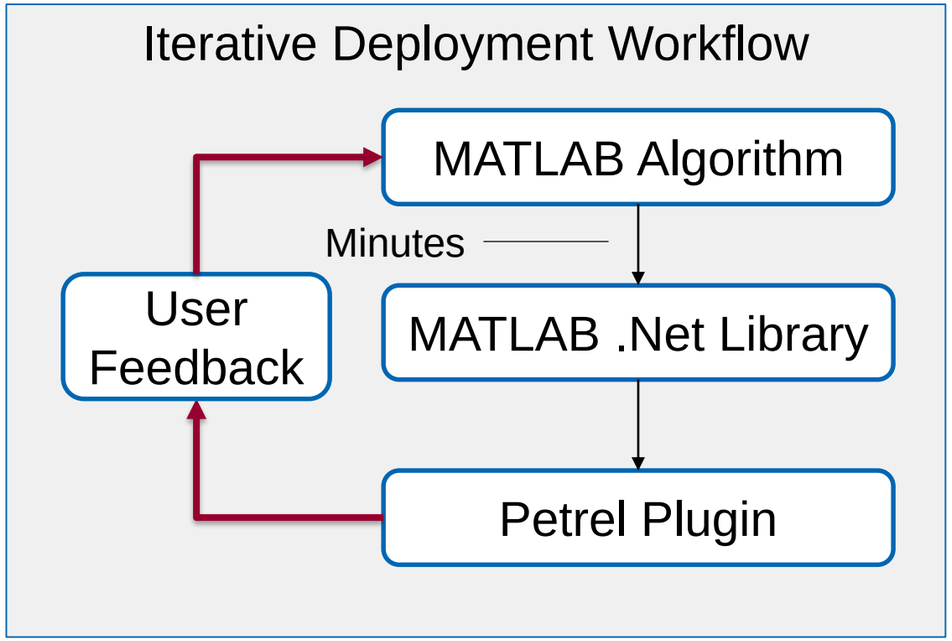




- MATLAB's visualization libraries allow for rapid prototyping and algorithm analysis

Algorithm Deployment Workflow





- User feedback starts when the algorithm is in Petrel

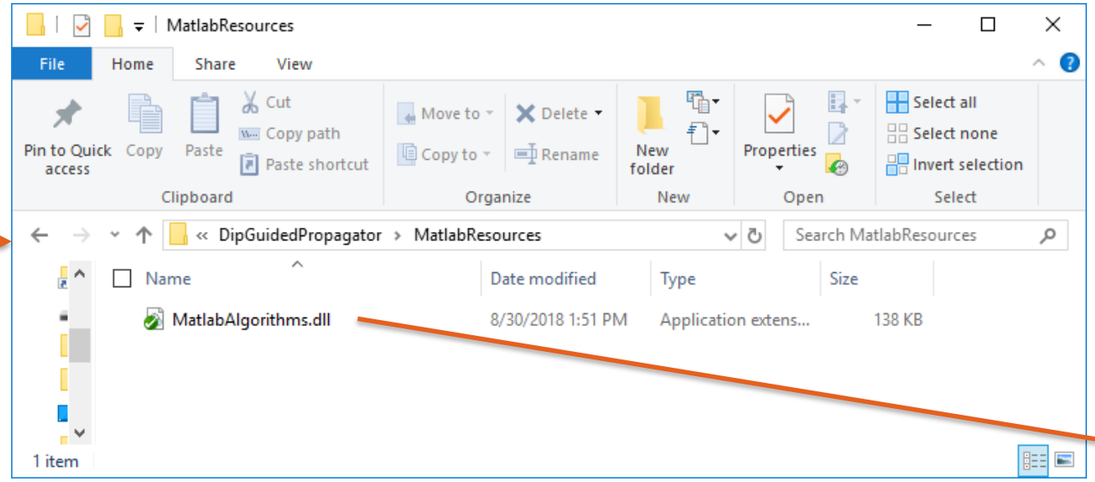
- Easier to iteratively improve to MATLAB implementation

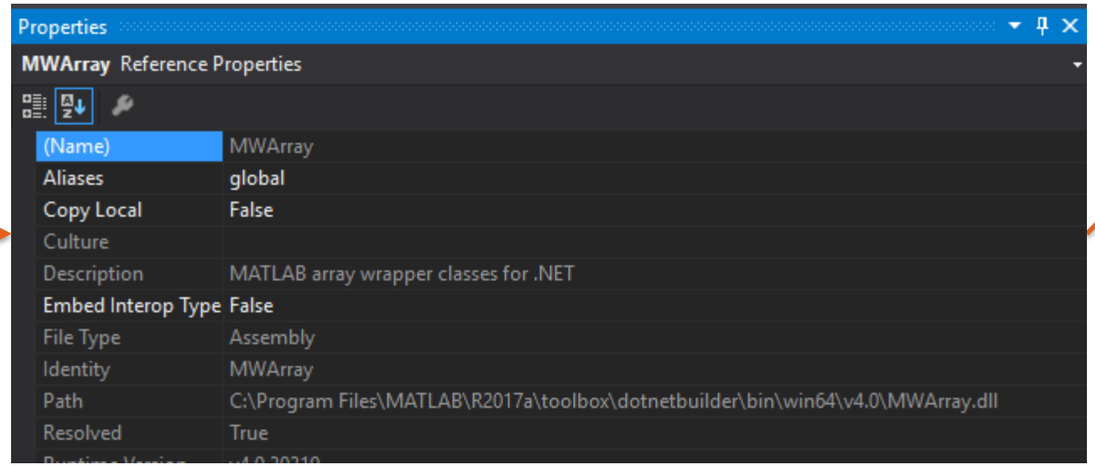
Algorithm Deployment Workflow

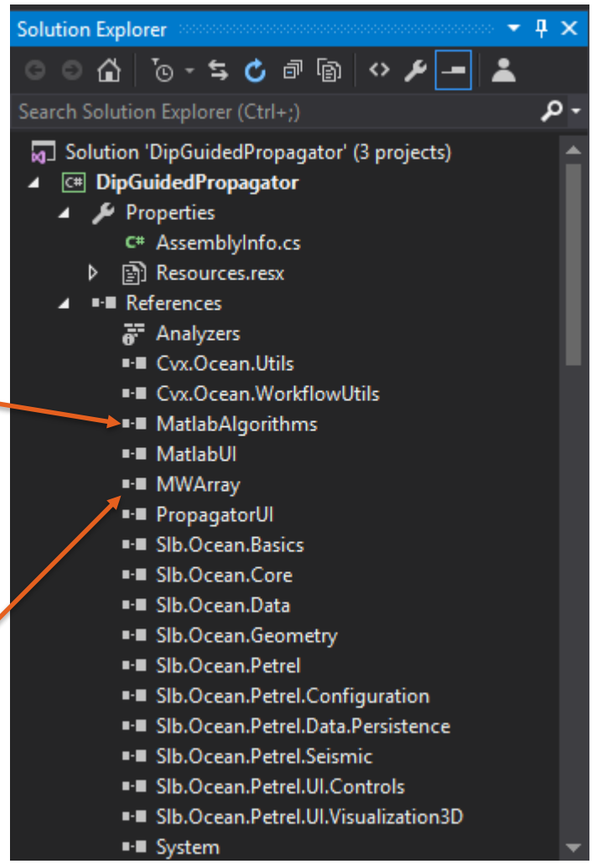
MATLAB function

Compiler SDK

MATLAB or MATLAB Runtime Installation

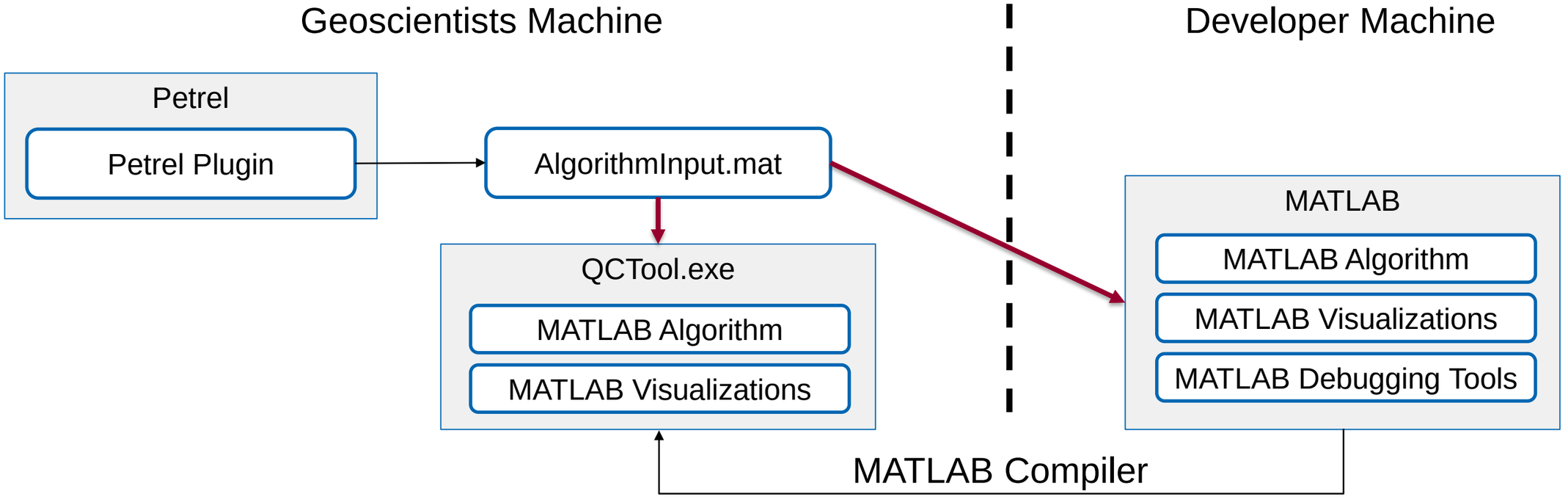






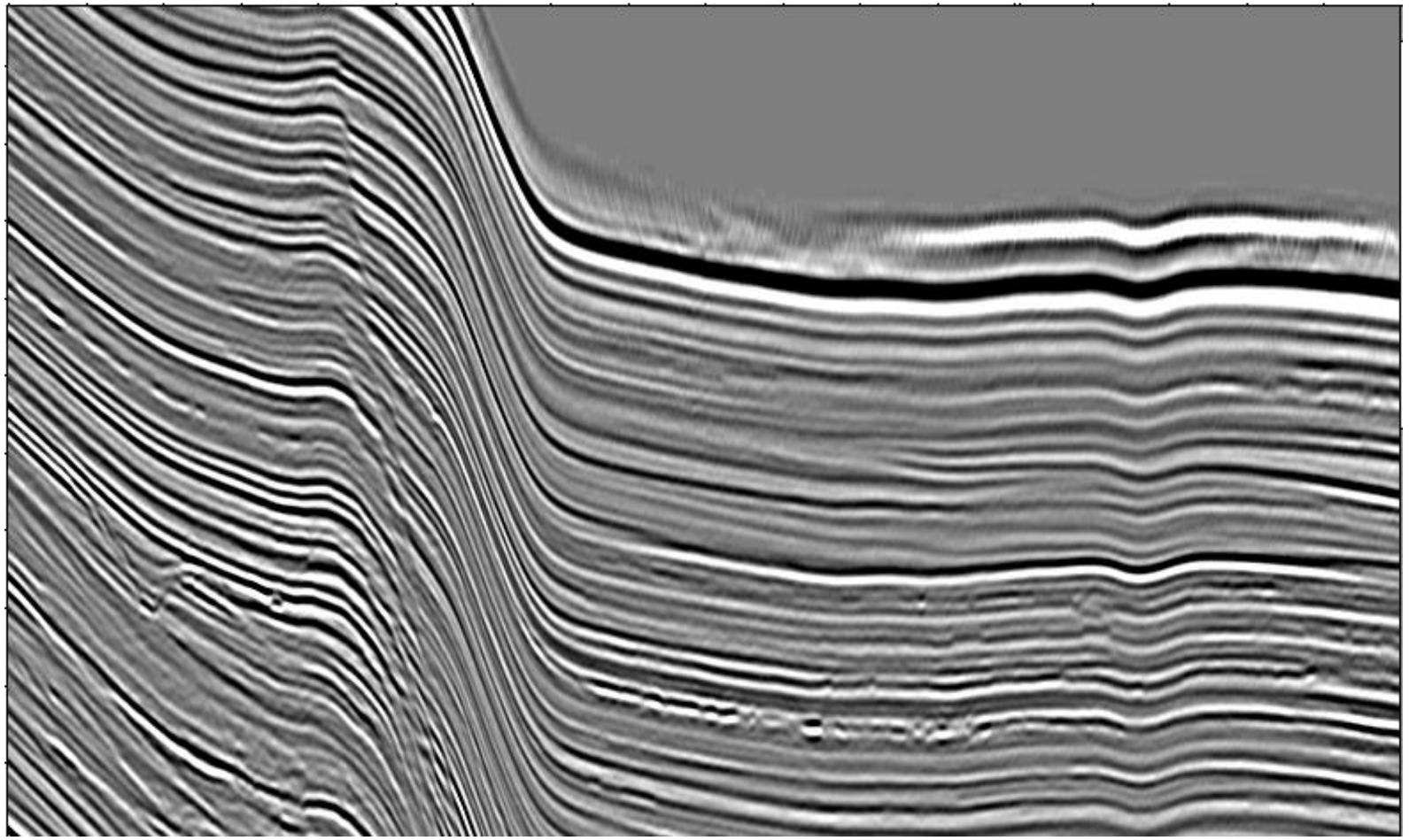
- Adding MATLAB libraries to Petrel plugins is simple and well documented

Algorithm Enhancement and QC Workflow



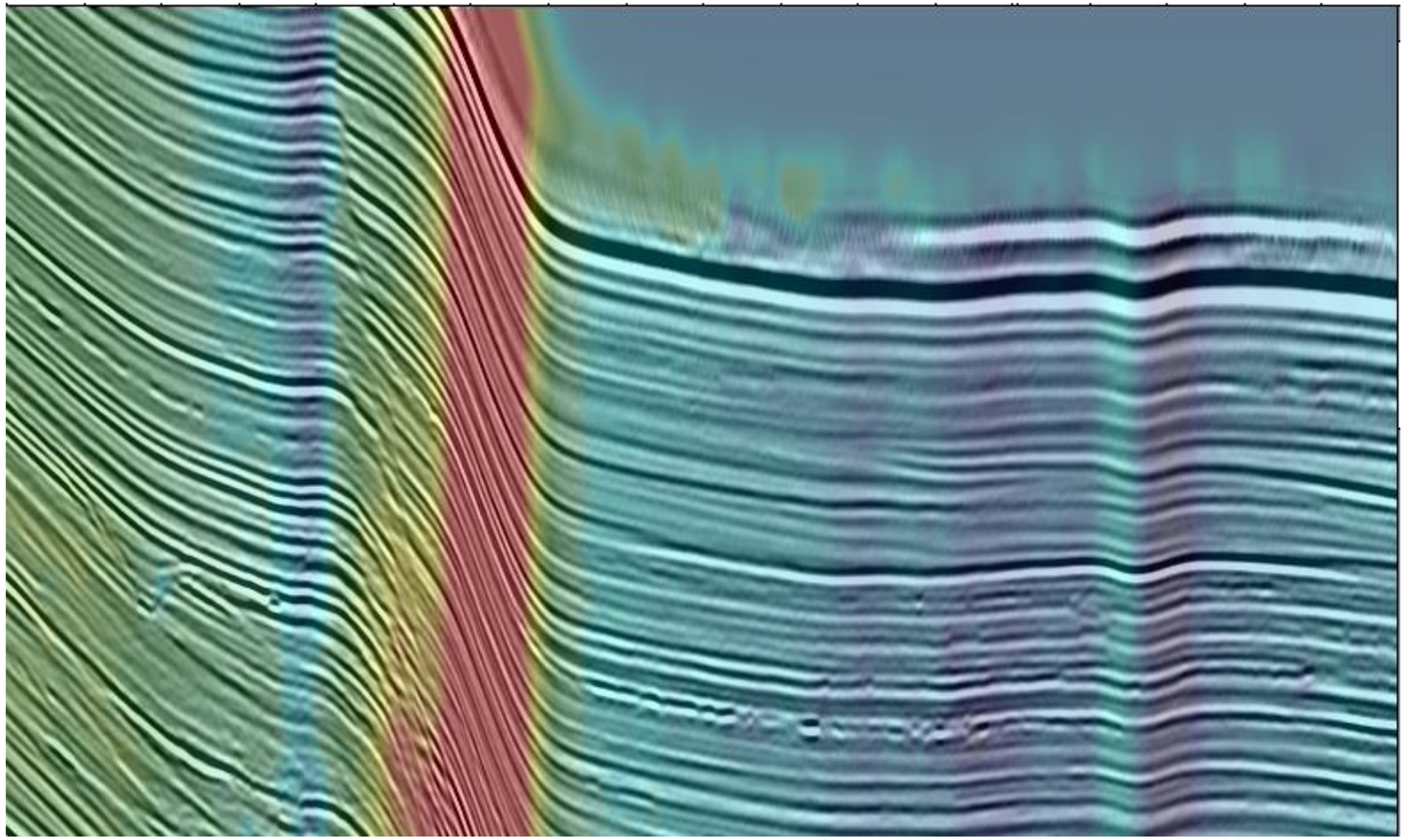
- Several algorithm changes were enabled by this rapid prototyping process:
  - More flexible geometry of auto-correlation input
  - Corrections for seismic amplitude clipping / quantization
  - Include horizon-based dip in addition to precomputed seismic dip volumes
  - Numerous additional stopping conditions (e.g. horizon curvature)

Dip QC



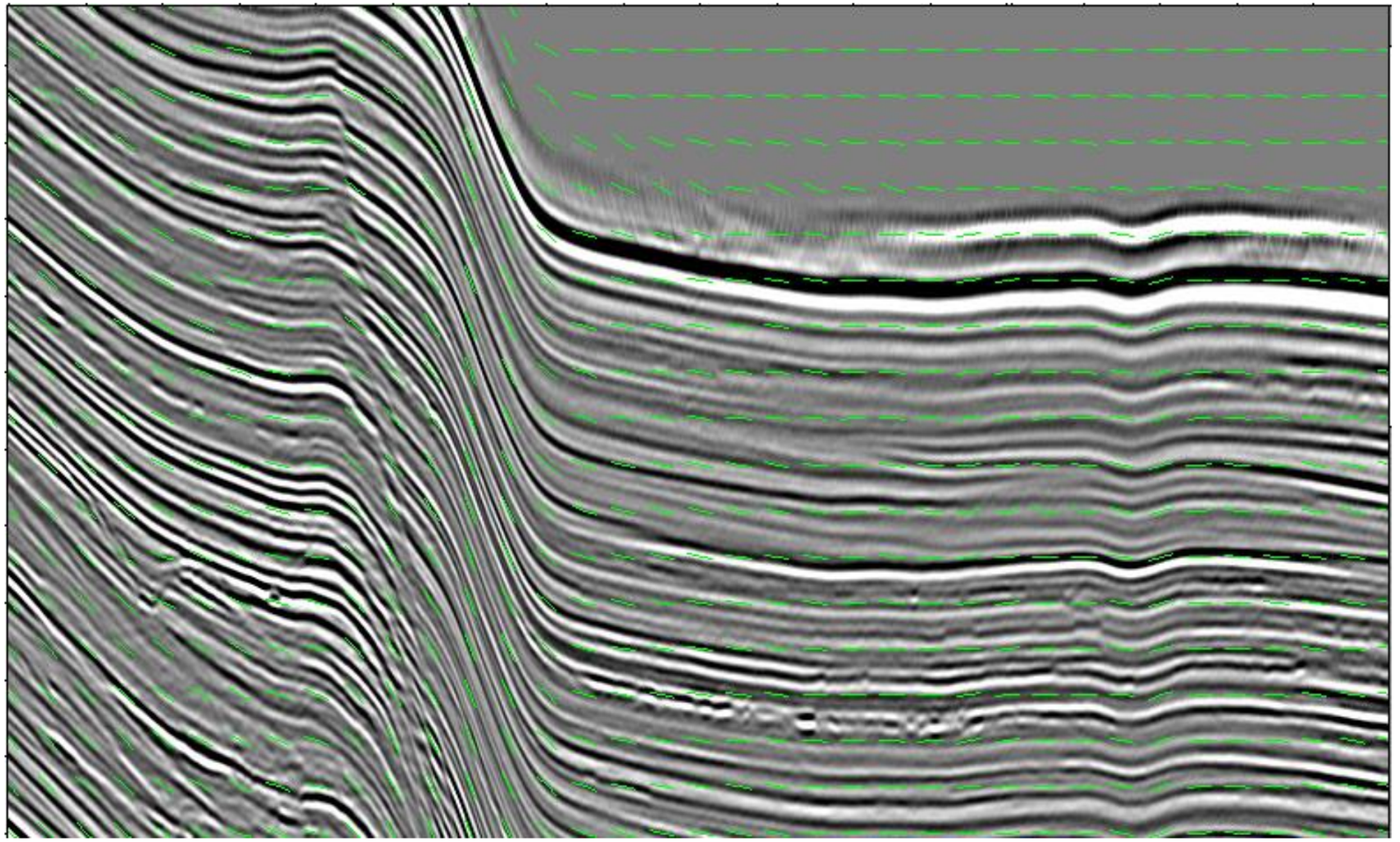
- There are a variety of seismic dip estimators and representations.

Dip QC



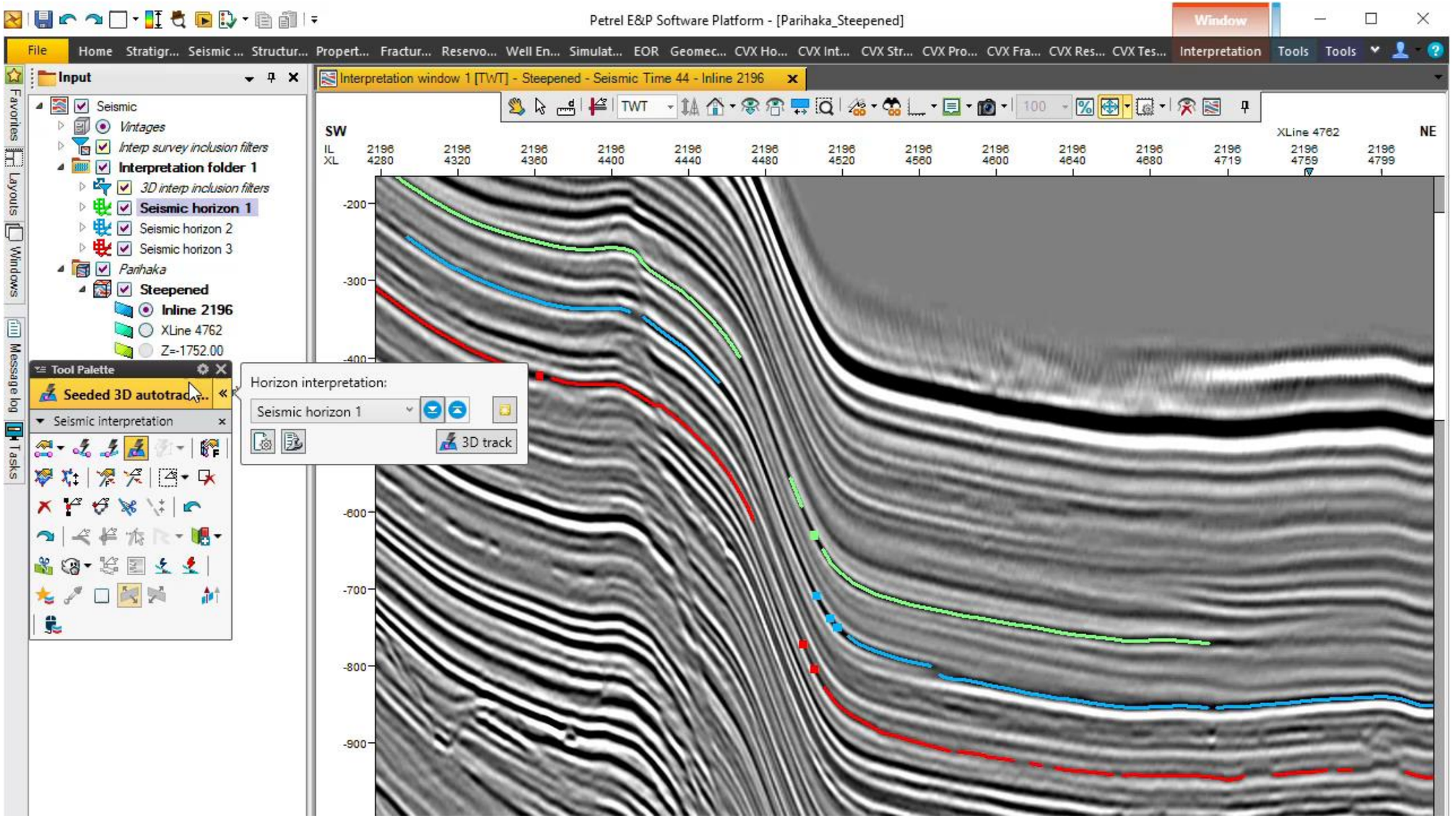
- Typically seismic dip is QC’d by co-rendering dip with seismic amplitude

Dip QC



- Geoscientists requested that we incorporate out dip QC visualization direction into Petrel

Dip-guided Auto-tracking



Conclusions

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